Guernsey Water
Water Quality Report

2020

GuernseyWater

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CONTENTS

OUR 7 OUTCOMES

Our vision is focused on the value of our core business which is water and wastewater service provision.

“Customers always value the quality of our drinking water and the safe return of our wastewater to the environment.”

DRINKING WATER OF CHOICE

The quality, sustainability and availability of our water makes it the drinking water of choice

- **Customers trust that our drinking water meets the highest standards, looks and tastes good**
- **Invest in efficient and sustainable water treatment to improve drinking water**
- **Ensure our drinking water is available to everyone**

99.95%

COMPLIANCE WITH DRINKING WATER STANDARDS

In 2020, Guernsey Water provided 3,958 mega litres of safe and high quality drinking water (over four times the volume of St. Saviour's Reservoir) to its customers.

Protecting public health with clean, fresh, wholesome drinking water is vitally important to Guernsey Water and in 2020 we conducted 7,341 laboratory analyses on compliance samples taken at water treatment works, service reservoirs and customers taps. These samples verify that the water produced at treatment works and supplied to customers complies with the standards set out in the regulations we follow as best practice.

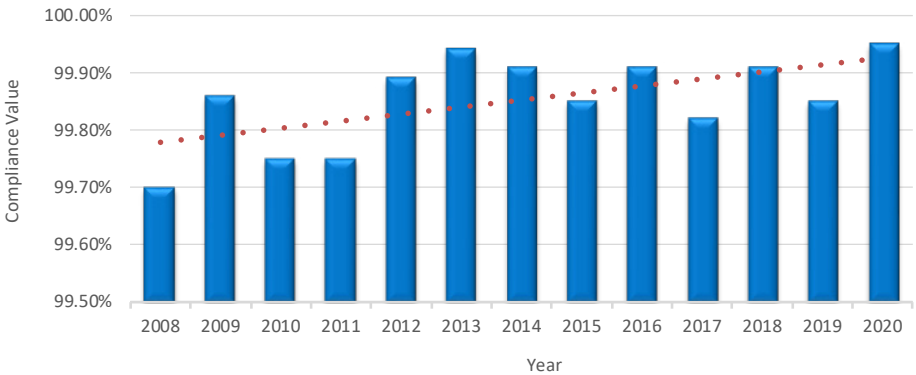
Many more samples were analysed both in laboratories and onsite for operational reasons over and above these compliance samples, providing additional checks and monitoring of the performance of our assets.

The quality of water supplied was excellent with 99.95% of 7,341 analyses meeting the prescribed standards. This shows an increase in compliance compared to the 2019 figure, which was 99.85% and is our best compliance to date.

The achievement of such a high compliance figure is due to the technical expertise of our staff covering all aspects of the science and engineering of the public water supply.

Safe, clean drinking water is vital to public health and the wellbeing of our island. This is ever more important in the face of significant challenges to drinking water supplies from the impacts of climate change on the quality and availability of water resources.

Overall Compliance



It is essential that good quality drinking water, and the investment by Guernsey Water necessary to achieve it is maintained into the future.

2020 Water Quality Key Performance Indicators

- Achieve 99.5% compliance for Prescribed Concentration or Values (PCVs) at Water Treatment Works
- Achieve 99% compliance for PCVs at service reservoirs
- Achieve 99% compliance for Maximum Admissible Concentrations at customer taps

Guernsey Water has achieved its 2020 water quality targets but the work we are doing to improve water quality continues. Guernsey Water continues to provide safe, high quality drinking water to the satisfaction of its customers. There are a small number of occasions where water quality does not meet the high standard we expect, and our customers deserve. We will continue to investigate and strive to eliminate these to further improve the quality of Guernsey's public drinking water supplies.

STEPHEN LANGLOIS
MANAGING DIRECTOR

SUMMARY

In 2020 there was only one breach at any of the three water treatment works - Kings Mills, Juas and St. Saviour's. This was at Kings Mills and was one coliform failure, this was thoroughly investigated, and no further issues were detected.

Compliance with bacterial standards at the Island's three service reservoirs was slightly higher than in 2019 at 99.46%. There were two low level bacterial detections at the service reservoirs at Forest Road, these occurred during refurbishment works. We have in 2020 continued with the programme of works to improve the water storage resilience at this site.

Supply zones (customer tap samples) were only sampled for part of the year due to the pandemic. The decision was made early in 2020 to stop going into customer's properties. Monitoring of water quality continued from fixed points in the supply network, in line with the rest of the industry, following agreement from the UK Drinking Water Inspectorate (DWI). There was one breach in total, this was a Trihalomethane (THM) failure. THM's are disinfection by-products formed primarily by reactions between chlorine and organic matter (measured as Total Organic Carbon).

THM formation remains an area of focus and further work will be undertaken throughout our latest business planning period to further reduce these by operational and capital investment. The DWI is however clear that "at all times that actions taken to minimise disinfection by-product formation should not compromise the effectiveness of the disinfection process." Guernsey Water follows this guidance as best practice.

We regularly analyse for a wide range of pesticides. There were no breaches of the 0.1µg/l limit observed in 2020.

We have continued to monitor our streams regularly for the presence of glyphosate which is regularly detected and at present remains a risk **(Appendix 2)**, and we will continue to monitor for this parameter in 2021 to ensure that the levels we find are of no concern to our treatment processes.

Perfluorooctane sulphonate (PFOS) has been monitored on a regular basis both in the raw water in St. Saviour's Reservoir and treated water leaving St. Saviour's Water Treatment Works **(Appendix 3)**. The maximum result detected in the treated water analysis was 0.0708µg/l (ppb) which is within Tier 1 (<0.1µg/l) of the guidance issued by the UK DWI on PFOS[1]. This was slightly higher than the levels detected in 2019.

Categorisation as Tier 1 merely recognises that there may be a potential hazard which should as a minimum be considered by a risk assessment. Guernsey Water has gone much further than this to ensure the protection of drinking water quality by working closely with the DEHPR and other States of Guernsey Departments to actively reduce PFOS levels found in raw water through the treatment of stream water from affected catchments as well as the removal and containment of contaminated soils. The affected catchments have also been closely monitored and measures put in place (such as stream diverts) to minimise levels in raw waters. In 2020 the maximum detected PFOS concentration recorded in the raw water stored at St. Saviour's Reservoir was 0.0613µg/l, slightly lower than the 0.0742µg/l recorded in 2019.

There was an increase in the maximum PFOS concentration detected in samples collected from streams, from 1.94µg/l in 2019 to 3.21µg/l in 2020. This was due to a combination factors including remedial works at the airport and the natural variation in rainfall amounts.

There were 61 water quality related contacts from customers in 2020 (2019:141). The number of contacts regarding taste and odour of tap water was 32 in 2020 (2019:89). From these figures we can see an improvement in the number of contacts. Minimising customer complaints will remain a focus for improvement throughout our business planning period.

Guernsey Water uses the same methodology for recording customer contacts and enquiries regarding water quality as is used in England and Wales, whereby every contact is recorded and categorised to enable year on year comparisons.

The implementation of Water Safety Planning in 2016, a proactive management system that aims to ensure clean, safe drinking water, continues to assist us in our aim of consistently supplying high quality drinking water to our customers. The updating and development of these plans will be ongoing throughout our business plan period, mirroring the improvements in planning across Europe and the United Kingdom.

[1]http://dwi.defra. gov.uk/stakeholders/information- letters/2009/10_2009.pdf

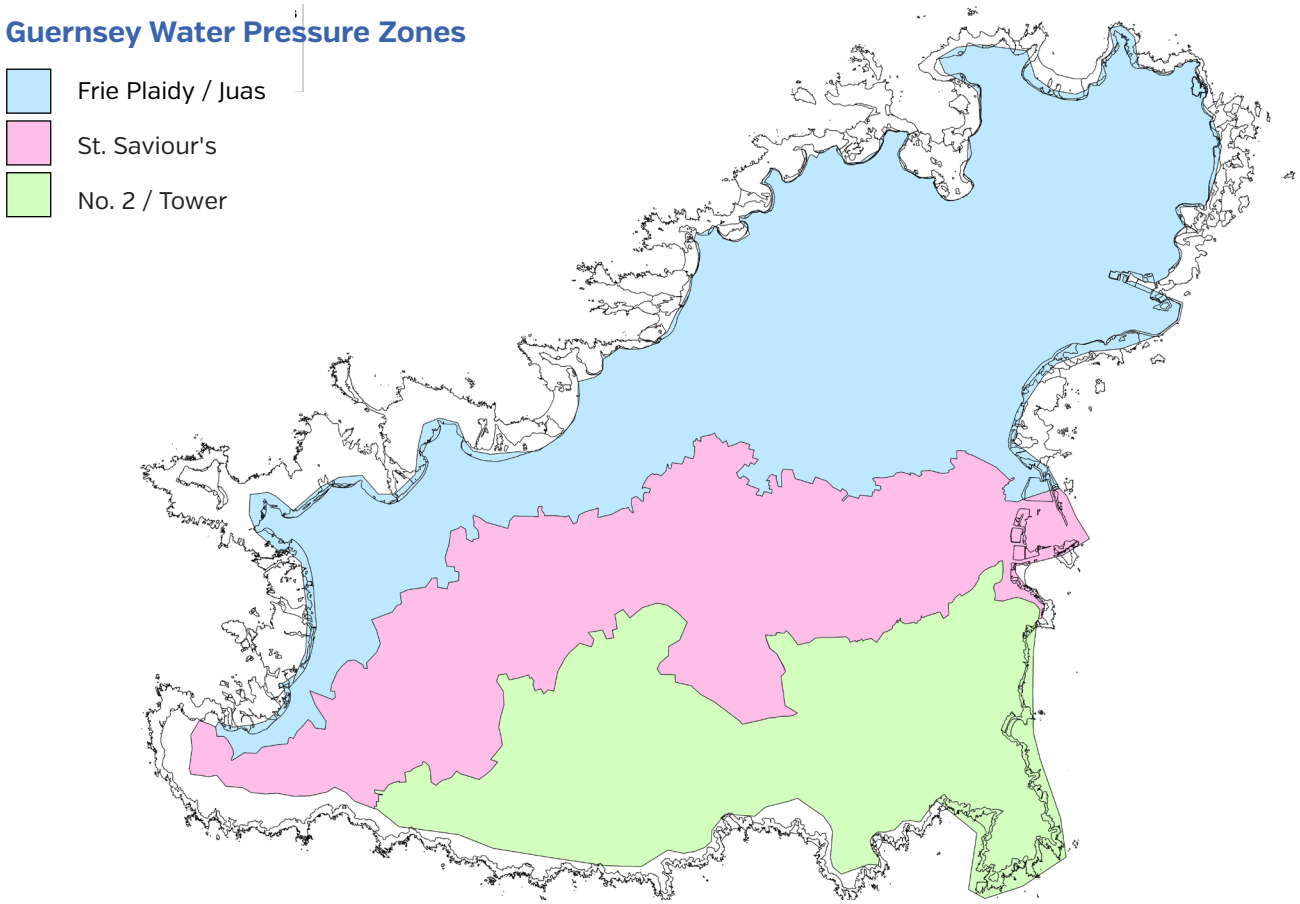
INTRODUCTION

Guernsey Water is regulated by the Director of Environmental Health and Pollution Regulation (DEHPR), with the current standard by which water quality is measured taken from England and Wales in the form of The Water Supply (Water Quality) Regulations, 2018. The regulations set out the parameters to be analysed for **(Appendix 1)** and the required frequency of testing.

Treated Water

Guernsey Water operates using current Drinking Water Inspectorate regulations and guidance as best practice. This requires us to meet very high standards to satisfy our Regulator, the Director of Environmental Health and Pollution Regulation. Guernsey Water has three treatment works, three service reservoirs, a water tower and a single water supply zone.

The general rationale of water movement in Guernsey is: St. Saviour's Water Treatment Works supplies water to No.2 East and West service reservoirs which then either goes into the Water Tower and onto the Tower Supply Zone (green in image below) or direct to No.2 Supply Zone (pink in image) Juas Water Treatment Works (or Kings Mills Water Treatment Works when Juas is offline) supplies water direct into Juas Supply Zone (blue in image below) and into Frie Plaidy Service Reservoir.



2020 COMPLIANCE SUMMARY

Below is a breakdown of the compliance for 2020, as measured against The Water Supply (Water Quality) Regulations, 2018.

Water Treatment Works

	St. Saviour's	Juas	Kings Mills	Total
No of Breaches	0	0	1	1
No of Passes	2288	2263	2234	6775
No of Samples	2288	2263	2235	6776
% Compliance	100.00%	100.00%	99.96%	99.99%

Service Reservoirs & Water Tower

	No. 2 East	No. 2 West	Frie Plaidy	Tower	Total
No of Breaches	0	0	1	1	2
No of Passes	74	90	103	103	370
No of Samples	74	90	104	104	372
% Compliance	100%	100%	99.04%	99.04%	99.46%

Distribution Zones

	Single Zone	Total
No of Breaches	1	1
No of Passes	211	211
No of Samples	212	212
% Compliance	99.53%	99.53%

Overall Total – all parameters

	Total
No of Breaches	4
No of Passes	7337
No of Samples	7341
% Compliance	99.95%

Tables 1 to 11 have the breakdown of drinking water quality in the detailed format used by water companies in England and Wales and annually reported by the DWI.

Raw Water

With regard to the Island's water catchment area, Guernsey Water has managed the legislation concerning pollution of this area. This has meant water quality that could potentially have an effect on drinking water has been managed through strict limits on discharges to the environment. This responsibility will in the future be moved to fall under the jurisdiction of the Director of Environmental Health and Pollution Regulation.

Raw water quality is closely monitored with analyses of 19 streams and stored water in 14 quarries and reservoirs. Raw water quality determines if water is collected and stored; in turn stored water is transferred to water treatment works based on water quality parameters to ensure that good quality water is supplied to our customers.

Nitrate levels in some streams are at the upper acceptable limit but through careful blending and storage, levels are reduced to ensure compliance with the prescribed limit of 50 mg/l for the provision of wholesome drinking water.

Tables 12 and 13 show the raw water quality that was observed in 2020 in the Island's various streams and storage reservoirs.

TREATED WATER SUMMARY

Treated Water 2020 Data Summary Tables

These tables contain a summary of results of treated water monitoring undertaken by Guernsey Water in 2020.

Notes relating to the interpretation of the tables: -

The tables below show the maximum and minimum levels detected over the year. The symbol < indicates that the result was less than the limit of detection of the analytical method used. The symbol > indicates that the result was above the recording range of the analytical method used

Table 1: Quality of water leaving treatment works - Directive requirements

Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of WTWs with failures
Nitrite	0.1 mg NO_2/l	29	0	<0.03	<0.03	0
TOTAL		29	0			0

Table 2: Quality of water leaving treatment works - National requirements

Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of WTWs with failures
Coliform Bacteria	0 number/100ml	744	1	0	1	1
E. coli	0 number/100ml	744	0	0	0	0
TOTAL	-	1488	1	0	1	1

Table 3: Quality of water leaving treatment works - Additional monitoring requirements

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum
Colony Counts After 3 Days At 22°C	No abnormal change	738	0	0	45
Turbidity	1 NTU	738	0	0.01	0.80
TOTAL		1476	0		

Table 4: Quality of water leaving service reservoirs - National requirements

Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of reservoirs failing standard
Coliform Bacteria	0 number/100ml	186	2	0	1	2
E. coli	0 number/100ml	186	0	0	0	0
TOTAL		372	2			2

Table 5: Quality of water leaving service reservoirs - National requirements

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum
Colony Counts After 3 Days At 22°C*	No abnormal change	274	10	0	<300
TOTAL		274	10		

*these are marked as n/a as they refer to changes observed and not a set numerical standard, they are linked to an internal standard. They do not count towards overall complaince score.

Table 6a: Quality of water leaving bulk supply points - European Standards

Indicator Parameter	Prescribed Con-centration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of supply points failing standard
1,2 Dichloroethane	3 µg/L	2	0	<0.16	<0.16	0
Benzene	1 µg/L	2	0	<0.09	<0.09	0
Boron	1 mg B/L	2	0	77.90	100.00	0
Bromate	10 µg Br03/L	2	0	<0.15	<0.15	0
Cyanide	50 µg CN/L	26	0	<5.5	<5.5	0
Fluoride	1.5 mg F/L	2	0	<0.1	<0.1	0
Mercury	1 µg Hg/L	33	0	<0.006	<0.006	0
Tetrachloroethene / Trichloroethene	10 µg/L	2	0	0	0.61	0
TOTAL	-	71	0	-	-	0

Table 6b: Quality of water leaving bulk supply points - European Standards (pesticides)

Parameter	Prescribed Concetration or Value	Count of times detected	Tests Failed	Minimum	Maximum	No. of supply points failing standard
2,4-D	0.1 µg/L	9	0	<0.012	0.025	0
Atrazine	0.1 µg/L	0	0	<0.004	<0.004	0
Atrazine Desethyl	0.1 µg/L	0	0	<0.005	<0.010	0
Atrazine Desisopropyl	0.1 µg/L	0	0	<0.007	<0.007	0
Bentazone	0.1 µg/L	0	0	<0.004	<0.008	0
Bromoxynil	0.1 µg/L	0	0	<0.009	<0.009	0
Carbendazim	0.1 µg/L	11	0	<0.003	0.007	0
Clopyralid	0.1 µg/L	24	0	<0.015	0.048	0
Chloridazon	0.1 µg/L	0	0	<0.008	<0.016	0
Chlorpyriphos Ethyl	0.1 µg/L	0	0	<0.016	<0.032	0
Cynazine	0.1 µg/L	0	0	<0.006	<0.012	0
Dicamba	0.1 µg/L	0	0	<0.012	<0.012	0
Diflufenican	0.1 µg/L	0	0	<0.007	<0.007	0
Diuron	0.1 µg/L	0	0	<0.009	<0.009	0
Endrin	0.1 µg/L	0	0	<0.005	<0.005	0
Fenpropimorph	0.1 µg/L	0	0	<0.004	<0.008	0
Floroxypyr	0.1 µg/L	1	0	<0.009	0.009	0
MCPA	0.1 µg/L	9	0	<0.012	0.041	0
MCPP (Mecoprop)	0.1 µg/L	10	0	<0.009	0.056	0
Methabenzthiazuron	0.1 µg/L	0	0	<0.005	<0.005	0
Metoxuron	0.1 µg/L	0	0	<0.007	<0.007	0
Propazine	0.1 µg/L	0	0	<0.004	<0.004	0
Propiconazole	0.1 µg/L	0	0	<0.007	<0.007	0
Simazine	0.1 µg/L	0	0	<0.004	<0.004	0
Tebuconazole	0.1 µg/L	0	0	<0.005	<0.005	0
Terbuthylazine	0.1 µg/L	0	0	<0.003	<0.003	0
Terbutryn	0.1 µg/L	11	0	<0.003	0.017	0
Triclopyr	0.1 µg/L	0	0	<0.028	<0.028	0
Aldrin	0.1 µg/L	0	0	<0.005	<0.005	0
Dieldrin	0.1 µg/L	0	0	<0.005	<0.005	0
Heptachlor	0.1 µg/L	0	0	<0.004	<0.004	0
Heptachlor epoxide	0.1 µg/L	0	0	<0.005	<0.006	0
Pesticides - Total Substanc-es		27	0	0.015	0.154	0
Total		102	0			

Table 7: Quality of water leaving bulk supply points - National Standards

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of supply points failing standard
Tetrachloromethane	3 µg/L	2	0	<0.13	<0.13	0
TOTAL	-	2	0			0

Table 8: Quality of water leaving bulk supply points - Additional Monitoring Requirements

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of supply points failing standard
Clostridium Perfringens	0 number/100ml	31	0	0	0	0
Conductivity	2500 µS/cm	156	0	448	606	0
Radioactivity - Gross Alpha	0.1 Bq/L	3	0	<0.021	<0.022	0
Radioactivity - Gross Beta	1 Bq/L	3	0	0.108	0.158	0
Radioactivity - Tritium	100 Bq/L	3	0	<5	<5	0
Total Organic Carbon (TOC)	No abnormal change	155	0	1.40	4.10	0
Chloride	250mg/l	2	0	86	95	0
Sulphate	250mg SO4/L	2	0	63	71	0
Total		355	0			0

Table 9: Quality of water at consumer's tap (zones) - European Standards[2]

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of zones with failures
Antimony	5 µg Sb/L	2	0	0.430	1.160	0
Arsenic	10 µg As/L	2	0	0.30	0.34	0
Benzo(a)pyrene	0.01 µg/L	2	0	<0.0057	<0.00057	0
Cadmium	5 µg Cd/L	2	0	<0.03	<0.03	0
Chromium	50 µg Cr/L	2	0	0.48	0.60	0
Copper	2000 µg Cu/L	2	0	34.7	36.9	0
E. Coli	0 number/100ml	37	0	0	0	0
Enterococci	0 number/100ml	2	0	0	0	0
Lead	25 µg Pb/L	2	0	0.38	0.43	0
Nickel	20 µg Ni/L	2	0	1.35	1.37	0
Nitrate	50 mg NO3/L	2	0	10.9	28.1	0
Nitrite	0.5 mg NO2/L	2	0	<0.03	<0.03	0
Polycyclic aromatic hydrocarbons (PAHs)	0.1 µg/L	2	0	0.000	0.000	0
Selenium	10 µg Se/L	2	0	0.50	0.77	0
Trihalomethanes (THMs)	100 µg/L	2	1	22.37	116.01	1
TOTAL	-	65	1			1

[2]Customer tap samples were only sampled for part of the year due to the pandemic. The decision was made early in 2020 to stop going into customer's properties. Monitoring of water quality continued from fixed points in the supply network, in line with the rest of the industry, following agreement from the DWI.

Table 10: Quality of water at consumer's tap (zones) - National Standards

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum	No. of zones with failures
Aluminium	200 µg Al/L	11	0	14.0	51.0	0
Colour	20 mg/L Pt/Co scale	11	0	<5	<5	0
pH	6.5 - 9.5 pH value	11	0	7.11	7.40	0
Iron	200 µg Fe/L	11	0	<10	13.0	0
Manganese	50 µg Mn/L	11	0	<10	18.0	0
Organoleptic Odour	3 at 25°C dilution number	11	0	0	0	0
Organoleptic Taste	3 at 25°C dilution number	11	0	0	0	0
Sodium	200 mg Na/L	2	0	57	66	0
Turbidity	4 NTU	11	0	0.01	0.10	0
TOTAL	-	90	0			0

Table 11: Quality of water at consumer's tap (zones) - Additional Monitoring Requirements

Indicator Parameter	**Prescribed Concentration or Value**	**Total number of tests**	**Tests Exceeding Specification**	**Minimum**	**Maximum**
Ammonium	0.5 mg NH_4/L	11	0	<0.01	0.02
Coliform Bacteria	0 number / 100ml	37	0	0	0
Colony Counts after 72 hours at 22°C*	No abnormal change	11	2	0	230
Conductivity	2500uS/cm	11	0	519	607
TOTAL	-	70	2	-	-

*these are marked as n/a as they refer to changes observed and not a set numerical standard, they are linked to an internal standard. They do not count towards overall complaince score.

RAW WATER SUMMARY

Raw Water 2020 Data Summary Tables

These tables contain a summary of results of raw water monitoring undertaken by Guernsey Water in 2020.

Notes relating to the interpretation of the tables: -

The symbol < indicates that the result was less than the limit of detection of the analytical method used. The symbol > indicates that the result was above the recording range of the analytical method used.

Table 12: Quality of water in Island streams - Monitoring

Indicator Parameter	Units of Measure	Total number of tests	Minimum	Maximum
Conductivity	µS/cm	221	100	2780
Nitrate	mg NO3/L	221	1.1	75.9
Ammonia	mg NH4/L	192	0.01	28.0
Phosphate	mg P/L	221	0.04	2.30
Total Organic Carbon (TOC)	mg C/L	-	-	-
Coliforms	number / 100ml	220	4	72,000
E.Coli	number / 100ml	220	0	45,000
Enterococci	number / 100ml	220	0	5,000
TOTAL	-	1515		-

Table 13: Quality of stored water in quarries and reservoirs - Monitoring

Indicator Parameter	Units of Measure	Total number of tests	Minimum	Maximum
pH	pH value	24	6.96	9.60
Conductivity	µS/cm	24	489	671
Total Oxidised Nitrogen	mg NO3/L	24	1.50	25.0
Ammonium	mg NH4/L	13	0.01	0.27
Nitrite	mg NO2/L	13	0.03	0.38
Chloride	mg Cl/L	24	64	102
Coliforms	number / 100ml	24	4	2800
E. Coli	number / 100ml	24	0	4700
Enterococci	number / 100ml	24	5	880
Total Organic Carbon (TOC)	mg C/L	6	2.8	17.4
TOTAL	-	200		

Perfluorooctane Sulfonate (PFOS)

Since 2007 PFOS has been monitored in raw and treated water in accordance with guidance from DWI who have recently revised the PCV for these compounds from 0.3µg/l to 0.1µg /l Guernsey Water has used its available water resources to manage the levels of PFOS in water leaving St. Saviour's Water Treatment Works. The tables below provide a breakdown of the levels of PFOS observed in 2019 in drinking water from St. Saviour's Water Treatment Works, St. Saviour's Reservoir and affected stream systems.

Table 14: Quality of water leaving treatment works - PFOS

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum	Maximum
Perfluorooctane sulfonate (PFOS)	1.0 µg $C_8HF_{17}O_3S$/L	40	0	0.0128	0.0708
TOTAL		40	0		

Table 15: Quality of water in St. Saviour's Reservoir - PFOS

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Minimum	Maximum
Perfluorooctane sulfonate (PFOS)	1.0 µg $C_8HF_{17}O_3S$/L	22	0.0254	0.0613
TOTAL		22		

Table 16: Quality of water in Island streams - PFOS

Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Minimum	Maximum
Perfluorooctane sulfonate (PFOS)	1.0 µg $C_8HF_{17}O_3S$/L	59	0.0550	3.2100
TOTAL		59		

WATER CATCHMENT

2020 Water Catchment Area Nitrate Loadings

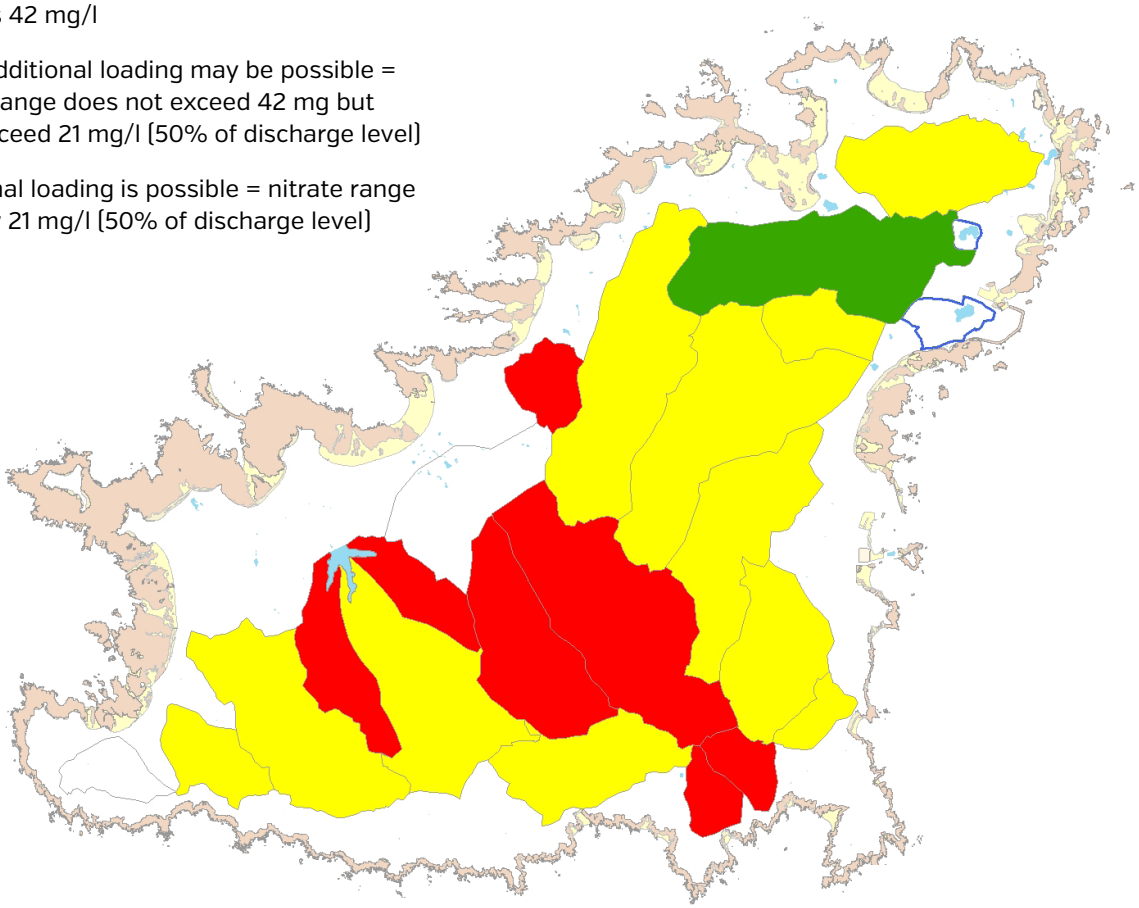
The 2020 nitrate loadings have been evaluated to produce a nitrate map showing the level of nitrates in each catchment area.

The Director of Environmental Health and Pollution Regulation submitted discharge standards for inclusion within Part VI of The Environmental Pollution (Guernsey) Law, 2004, to the States of Guernsey in Billet d'Etat XX1 2012 (dated 31st October 2012) and the proposed nitrate discharge level is recommended at 42 mg/l* (as NO3). The nitrate drinking water limit as prescribed in The Water Supply (Water Quality) Regulations 2000, as amended, is set at 50 mg/l.

No additional loading = nitrate range exceeds 42 mg/l

Some additional loading may be possible = nitrate range does not exceed 42 mg but does exceed 21 mg/l (50% of discharge level)

Additional loading is possible = nitrate range is below 21 mg/l (50% of discharge level)



*this lower level has been set to ensure that nitrate loadings decrease over time.

Table 18: Quality of water in Island streams – Nitrate

Catchment Area	5th Percentile (mg/L)	Mean (mg/L)	95th Percentile (mg/L)
Beau Vallee	15.3	24.2	29.4
Charroterie	19.9	26.7	29.9
Choffins	23.9	47.9	59.1
Cobo	27.9	45.5	71.5
Douit du Moulin	26.4	30.5	33.8
Fauxquets	27.6	56.7	69.5
Fermain	21.7	29.6	36.1
Les Clercs	20.8	25.7	31.7
Les Nicolles	3.0	7.2	13.0
Marais Stream	1.2	8.0	20.3
Mare De Carteret	11.5	23.0	35.7
Moulin Huet	22.0	29.2	34.0
Padins	21.7	32.8	45.0
Petit Bot	19.7	34.0	58.3
Saints	22.9	31.7	49.3
Talbots	21.5	38.5	47.0
Vale Pond	2.3	10.7	33.5
Vielle Marais	1.7	13.0	34.6
Vrangue	10.8	21.3	25.9

APPENDIX 1

Table 19: Listed parameters Guernsey Water samples for and prescribed concentration or values

Bacteriology Parameter	Prescribed Concentration or Value
Clostridium perfringens	0 number/100ml
Coliforms	0 number/100ml
Colony Count cfu /mL 22°C / 72 hr	No abnormal change
Cryptosporidium	oocyst >1 in 10 litres
E. coli	0 number/100ml
Enterococci	0 number/100ml

Chemistry Parameter	Prescribed Concentration or Value
1,2-Dichloroethane	3 µg/L
Aluminium	200 µg/L Al
Ammonium	0.5 mg/L NH_4
Antimony	5 µg/L Sb
Arsenic	10 µg/L As
Benxo(a)pyrene	0.01 µg/L
Benzene	1 µg/L
Boron	1000 µg/L B
Bromate	10 µg/L $Br0_3$
Cadmium	5 µg/L Cd
Chloride	250 mg/L Cl
Chromium	50 µg/L Cr
Colour	20 mg/L Pt/Co
Conductivity	2500 µS/cm
Cyanide	50 µg/L CN
Fluoride	1.5 mg/L F
Iron	200 µg/L Fe
Manganese	50 µg/L Mn
Mercury	1 µg/L Hg
Nitrate	50 mg/L N03
Nitrate / Nitrite Formula	1 mg/L NO_2
Nitrite (treatment works)	0.1 mg/L NO_2
Nitrite (consumers' tap)	0.5 mg/L NO_2
Organoleptic Odour	3 at 25°C dilution number
Organoleptic Taste	3 at 25°C dilution number

Chemistry Parameter	Prescribed Concentration or Value
PAH Total	0.1 µg/L
pH	6.5 - 10.0
Radioactivity - Gross alpha	0.5 Bq/L
Radioactivity - Gross beta	1 Bq/L
Radon	100 Bq/L
Residual Disinfectant - Free Chlorine mg/L	No abnormal change
Residual Disinfectant - Total Chlorine mg/L	No abnormal change
Selenium	10 µg/L Se
Sodium	200 mg/L Na
Sulphate	250 mg/L SO_4
Tetra/Trichloroethene	10 µg/L
Tetrachloromethane	3 µg/L
THMs Total	100 µg/L
Total Organic Carbon (TOC) mg/L C	No abnormal change
Tritium	100 Bq/L
Turbidity (treatment works)	1 NTU
Turbidity (consumer's tap)	4 NTU

Pesticides	
Aldrin	0.03 µg/L
Dieldrin	0.03 µg/L
Heptachlor	0.03 µg/L
Heptachlor epoxide	0.03 µg/L
Individual Pesticides	0.1 µg/L
Total Pesticides	0.5 µg/L

APPENDIX 2

GLYPHOSATE HERBICIDE RISK- REPORT 2020

Introduction

Guernsey Water undertakes regular monitoring of stored reservoir and drinking water supplies for the presence of approximately 125 different pesticide products, to ensure compliance with drinking water regulations. Surveillance monitoring of stream waters is also undertaken when residues of certain chemicals become a source of concern.

Sampling for the commonly available herbicide 'Glyphosate' in stream waters began in 2015. Amongst the many compounds that are regularly tested it is glyphosate that is now found in the greatest concentration in our stored water reservoirs. Through careful selection of stream resources, the rejection of affected stream supplies and blending of stored waters, Guernsey Water has to date avoided breaching the UK PCV for individual herbicides of 0.1 µg/l (micrograms/litre) in treated drinking water.

The use of sodium hypochlorite to disinfect water supplies has further ensured drinking water standards remained compliant below the maximum limit as this chemical, up to a point, degrades glyphosate in treated water.

Guernsey Water has raised awareness of glyphosate amongst relevant states departments (Office of Environmental Health and Pollution Regulation (OEHPR) / Health and Safety Executive / Agriculture, Countryside and Land Management Services / States Works) and members of the public through continued media coverage, with distribution and publication of herbicides leaflets and framed posters at point of sale, guidelines published annually in spring and summer supplements together with ongoing press releases, front page articles by Guernsey Water and OEHPR and more recently online media posts.

Although nearly ubiquitous the presence of glyphosate concentrations is of most concern in the northern (largely urbanised) catchments, as it is in these areas that glyphosate presently dominates. (See catchment mapping).

Glyphosate is currently banned or under restricted use in 21 countries worldwide and "greener" alternatives are now widely available.

Glyphosate Summary

Pesticide residues are invisible and odourless in our raw and treated water supplies – testing in UK laboratories is the only way to accurately determine concentrations, sample data return times are nominally several weeks.

Stream Supplies

In June 2019, the Water Quality Risk Management Department (WQRM) advised that the Vale Pond stream transfer station be switched off due to an excessive concentration of glyphosate following a stream sample result of 3.01 µg/l (30 x PCV). This water remained unavailable for collection for another 4 months after which the water was not required, as other stream resources were used to fill the northern reservoirs depleted over the summer demand period.

The same decision was again made in 2020 to not collect the water, and another catchment area, the Marais stream which exhibited similar raised concentrations of 2.54 µg/l (25 x PCV). Combined these two sources represent critical water resources for the north of the island, again the Vale Pond remained uncollected during the peak summer demand period.

The waters from these catchments are transferred into Juas and Longue Hougue Reservoirs respectively for subsequent treatment at Juas Water Treatment Works.

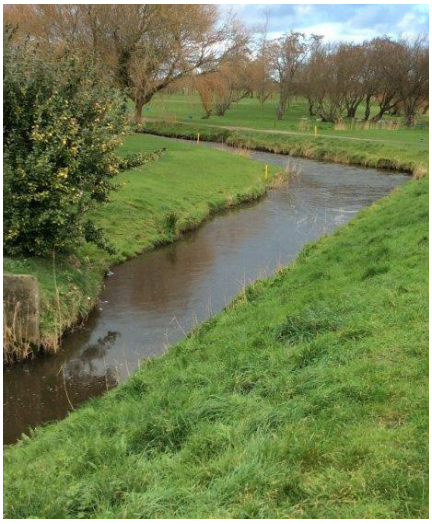
Ongoing sampling in 2020 determined that the concentrations within the Vale Pond stream catchment did not decrease below the PCV following autumn rainfall.

The other catchments of concern that supply northern stored waters are the Vielle Marais, Mare des Carteret and Le Vrangue.

Upstream source water assessments have shown individual samples within the Marais stream catchment as high as 8.36 µg/l in 2020. Additional sampling is inconclusive to a singular source for this excessive amount and further investigation is ongoing.

The flushing of glyphosate residues into stream systems following rainfall, and the lack of dilution to below the PCV from autumn rainfall is notable in the Vale Pond catchment and may become a concern in others. The excessive amounts noted in October 2020 attest the high degree of variability of this compound in the environment, the raised concentrations occurring at times when autumn recharge of Guernsey Water reservoirs should be underway.

This data is indicative of glyphosate flushing from impermeable, paved and permeable surfaces in urban environments such as brick and gravel driveways, paths and patios where attenuation and degradation of glyphosate in soils is less likely.



Stored Waters

Guernsey Water reservoirs accept water from a variety of stream catchments, allowing for the blending of different waters, thereby lessening the risks of pollution from a single source impacting on treated water supplies.

As most northern catchments are now exhibiting above PCV glyphosate concentrations for some of the time, the impact on stored water quality in northern reservoirs is now more apparent. From 2019 – 2020 the maximum glyphosate concentrations detected in stored waters increased in the following stored supplies:

- Capelles reservoir
- Longue Hougue reservoir
- Juas reservoir

By comparison the more rural catchments, the streams and reservoirs which they supply, currently exhibit lower overall Glyphosate residues. The smaller south and southeast catchments in particular Fermain, Saints and Moulin Huet exhibit low concentrations.

Glyphosate should decay slowly within stored waters over time however there is currently no data that shows this in effect, due to draw down and refill of the major reservoirs in use.

Treated Waters

The use of sodium hypochlorite as a primary disinfectant at the St. Saviour's and Kings Mills Water Treatment Works, together with sources low in glyphosate has thus far maintained concentrations, within treated water supplies, to low or below limit of detection (LOD) concentrations. The treatment process at Juas WTW does not employ primary disinfection as UV is the primary disinfectant at this site.

To date there have been three detections of glyphosate in treated water supplies from Juas WTWs of 0.03 / 0.05 µg/l in 2019 and 0.01 µg/l in 2020, all below the PCV.

Treatment - Ultraviolet Disinfection

The adoption of UV disinfection at the refurbished Juas WTWs has surpassed expectations in relation to the lowering of final water THMs (another regulated group of compounds). UV treatment also reduces the volume of imported salt required to disinfect water supplies, whilst also safeguarding drinking water compliance in relation to the cryptosporidium parasite. UV technology will be incorporated into all other WTWs as part of our water treatment strategy.

As UV disinfection requires only a final residual hypochlorite dose there is an inherently lower safeguard against glyphosate and therefore greater likelihood of treated water exceedance if glyphosate use is allowed to continue and raw water concentrations continue to rise. This means we will need to increase efforts to control Glyphosate at source if we are to continue to avoid costly additional water treatment processes that would put upward pressure on customers' bills and increase our carbon emissions.

Consequences

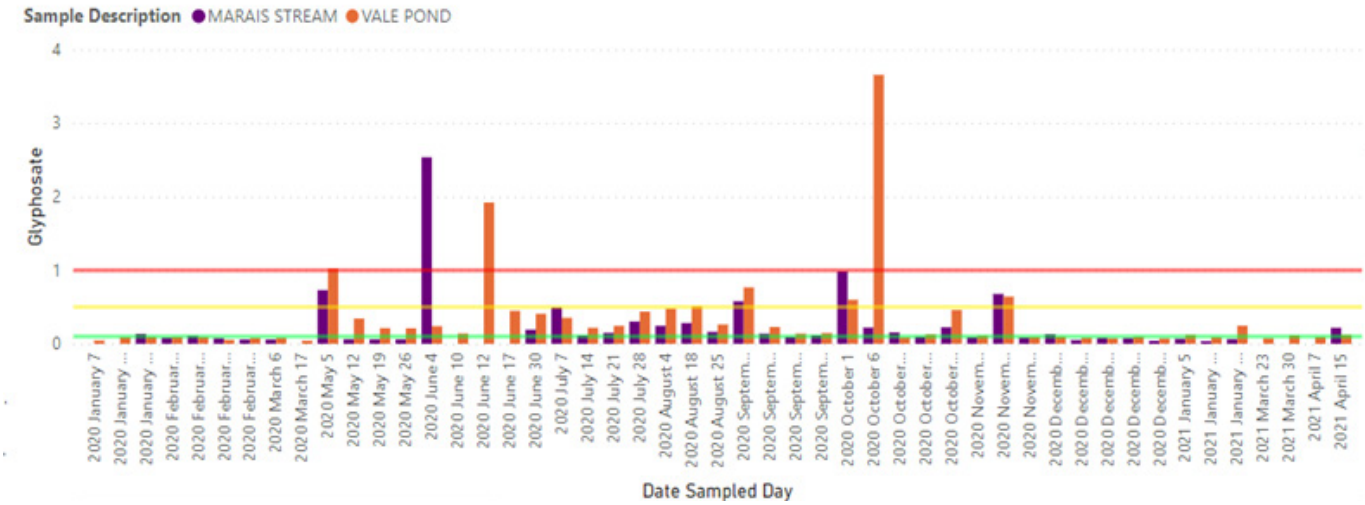
The potential consequences of further increases in glyphosate levels in streams are:

- The potential loss of an additional three catchment resources in the north and west of Guernsey due to glyphosate pollution, these together with the Vale Pond and Marais streams contribute the largest portion of supply to northern reservoirs.
- The increased risk of glyphosate exceedances in the treated drinking water supply.
- The requirement to invest in glyphosate treatment resulting in significant cost to Guernsey Water customers and increased carbon emissions.

Glyphosate Data Summary

Vale Pond / Marais stream Glyphosate 2020 – 2021 (0.1 µg/l PCV for treated drinking water – Green Line).

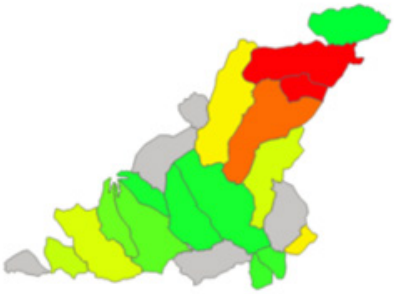
Glyphosate by Year, Month, Day and Sample Description



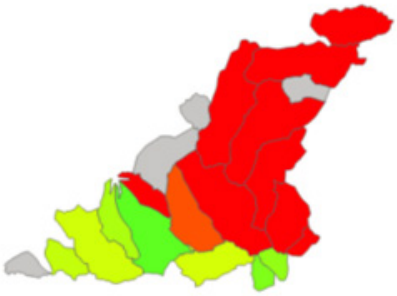
Glyphosate stream collection point data

Mapping below shows the max value of glyphosate detected from 2018 – 2020, sampled from the stream collection points . Samples below LOD are treated as 0µg/l. Data colours are presented as a gradient from green as 0µg/l, yellow as 0.1µg/l, red as ≥0.300µg/l.

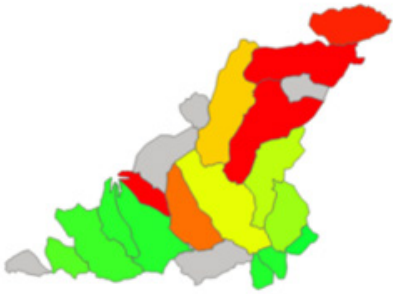
Max of Glyphosate 2018



Max of Glyphosate 2019



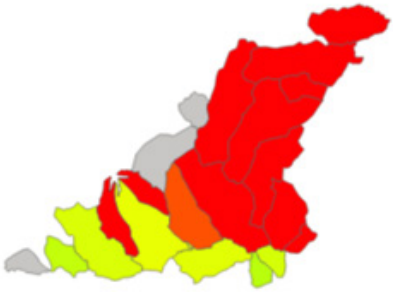
Max of Glyphosate 2020



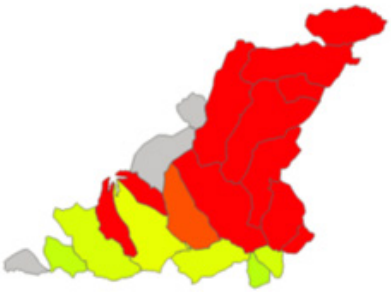
Glyphosate catchment sample data

Mapping below shows the max value of glyphosate detected from 2018 – 2020, sampled from within catchment areas. Samples below LOD are treated as 0µg/l. Data colours are presented as a gradient from green as 0µg/l, yellow as 0.1µg/l, red as ≥0.300µg/l.

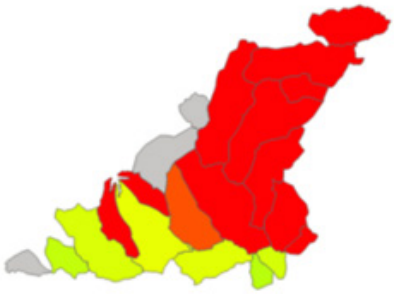
Max of Glyphosate 2018



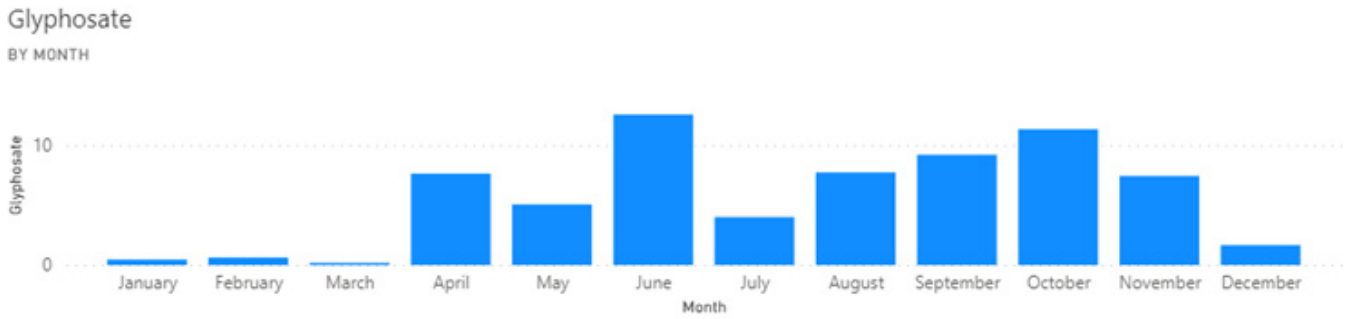
Max of Glyphosate 2019



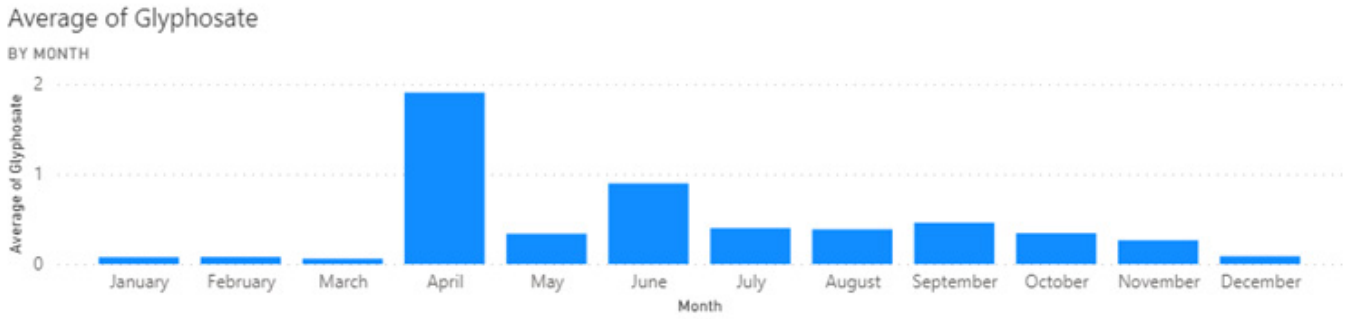
Max of Glyphosate 2020



Total number of monthly glyphosate samples at stream collection points 2017-2020



Mean monthly glyphosate levels all catchment points 2017-2020 (µg/l)



APPENDIX 3

WATER RESOURCE & SUPPLY PFAS REVIEW – 2020

Introduction

PFOS and PFOA are two of a group of compounds referred to as PFAS's. These notably contain numerous fluorine-carbon bonds, this chemical bond is extremely stable and not subject to environmental degradation, as such the chemicals persist in the environment and have become known colloquially as "forever chemicals" and more formally as part of the persistent organic pollutant (POP) chemicals group PFOS and PFOA are bio- accumulative, toxic compounds developed for stain- resistant treatments for carpets, upholstery and amongst other uses (AFFF) fire-fighting foams for hydrocarbon fires, they are chemical contaminants of worldwide concern.

PFOS and PFOA compounds have been detected in Guernsey's stream, stored and treated water supplies for many years, their presence stemming predominantly from the use of fire-fighting foams at Guernsey Airport following aircraft incidents fire-fighting appliance drain downs, spillages, and fire vehicle accidents; much smaller concentrations are also detected in other locations island wide.

PFOS comprises the majority component of the PFAS compounds detected in Guernsey with PFOA being approximately an order of magnitude lower, recent testing for a range of 17 PFAS's detected several other compounds also at low levels.

Regulatory Framework

In England and Wales PFOS is regulated by the UK Drinking Water Inspectorate (DWI) under a tiered risk assessment format, which until recently specified a PCV in drinking water of 0.3 µg/l.

Recent changes to the legislation, considering the latest scientific evidence on PFAS toxicity, has lowered both the PFOS / PFOA PCV to 0.1 µg/l, with an ongoing requirement for consultation with the environmental regulator and risk assessments for detections.

Changes to UK drinking water regulations are reviewed and if appropriate adopted by Guernsey Water in close liaison with the Office of Environmental Health and Pollution Regulation (OEHPR). OEHPR act as a shadow drinking water quality regulator in accordance with States of Guernsey policy.

Given the concentrations detected in the Islands stream supplies a reduction of the PCV by two thirds is significant and as such the impact of the new legislation on Guernsey Water operations for southern catchments is discussed further in this report.

Previous reporting by Guernsey Water focused only on PFOS as it was this regulated compound that contributed the greatest component of the AFFF foams in use on Island and therefore the greatest concentration of detected compounds. As of 2021 reporting will include both compounds of interest as well as some surveillance monitoring for the general PFAS group overall.

Catchment Management

Guernsey Water conducts monthly PFOS / PFOA monitoring of stream, stored and treated water supplies to determine the ongoing trends of these compounds in the islands water resources. This is done as part of our ongoing risk assessment obligations. The main focus is on three sub catchment areas in particular – Petit Bot, Beau Vallee and Les Padins as these are the catchments with the most contamination from the use of AFFF foams.

Diversion intakes and pipework have been installed on these stream systems to bypass the St. Saviour's Reservoir and discharge into the north Perelle Bay stream. These stream diverts remain essential in reducing the concentration of PFOS / PFOA within the reservoir to an acceptable concentration for treatment and supply to customers.

Stream Data Summary

Guernsey Water has taken a conservative view to the collection of PFOS / PFOA contaminated stream supplies. This precautionary approach has reduced PFOS / PFOA concentrations within the St. Saviour's Reservoir to levels that are below the new regulatory standards that are being introduced by the UK DWI. However, the new standards are severely limiting our ability to collect water from the Petit Bot, Padins and Beau Vallee catchments, which increases drought risk.

PFOS /PFOA concentrations in these stream have stabilised, with annual rainfall changes exhibiting the biggest influence in detected concentrations. Over the long term levels are expected to reduce further, but in the meantime, without further remediation or investment in costly, carbon intensive water treatment drought risk will be increased.

Ongoing sampling and analysis will continue across the island to ensure that PFOS / PFOA risks are continually assessed and adequately mitigated.

Stored & Treated Water Management

Raw and treated water supplies at St. Saviour's and Kings Mills Water Treatment Works are tested twice per month. Through the judicious selection of stream supplies and the rejection of waters containing elevated PFOS / PFOA, the concentrations in the St. Saviour's Reservoir have been reduced from a recent maximum of 0.230 µg/l in 2013, to a maximum of 0.06 µg/l in 2020. A mean raw water value for PFOS of 0.044 µg/l was recorded in the St. Saviour's Reservoir in 2020, which is below the requirement for drinking water.

Removal of PFOS through treatment is variable, with rates being between 15 – 50% through coagulation at St. Saviour's Water Treatment Works. Kings Mills treated water supplies fair even better with blending of St Andrews reservoir at this treatment works lowering the PFOS concentration further.

Sampling at other Guernsey Water reservoirs in the north of the Island have shown PFOS concentrations between 0.01 – 0.03 µg/l.

Summary

The current status of PFOS / PFOA contamination in Guernsey is favourable when compared with other similarly afflicted jurisdictions. In part this is down to remediation action taken by Guernsey Airport.

The rejection of stream waters heavily contaminated with PFOS / PFOA, and the selective use of those where it is detected at lower concentrations has placed Guernsey Water in a good position with regards to the continued safeguarding of treated water supplies. This remains the case even with the introduction of the more stringent water quality standards for both PFOS and PFOA.

However, the revised standards do severely limit our ability to collect water in the south of the island and extend the timeframe for when certain resources may become acceptable for collection and use once again.

For the foreseeable future PFOS /PFOA f will remain a significant challenge in catchment and storage management, particularly when drought conditions prevail.

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