

Annual Drinking Water Report

July 2023 – June 2024





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Foreword

The Rottnest Island Authority (RIA) is committed to providing high quality drinking water that meets the Australian Drinking Water Guidelines (ADWG), other regulatory requirements and consumer expectations in a sustainable way.

This Annual Report describes Rottnest Island's drinking water quality performance for the 2023 to 2024 reporting period. The RIA is committed to being transparent on its performance by providing the public with accurate and representative information in this report. The report aims to demonstrate to island customers and visitors, the ongoing commitment to the sustainable production and supply of high-quality drinking water on Rottnest Island.

Further details on RIA's commitment to Drinking Water Quality can be reviewed under [Rottnest Island Drinking Water Quality Policy](#) on the Rottnest Island website.

The [Rottnest Island Management Plan 2023-28](#), Drinking Water Source Protection Plan, and Groundwater Licence Operating Strategy reflect this commitment and contain the strategies, procedures and processes to meet this objective. The successful implementation of these documents relies on the competency of all staff and contractors holding duties and responsibilities relating to the supply of water on Rottnest Island. The RIA is committed to ensuring that adequate training and opportunities for development are provided.

Programmed Facility Management (PFM) continues to operate the major facilities and delivers other services on behalf of the RIA. Management of the water network is a component of the utilities services performed by PFM, which includes the production, distribution, and monitoring of drinking water.

The 2023-2024 Annual Water Quality Report confirms that the RIA and PFM have remained consistent with previous years' performance in the management of the Drinking Water supply on Rottnest Island.

Acronyms

ADWG	Australian Drinking Water Guidelines	The Australian Drinking Water Guidelines provides a framework for management of drinking water supply.
Bq/L	Becquerels per litre	Becquerels per litre is the unit of activity of radioactivity per unit volume
DOH	Department of Health	The Department of Health oversee compliance of Western Australia's health system.
DWQMP	Drinking Water Quality Management Plan	The Drinking Water Quality Management Plan describes how the production, distribution and monitoring of drinking water is managed on Rottnest Island.
HU	Hazen Unit	A Hazen unit is a measurement of colour.
kL	Kilolitre	A kilolitre is a unit of volume in the metric system, equal to one thousand litres.
km	Kilometre	A kilometre is a unit of length in the metric system, equal to one thousand metres.
mg/L	Milligrams per litre	Milligrams per litre is the mass of a chemical per unit volume of water.
mg-NO ₂ /L	Milligrams of nitrite	Milligrams per litre is the mass of nitrite per unit volume.
mg-NO ₃ /L	Milligrams of nitrate	Milligrams per litre is the mass of nitrate per unit volume.
ML	Megalitre	A megalitre is a unit of volume in the metric system, equal to one million litres.
MoU	Memorandum of Understanding	The memorandum of understanding is an agreement between the RIA and DOH and demonstrates the agreed commitments to drinking water quality.
NTU	Nephelometric Turbidity Unit	A nephelometric turbidity unit is a measurement of turbidity.
PFAS	Per- and polyfluoroalkyl substances	A group of over 4,000 synthetic chemicals that are used for a variety of household and industrial purposes.
PFM	Programmed Facility Management	Programmed Facility Management (ABN 23001382010) is contracted to manage drinking water supply on Rottnest Island.
RIA	Rottnest Island Authority	Rottnest Island Authority is a statutory body who manage Rottnest Island.
TDS	Total Dissolved Solids	Total Dissolved Solids is a measurement of inorganic salts and organic matter dissolved in water.
µg/L	Micrograms per litre	Micrograms per litre is a unit of volume in the metric system. One microgram is equal to one millionth of a gram.



1. Introduction

Rottneest Island is located 19 kilometres west of Fremantle, Western Australia, and is 11 kilometres long and 4.5 kilometres at its widest point. The total land area measures approximately 1,900 hectares and is managed by the RIA. The island is a Class A Reserve and a popular destination for local, interstate and international visitors.

Water production facilities include saline groundwater bores, desalination plant, drinking water storage tanks, and distribution system. The distribution and supply to customers is via a reticulated network. PFM is contracted by the RIA to manage the production, distribution and monitoring of the drinking water supply to customers, Rottneest Island residents, and visitors.

The source of drinking water on Rottneest Island processed through the desalination plant is six saline production bores located within the Longreach Borefield. Historically Wadjemup Borefield has been used for the supply of drinking water which ceased in 2017. However, during October 2023 to November 2023 groundwater was abstracted to supplement the supply of potable water on the Island as detailed in Section 6.2.

1.1 Drinking Water Quality Risk Management

The Drinking Water Quality Risk Management Plan (DWQRMP) is the principal framework document used by RIA and PFM to implement the effective management of the drinking water distribution system on Rottneest Island. The DWQRMP forms part of the Memorandum of Understanding (MoU) between the RIA and the Department of Health (DOH) and is supported by the drinking water binding protocols. The DWQRMP also includes the Drinking Water Incident Response Protocols and other statutory documentation required to ensure compliance with the ADWG.

The ADWG are published and updated by the National Health and Medical Research Council, Australia's peak health research body on Australian Drinking Water. The ADWG are the national standard for Australian Drinking Water; requiring a risk management framework to be established for the effective management of drinking water supplies in Australia.

The ADWG can be downloaded from: <https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines>

A key aspect of the ADWG is a risk management approach. This approach is aimed at ensuring the ADWG are achieved from the water source, to points of consumption. This ensures, and requires, that there is a monitoring program established with appropriate sampling points throughout the distribution system, whilst providing a robust tool for identifying preventative and corrective actions for the improvement of water quality.

The ADWG recognise the significance of a preventative, multi-barrier approach for the protection of public health in drinking water supplies and have incorporated a framework for management of drinking water quality. The framework presented in the ADWG includes twelve elements considered good practice in the systematic management of drinking water supplies.



A DWQRMP has been developed for Rottnest Island, utilising the elements within the Australian Drinking Water Guidelines – Framework for the Management of Drinking Water Quality.

The DWQRMP is an important requirement of the MoU, and has included a detailed risk assessment for each element of the system including:

- Longreach (saline) Borefield;
- Desalination Plant;
- Storage Tanks;
- Treatment System (Chlorination);
- Pumping System;
- Distribution and Reticulation system;
- Water sampling and monitoring points.

To ensure that the production, monitoring, supply and management of Rottnest Island's drinking water supply continues to remain of high quality, the DWQRMP is reviewed at set frequencies. Where changes are made to the DWQRMP, these undergo a detailed review by relevant stakeholders and the changes will be presented within subsequent Quarterly and Annual Drinking Water Reports.

1.2 Memorandum of Understanding

In April 2012 the MoU between DOH and RIA commenced. This commitment to the MoU by both parties ensures a strong cooperative relationship for the management of drinking water and the protection of public health. The MoU was updated and re-signed by the RIA and DOH in December 2019 which extends for a period of five years. A copy of the 2019 Memorandum of Understanding is available to view on the RIA website.

Another important component of the MoU is the requirement for the Licensee (RIA) to notify DOH of the provision of other forms of water supply. That is, the supply of water not intended for drinking purposes. The specific items pertaining to management of this commitment as described within the MoU, and how these items are complied with on Rottnest Island, are detailed within the table below. Primarily, provision of non-drinking water on Rottnest Island occurs for the toilet facilities at the western end of Rottnest Island.

Memorandum of Understanding and the provision of non-drinking Water on Rottnest Island	
MoU	RIA Provision
Ensure advice is given to customers and their tenants or visitors that this water supply is not to be used for drinking or food preparation.	Where water provided is unsuitable for drinking/food preparation, public signage has been installed. Example provided below. 
Annual requirement by way of written reminders of water quality. Inspections to ensure affected taps are labelled with “non-drinking water”.	Water quality is reported annually and quarterly. Points have been labelled where the water provided is unsuitable for drinking.
If the Licensee provides non-drinking water to public open space areas, accessible to general public or via standpipes, then adequate signage advising “not suitable for drinking” is required.	Where non-drinking water is used in public open spaces, and areas accessible to the general public, appropriate signage has been installed clearly stating non-drinking water is in use.



2. Water Provider Information

Contact Details			
Name of Company	Rottnest Island Authority		
Company Address	1 Mews Road, Fremantle WA 6160		
Company Phone	Ph (08) 9432 9300	Fax	(08) 9432 9301
Company Website	www.rottnestisland.com		
Company Email	enquiries@rottnestisland.com		
Executive Director	Jason Banks		
Director Environment Heritage and Parks	Arvid Hogstrom		
Manager Environment and Compliance	Rebecca Gabbitus		
Island Operations Manager (PFM)	Gary Monaghan		

2.1 System Information

2.1.1 Consumers

The water demand on Rottnest Island is highly seasonal, with monthly consumption ranging from approximately 12,000 kL in July (low season) to 22,000 kL in December (peak season). During this reporting period approximately 823,441 visitors arrived at the Island, an increase from last year's number of 806,000.

The number of beds on the island for visitors totals 4,362, with the average length of stay being 2 nights. In addition, there are approximately 150 permanent residents on the island, however, this value fluctuates with seasonal staffing demands.

2.1.2 Distribution System & Water Supply

The drinking water quality parameters are regularly monitored by the PFM Quality and Compliance Officer and hydraulic technicians to ensure that drinking water produced on Rottnest Island meets the requirements of the ADWG and DOH. A graphical representation of the drinking water distribution system is provided in **Figure 1**.

In managing the distribution system and water supply, the RIA follows the guideline: *Materials, Products and Substances in Contact with Drinking Water*, as published by the DOH (2023).



During the reporting period, 500,605 kL of saline groundwater was abstracted from the Longreach Borefield (Ground Water Licence GWL177495(2) – Department of Water 2015-2025) for desalination purposes. Approximately 3,500 kL of groundwater was abstracted from the Wadjemup Borefield (Groundwater Licence GWL172015(2) – Department of Water 2015-2025) and used to supplement the drinking water system.

The combined storage capacity of the drinking water infrastructure is approximately 14.5 megalitres (ML), which provides around 22 days of drinking water storage at full capacity.

2.1.3 Sampling Schedule & Procedure

The DWQRMP details a comprehensive sampling schedule developed by a specialist consultant based on a risk management strategy and adopted by the RIA and PFM. The schedule includes eight nominated sampling points throughout the distribution system. The nominated sample points allow for fair representation of the water supply on Rottnest Island.

The sampling locations are shown in **Figure 1** and **Figure 2**.

Sampling and in-house monitoring procedures are carried out in accordance with best industry practice and executed by qualified hydraulics technicians. Nominated samples in the sampling schedule are analysed by a NATA accredited laboratory in accordance with the requirements of DOH.

Sampling instrumentations used for drinking water quality monitoring meet industry standards and are routinely calibrated in accordance with the *National Measurement Act* 1960 (Cth).

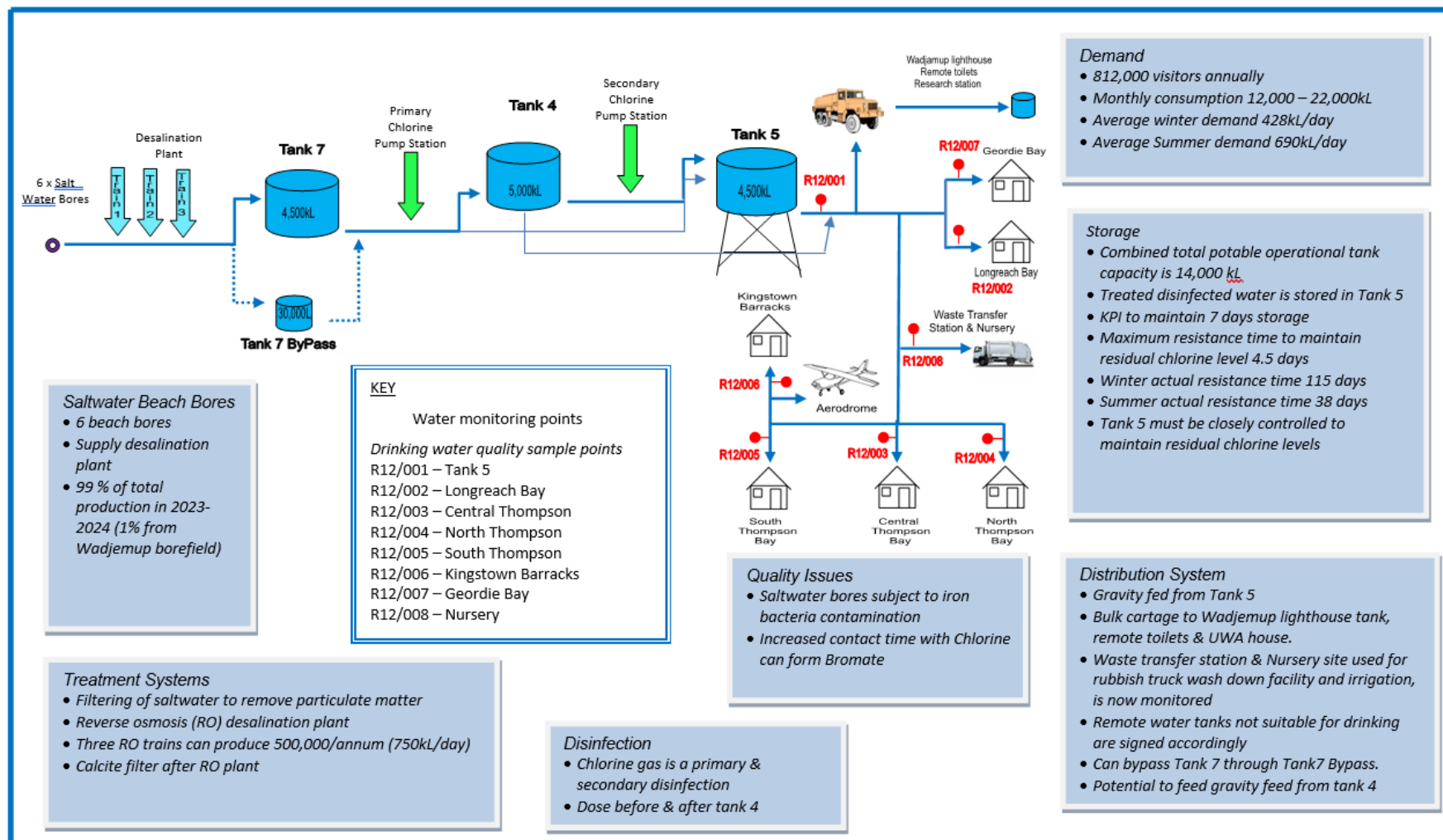


Figure 1: Rottneest Island Water Distribution System



Figure 2: Map of Sampling Locations



3. Microbial Performance

The results in Section 3.1 summarise the outcome of microbial characteristics monitored during the 2023-2024 period. 100% compliance was reported at the eight nominated sampling points in 2023-2024, maintaining the compliance rate set in 2022-2023.

3.1 Microbial Compliance Summary

Rottnest Island Distribution System 2023-24				
Microbial Characteristic	Memorandum of Understanding Compliance Criteria	No. of Analyses	No. of Analyses Complying with Memorandum of Understanding	% Compliance
Bacterial				
<i>E.coli</i>	Non Detect	228	228	100%
Amoeba				
Thermophilic <i>Naegleria</i>	Non Detect	102	102	100%

3.2 Microbial Incident Specific Information

There were no recorded microbial non-conformances for *E.coli*, thermotolerant coliforms or thermophilic *Naegleria* at the eight nominated sample points during the 2023-2024 reporting period.

4. Chemical: Health Related Performance

The results in Section 4.1 summarise the outcome of health characteristics monitored during the 2023-2024 reporting period.

The health characteristics monitored within the eight nominated sampling points recorded 99% overall compliance with the ADWG. The reported exceedances were related to the presence of bromate in the drinking water system at levels above the ADWG trigger value.

Specific details are described in the below section 4.2 Health Related Incident Specific Information.

4.1 Chemical: Health Related Compliance Summary

Rottnest Island Distribution System 2023-24					
Health Characteristic	ADWG Compliance Criteria (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Antimony (Sb)	0.003	94	94	100%	< 0.001
Bromate (BrO ₃ ⁻)	0.02	406	403	99%	0.025
Cadmium (Cd)	0.002	16	16	100%	< 0.002
Chlorine Total (Cl)	5	413	413	100%	1.76
Copper (Cu)	2	19	19	100%	0.012
Fluoride (F)	1.5	102	102	100%	0.40
Lead (Pb)	0.01	19	19	100%	< 0.001
Manganese (Mn)	0.5	16	16	100%	< 0.005
Nickel (Ni)	0.02	19	19	100%	< 0.001
Nitrate (NO ₃)	50 mg-NO ₃ /L	14	14	100%	< 0.01
Nitrite (NO ₂)	3 mg-NO ₂ /L	40	40	100%	< 0.01
¹ Trihalomethanes (THM)	0.25	44	44	100%	0.083

¹ Trihalomethanes can be present in drinking water as a by-product of chlorination or chloramination. Chlorine is the only source of disinfection currently used on Rottnest.

4.2 Chemical: Health Related Incident Specific Information

The health characteristics sampled during the 2023-2024 reporting period returned results in line with those taken during the 2022-2023 period in that bromate was the only detected exceedance. There were three exceedance events of bromate in the current reporting period compared with one exceedance in the previous reporting period. The results are presented in the table below.

Chemical: Health Related Water Quality Exceptions 2023-24						
Date	Chemical Characteristic	Memorandum of Understanding Alert Level	Level reported	Sample Location	Department of Health Notified	Close Out Date
1 August 2023	Bromate	0.02 mg/L	0.025 mg/L	R12-005 (South Thompson)	Yes	22 August 2023
15 August 2023	Bromate	0.02 mg/L	0.022 mg/L	R12-005 (South Thompson)	Yes	22 August 2023
3 October 2023	Bromate	0.02 mg/L	0.021 mg/L	R12-007 (Geordie Bay)	Yes	10 October 2023

As per Drinking Water Response Protocol 10 for Chemical Exceedance, the following actions took place after every bromate exceedance event:

- The sample was verified with the laboratory.
- Remedial flushing was initiated in accordance with the Rottneest Island Flushing Plan and the Island's Bromate Remediation Plan (PFM, 2018). For each exceedance event, the nearby flush point was flushed for 24 hours. Flushing then occurred weekly until bromate results were below the ADWG limit of 0.020 mg/L for two consecutive samples.
- An investigation of the water supply line was carried out which determined that water had been sitting in the pipe work for a prolonged period, enabling the formation of bromate.
- Resampling took place from the sample location where the exceedance was reported and at every other distribution sample point as part of the weekly sampling schedule.
- Critical Control Points (Desalination RO membranes and chlorination stations) were then checked and confirmed to be operating within the prescribed critical control limits (pH, chlorine, and turbidity sensors).

When bromate reported below the health limit in two consecutive samples the event was closed out with DOH.



4.2.1 Bromate Management

Bromate testing was added to the agreed sampling schedule in the 2017-2018 reporting period. This followed a request from DOH to participate in a voluntary monitoring program for bromate. RIA and PFM continue to manage bromate formation through proactive and reactive management:

Proactive

Close monitoring of tank levels, water retention times and their relationship with bromate formation. The holding time in pipes is believed to be a contributing factor in the production of bromate in the drinking water system. Avoidance of excessive chlorination and oxidation of bromide to bromate by optimising chlorine levels in the storage tanks before distribution in the water network. Regular maintenance and replacement of membranes, which improves the quality of the permeate, in turn lowering bromide levels.

Reactive

Flushing regime – Flushing of the distribution system when the bromate levels are reported above the limit set out in the AWDG and as per the Incident Response protocols.

Rottnest Island Homestead

In addition to the above-mentioned monitoring program, PFM commenced monthly sampling of a 3 kL potable water storage tank installed at the Rottnest Island Homestead shortly after its installation in November 2022. In February 2024, the 3 kL tank was replaced with a 50kL tank which was directly supplied by the pressurised water main. This tank is sampled weekly for bromate. During the 2023-2024 reporting period 21 out of 50 sampling events reported an exceedance in bromate which is detailed in section 8.3.

4.3 Pesticides

As part of RIA's commitment to providing a sustainable environment, pesticide usage is minimised and applied in a controlled manner on Rottnest Island. Pesticide testing was undertaken in February 2021 at R12/001 in line with DOH '*Pesticides Monitoring Exclusion Policy*' (2018) and from the MoU between RIA and DOH. All pesticide test results in February 2021 complied with the health-related guideline values set out in the ADWG. These results are shown in the 2020-21 annual report. According to the '*Pesticides Monitoring Exclusion Policy*' (2018), if the presence of pesticides is unlikely, very infrequent monitoring or no monitoring at all is required. Therefore, there was no pesticide analysis completed during this reporting period.



4.4 PFAS

PFAS are manufactured chemicals that do not occur naturally in the environment. PFAS chemicals include perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS) amongst a large group of other compounds. PFAS are persistent in the environment, show the potential for bioaccumulation and biomagnification, and are toxic in animal studies (potential developmental, reproductive and systemic toxicity). They have been used in a wide range of consumer products including surface treatments such as non-stick cookware, and notably in aqueous film forming foam historically used to extinguish fires.

Following the Drinking Water Quarterly Meeting held on 5 June 2019, DOH recommended a one-off sampling event for per- and poly-fluoroalkyl substances (PFAS) to take place at two locations along the drinking water distribution line. From this point onwards, PFAS has been tested on an annual basis.

Samples for this reporting period were taken 28 May 2024. The results are presented in the below table with all samples reporting below LoR of 0.01 µg/L and below the ADWG compliance criteria.

Rottneest Island Distribution System 2023-24					
Health Characteristic	ADWG compliance criteria (µg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (µg/L)
Sum of Perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS)	0.07	2	2	100%	< 0.01
Perfluorooctanoic acid PFOA	0.56	2	2	100%	< 0.01

5. Chemical: Aesthetic Related Performance

5.1 Chemical: Aesthetic Compliance Summary

The following table summarises the outcomes for specific aesthetic related characteristics during the 2023-2024 reporting period.

Rottnest Island Distribution System 2023-24					
Aesthetic Characteristic	ADWG compliance criteria (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Aluminium (Al)	0.2	17	17	100%	0.08
Ammonia (NH ₃)	0.5	40	40	100%	0.06
Chloride (Cl ⁻)	250	4	4	100%	170
Chlorine (Cl ₂) Free Residual	0.6	410	409	0.02%	1.69
Colour (True Colour)	15 (HU)	27	27	100%	< 5 (HU)
Hardness (CaCO ₃)	200	4	4	100%	43
Iron (Fe)	0.3	93	82	88%	2.40
pH	6.5 - 8.5	407	407	100%	6.5 – 8.5 ²
Sodium (Na)	180	390	390	100%	120
Sulfate (SO ₄ ²⁻)	250	4	4	100%	6.9
Hydrogen Sulphide (H ₂ S)	0.05	14	14	100%	< 0.05
TDS	600	4	4	100%	300
Turbidity	5 (NTU)	27	27	100%	0.8 (NTU)
Zinc (Zn)	3	19	19	100%	0.037

² The two numbers represent the lowest and the highest pH values measured respectively.

5.2 Chemical: Aesthetic Incident Specific Information

Whilst exceedances of aesthetic guidelines can affect consumer experience, it is important to note that exceedances to aesthetic guidelines refer only to palatability to consumers, including appearance, taste and odour. There were several instances where analytical results exceeded the aesthetic guidelines for chemical and physical properties as follows:

- **Free Chlorine:** 409 out of 410 samples reported chlorine concentrations above the ADWG aesthetic value of 0.6 mg/L, with the highest concentration reported at 1.69 mg/L in September 2023 at R12-001 (Tank 5). The ADWG states that chlorine has an aesthetic odour threshold of 0.6 mg/L, however, the reported concentrations exceeding this threshold do not pose any health risks, as values are below the specific health guideline value of 5 mg/L. Whilst impacts to aesthetic quality of drinking water may occur due to greater concentrations of chlorine, it is important to note that adequate disinfection is paramount for the provision of safe drinking water. In the interest of maintaining microbiological safety across the entire drinking water distribution system, the RIA intends to continue operating the distribution system using higher levels of chlorine that may exceed the ADWG aesthetic values to maintain disinfection. No complaints were recorded during the year with regards to odour.
- **Iron:** 11 of the 93 samples recorded iron concentrations above the ADWG aesthetic value of 0.3 mg/L, with the highest concentration reported at 2.40 mg/L in September 2023 at R12-005 (South Thompson). The cause of the iron exceedances is likely to be related to rusted pipework. Iron has a taste threshold of 0.3 mg/L in water, and becomes objectionable above 3 mg/L.

6. Special Interest Performance

6.1 Compliance Summary for Drinking Fountains

The following tables summarise the outcomes for the Drinking Water Quality Monitoring Program completed at the Rottnest Island drinking fountains. This program monitors health and aesthetic related characteristics during the 2023-2024 reporting period. There are currently 11 drinking fountains installed on Rottnest Island including three installed during the reporting period. Two were installed in October 2023 at the Campground and at Kingstown Barracks and one at Longreach Bay in December 2023. The Geordie Bay drinking fountain was inaccessible from April 2024 to June 2024 due to accommodation renovation works in the area.

Health - Rottnest Island Drinking Fountain Network 2023-24					
Health Characteristic	ADWG compliance criteria (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Antimony (Sb)	0.003	258	258	100%	0.002
Cadmium (Cd)	0.002	258	258	100%	0.0002
Lead (Pb)	0.01	258	257	99.6%	0.012
Nickel (Ni)	0.02	258	257	99.6%	0.024

Aesthetic - Rottnest Island Drinking Fountain Network 2023-24					
Aesthetic Characteristic	ADWG compliance criteria (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Copper (Cu)	1	258	258	100%	0.11
Zinc (Zn)	3	258	258	100%	0.15



6.1.1 Drinking water health related incident specific information

There were two exceedance events during the reporting period, one for lead and one for nickel as presented in the table below.

Drinking Fountains: Health Related Water Quality Exceptions 2023-24						
Date	Chemical Characteristic	Memorandum of Understanding Alert Level	Level reported	Sample Location	Department of Health Notified	Close Out Date
25 July 2023	Lead	0.01 mg/L	0.012 mg/L	Pedal & Flipper	Yes	15 August 2023
17 October 2023	Nickel	0.02 mg/L	0.024 mg/L	Campground	Yes	21 November 2023

Lead reported above the ADWG health limit in the first flush at the Pedal and Flipper drink fountain in a sample taken on 25 July 2023. The result was reported by the laboratory on 1 August 2023. In line with the Drinking Water Response Protocols the following actions took place in response:

- The sample was verified with the laboratory.
- Investigation of the drink fountain components for corrosion or if they need replacement.
- Investigation into the properties of the fountain components commenced to see if they met the Watermark standard and contained any lead products.
- Resampling took place on 3 August 2023 at the Pedal and Flipper Fountains as well as R12-003 and R12-005 distribution sample points. These locations are the closest ones to that fountain. The samples were taken using the 30MS sampling methodology recommended by DoH. There were no exceedances in lead in the samples.
- The manufacture of the drinking fountains confirmed that the components meet the Watermark standard, contain no lead and were not observed to be corroded.
- Sampling at all distribution sample points on 15 August 2023 also returned no exceedances of lead.
- Critical Control Points (Desalination RO membranes and chlorination stations) were then checked and were operating within the prescribed critical control limits.

Nickel reported above the ADWG limit in the first flush at the Campground drink fountain in a sample taken on 17 October 2023. The result was reported by the laboratory on 26 October 2023. In line with the Drinking Water Response Protocols the following actions took place in response:

- The sample was verified with the laboratory.
- Investigation of the drink fountain components for corrosion or if they need replacement, however this is unlikely given this fountain was installed in July 2023.



- Investigation into the properties of the fountain components commenced to see if they met the Watermark standard.
- No re-sampling was carried out as the second flush returned a nickel concentration of 0.0020 mg/L, well below the ADWG limit of 0.02 mg/L.
- Nickel was not detected anywhere in the distribution network in the next routine sample taken on 21 November 2023.
- The manufacturer of the drinking fountains confirmed that the components meet the Watermark standard, contain no nickel and were not observed to be corroded.
- Critical Control Points (Desalination RO membranes and chlorination stations) were then checked and were operating within the prescribed critical control limits.

6.2 Supplemental Groundwater (Wadjemup Borefield)

From 18 October 2023 to 28 November 2023 approximately 3,500 kL of groundwater was extracted from the Wadjemup Borefield to supplement the supply of potable water on the Island due to a failure in two of the desalination treatment trains. Samples were taken on 10, 18 and 27 October 2023 from the Borefield inlet to Tank 7 with no exceedances detected in any sample. The analytes tested served to gather additional background information on the source water quality, consistent with the risk assessment methodology outlined in the ADWG.

Electrical Conductivity (EC), total dissolved solids, pH and temperature were also measured weekly with hand-held meters in the field. If EC was reported above 1,850 $\mu\text{S}/\text{cm}$, then testing was increased to twice weekly. If EC reported above 2,000 $\mu\text{S}/\text{cm}$ at any bore then abstraction would cease from that bore. EC reported above 2,000 $\mu\text{S}/\text{cm}$ at bore 2/77 on 24 October 2023 (2,264 $\mu\text{S}/\text{cm}$) and the bore was subsequently turned off to cease abstraction from that bore.



7. Radiological Performance

Radiological sampling for gross alpha and gross beta is required annually. Testing occurred in October 2023 at the eight designated distribution sampling locations. There were no exceedances identified for Gross Alpha and Gross Beta.

Rottnest Island Distribution System 2023-24					
Radiological Characteristic	ADWG screening values (Bq/L)	No. of Analyses	No. of Analyses Complying with ADWG screening value	% Compliance with ADWG	Max Value of Analysis (Bq/L)
Gross Alpha	0.5	8	8	100%	0.041 ±0.03 ³
Gross Beta less K-40	0.5	8	8	100%	< 0.078

³ Indicates that the primary value of 0.041 is accurate to plus or minus 0.03 Bq/L



8. Customer Service & Notifiable Incidents

8.1 Customer Complaints

No customer complaints pertaining to drinking water quality were received during the reporting period.

The RIA are committed to meeting customer service standards for the supply of water in accordance with the Water Services Code of Conduct (Customer Service Standards) 2024, the Ombudsman scheme and all licence and customer service policies required by the Economic Regulatory Authority (ERA).

8.2 Notifiable Incidents

During the 2023-2024 reporting period there were five health exceedance results reportable to DOH concerning the drinking water distribution system. Three were related to three health exceedances for bromate, one was related to a health exceedance for lead, and one was related to a health exceedance for nickel (refer to Section 6.1.1.). There were also 11 aesthetic exceedances for iron reported to DOH during the reporting period.

8.3 Bromate at the Homestead

It was agreed upon in the June 2023 Quarterly Drinking Water meeting between DOH, RIA and PFM that any exceedances noted at the Homestead would be reported to DOH.

Previous investigations into bromate exceedances have concluded that prolonged retention of chlorinated water increases bromate concentration. The Homestead is at the furthest limit of the distribution network so the water that arrives there has had a relatively long retention time in the pipework. This was made worse because it was the only point of supply remaining on the gravity fed water line since Kingstown was disconnected and connected to the pressure main.

During July 2023 to September 2023 bromate continued to report in exceedance. On 29 September 2023 “Do Not Drink” signs were placed within the Homestead building at all water outlets and a mobile water trailer containing potable water was mobilised to the Homestead to provide drinking water.

On 20 February 2024 a 50 kL water storage tank was installed at the Homestead to replace the 2 kL tank. This new tank is connected to the pressurised water main that feeds the Kingstown Barracks area to provide the Homestead with water that has had less retention time in the network. Bromate reported below the ADWG limit in the next two consecutive weekly samples at 0.009 mg/L on 28 February 2024 and at 0.013 mg/L on 5 March 2024.

The exceedance in bromate event was closed out, DoH was notified and on 13 March 2024 the “do not drink” signs were removed as per Drinking Water Response Protocol 10. There has been no exceedance for bromate reported at the Homestead since 20 February 2024.

9. Comments

Ten Commandments for Safe Drinking Water

The Ten Commandments for Safe Drinking Water stand behind all internal drinking water operations on Rottnest Island. To remind all workers of the RIA's commitment to public health and safety relating to drinking water, the Ten Commandments for Safe Drinking Water have been installed in all pump stations and operational areas of the desalination plant (**Figure 3** and **Figure 4**). The Ten Commandments are shown in **Figure 5**.



Figure 3 and Figure 4 Ten Commandments for Safe Drinking Water at the Rottnest Island Desalination Plant

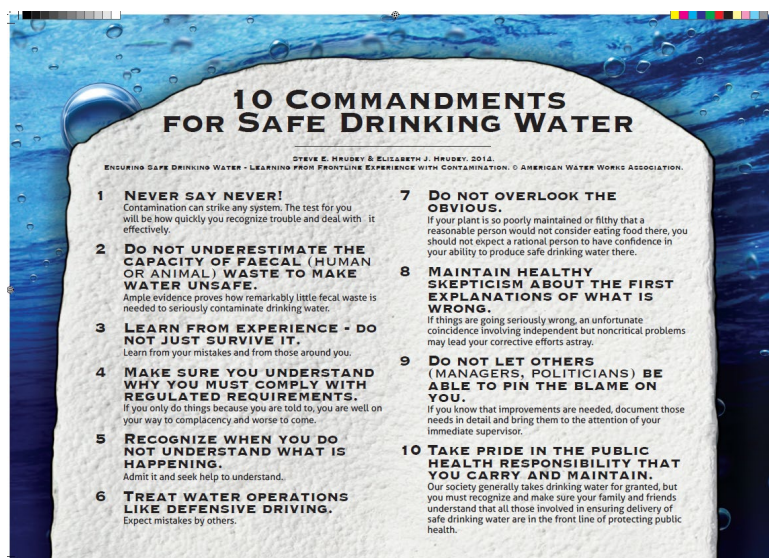


Figure 5 The Ten Commandments for Safe Drinking Water (Hruddy SE & Hruddy EJ, 2014)

**Mock Incident Scenario**

The Rottnest Island Mock Incident Scenario was held on 6 March 2024 and was based around an issue with the automatic chlorine dosing system, which resulted in insufficient free chlorine that initially showed in the water storage tanks and then in the distribution system. The scenario involved the RIA Director for Environment Heritage and Parks, relevant managers, operational staff and relevant PFM staff who all focused on their role in the relevant response protocol. Incident Protocol #5 (Insufficient Free Chlorine) was followed by the group to investigate and resolve the issue.

Summary of actions:

RIA will update the incident response flowcharts in consultation with stakeholders involved in management of the drinking water system (RIA Infrastructure and PFM) to ensure a logical and appropriate response to any real incidents of this nature.

Water Services Licence 2023 Operational Audit

The RIA holds a Water Services Licence, issued by the ERA under the *Water Services Act 2012*, for the provision of potable and non-potable water supply services, drainage services and sewerage services in the Rottnest Island operating area. Compliance with the licence is periodically audited, including an Operational Audit during the 2023-2024 reporting period (September 2023).



10. References

Hrudey S E, Hrudey E J, *Ten Commandments For Safe Drinking Water* Canadian Water Network 2020, and American Water and Wastewater Association, 2014

Neale O, *Bromate Remediation Plan*, Programmed Facility Management 2018.



11. Acknowledgements

The RIA acknowledges the work of PFM in managing Drinking Water Quality at Rottnest Island, and the assistance of DOH throughout the year.

This report was produced by PFM on behalf of the RIA.

The RIA recognises and supports the ongoing work of the Advisory Committee for the Purity of Water⁴.

⁴ More information on the Advisory Committee for the Purity of Water can be found at:

http://ww2.health.wa.gov.au/Articles/A_E/Advisory-Committee-for-the-Purity-of-Water



12. Enquiries

To request further information, or to seek clarification on information provided within this Rottnest Island Annual Drinking Water Report, please contact the RIA Administration by phone at (08) 9432 9300 (8:30 am to 5:00 pm, Monday to Friday). Alternatively, enquiries may be sent by e-mail to rotnnest.compliance@dbca.wa.gov.au.



13. Appendices

Appendix A: Annual Data Summary

Health Characteristic	Australian Drinking Water Guidelines (mg/L)	July-September 2023				October-December 2023				January-March 2024				April-June 2024				2023-2024 Summary			
		No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Antimony	0.003	24	24	100%	0.001	24	24	100%	0.001	24	24	100%	0.001	22	22	100%	0	94	94	100%	0.001
Bromate	0.02	104	102	98%	0.025	104	103	99%	0.021	103	103	100%	0.019	95	95	100%	0.015	406	403	99%	0.025
Cadmium	0.002	8	8	100%	0	0	0	-	0	8	8	100%	0	0	0	-	0	16	16	100%	0
Chlorine (Total Residual)	5	104	104	100%	1.65	104	104	100%	1.76	104	104	100%	1.72	101	101	100%	1.65	413	413	100%	1.76
Copper	2	8	8	100%	0.009	4	4	100%	0.012	3	3	100%	0.004	4	4	100%	0.012	19	19	100%	0.012
Fluoride	1.5	24	24	100%	0.2	24	24	100%	0.4	32	32	100%	0.3	22	22	100%	0.2	102	102	100%	0.4
Lead	0.01	8	8	100%	0	4	4	100%	0	3	3	100%	0	4	4	100%	0	19	19	100%	0
Manganese	0.5	8	8	100%	0	0	0	100%	0%	8	8	100%	0%	0	0	100%	0	16	16	100%	0
Nickel	0.02	8	8	100%	0	4	4	100%	0	3	3	100%	0.001	4	4	100%	0	19	19	100%	0.001
Nitrate (as NO ₃ -)	50	3	3	100%	0	4	4	100%	0.01	3	3	100%	0.02	4	4	100%	0.02	14	14	100%	0.02
Nitrite (as NO ₂ -)	3	6	6	100%	0	11	11	100%	0	14	14	100%	0	9	9	100%	0	40	40	100%	0
Total THM	0.25	10	10	100%	0.015	11	11	100%	0.069	14	14	100%	0.083	9	9	100%	0.013	44	44	100%	0.083

Aesthetic Characteristic	Australian Drinking Water Guidelines (mg/L)	July-September 2023				October-December 2023				January-March 2024				April-June 2024				2023-23 Summary			
		No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Aluminium	0.2	10	10	100%	0	3	3	100%	0	3	3	100%	0.08	1	1	100%	0	16	16	100%	0.08
Ammonia	0.5	6	6	100%	0	11	11	100%	0.06	14	14	100%	0.04	9	9	100%	0	31	31	100%	0.06
Chloride	250	1	1	100%	170	1	1	100%	110	1	1	100%	100	1	1	100%	96	3	3	100%	170
Chlorine (Free Residual)	0.6	104	0	0%	1.51	104	1	1%	1.69	104	0	0%	1.51	98	98	0%	1.58	312	1	0%	1.69
True Colour	15HU	6	6	100%	0	7	7	100%	0	7	7	100%	0	7	7	100%	0	20	20	100%	0
Hardness	200	1	1	100%	17	1	1	100%	43	1	1	100%	9.2	1	1	100%	13	3	3	100%	43
Iron	0.3	24	22	92%	2.4	24	20	83%	1.1	23	20	87%	1.6	22	20	91%	0.57	71	62	88%	2.4
pH	6.5-8.5	104	104	100%	8.5	104	104	100%	8.04	104	104	100%	8.08	95	95	100%	8.46	312	312	100%	8.5
Sodium	180	104	104	100%	110	104	104	100%	120	95	95	100%	86	87	87	100%	74	303	303	100%	120
Sulphate	250	1	1	100%	2	1	1	100%	6.9	1	1	100%	1.8	1	1	100%	1.7	3	3	100%	6.9
Sulphide	0.05	3	3	100%	0	4	4	100%	0	3	3	100%	0	4	4	100%	0	10	10	100%	0
TDS	600	1	1	100%	300	1	1	100%	260	1	1	100%	230	1	1	100%	200	3	3	100%	300
Turbidity	5NTU	6	6	100%	0.2	7	7	100%	0.8	7	7	100%	0.6	7	7	100%	0.6	20	20	100%	0.8
Zinc	3	8	8	100%	0.037	4	4	100%	0.028	3	3	100%	0.022	4	4	100%	0.037	15	15	100%	0.037



		July-September 2023			October-December 2023			January-March 2024			April-June 2024			2023-2024 Summary		
Microbial Characteristic	Memorandum of Understanding Compliance Criteria	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG
Bacterial																
<i>E.coli</i>	Non Detect	59	59	100%	57	57	100%	59	59	100%	53	53	100%	228	228	100%
Amoeba																
Thermophilic <i>Naegleria</i>	Non Detect	27	27	100%	24	24	100%	30	30	100%	21	21	100%	102	102	100%

		July-September 2023				October-December 2023				January-March 2024				April-June 2024				2023-2024 Summary			
Drinking Fountain Analytes	Australian Drinking Water Guidelines (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)	No. of Analyses	No. of Analyses Complying with ADWG	% Compliance with ADWG	Max Value of Analysis (mg/L)
Health Characteristics																					
Antimony	0.003	48	48	100%	0	62	62	100%	0	66	66	100%	0	82	82	100%	0	258	258	100%	0
Cadmium	0.002	48	48	100%	0	62	62	100%	0	66	66	100%	0.0001	82	82	100%	0.0002	258	258	100%	0.0002
Lead	0.01	48	47	98%	0.012	62	62	100%	0.003	66	66	100%	0.006	82	82	100%	0.012	258	257	100%	0.012
Nickel	0.02	48	48	100%	0.009	62	61	98%	0.024	66	66	100%	0.009	82	82	100%	0.024	258	257	100%	0.024
Aesthetic Characteristics																					
Copper	1	48	48	100%	0.24	62	62	100%	0.11	66	66	100%	0.16	82	82	100%	0.28	258	258	100%	0.28
Zinc	3	48	48	100%	0.57	62	62	100%	0.15	66	66	100%	0.54	82	81	99%	9.4	258	257	100%	9.4

Appendix B: ADWG Sample Point Graph Summaries (Health)

The following graphs provide a summary of all data collected over the monitoring period for each health-related parameter. There were either none or very few detections for the following analytes during the reporting period, therefore there are no graphs for the following analytes:

- Antimony;
- Cadmium;
- Copper
- Fluoride (Rottnest Island's drinking water is not fluoridated);
- Lead;
- Manganese;
- Nickel;
- Nitrite and
- THM.

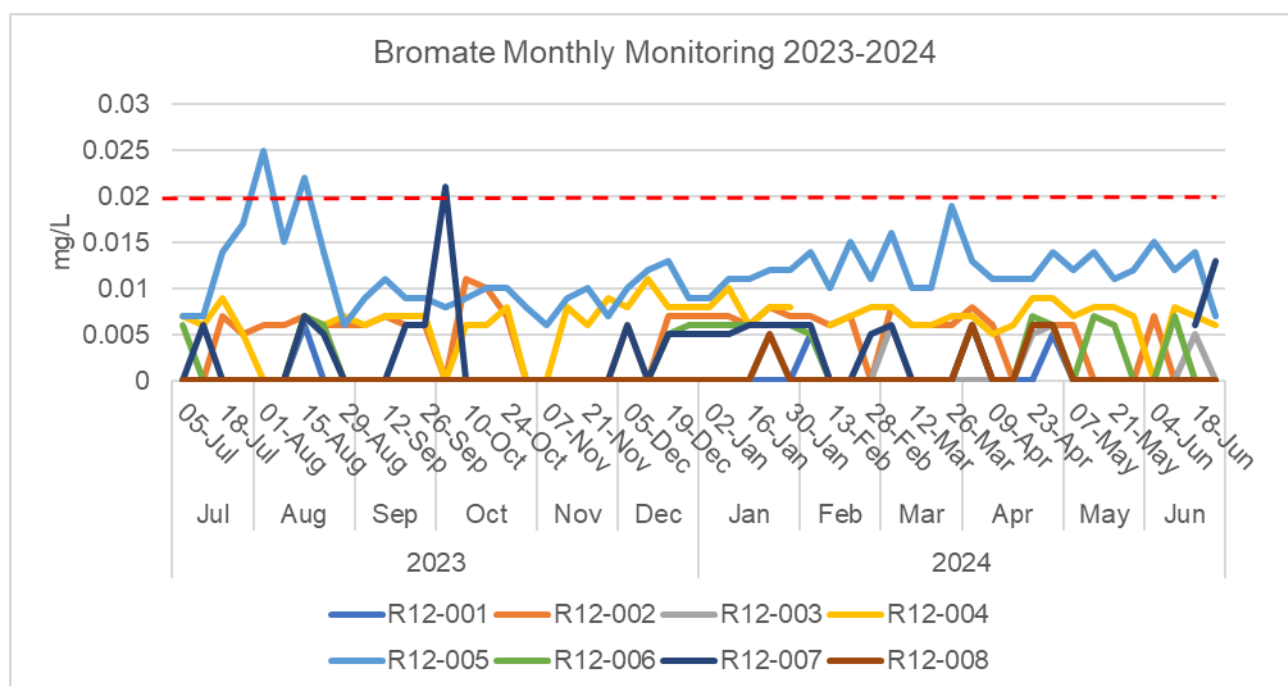


Figure B.1: Bromate trends during the 2023 – 2024 monitoring period (ADWG limit 0.02 mg/L).

Appendix C: ADWG Sample Point Graph Summaries (Aesthetic)

The following graphs provide a summary of all data collected over the monitoring period for each aesthetic related parameter. Graphs have not been included for the following analytes as there were either no or very few detections during the reporting period:

- Aluminum;
- Ammonia;
- Chloride;
- Colour;
- Hardness;
- Sulfate;
- TDS;
- Turbidity; and
- Hydrogen Sulphide.

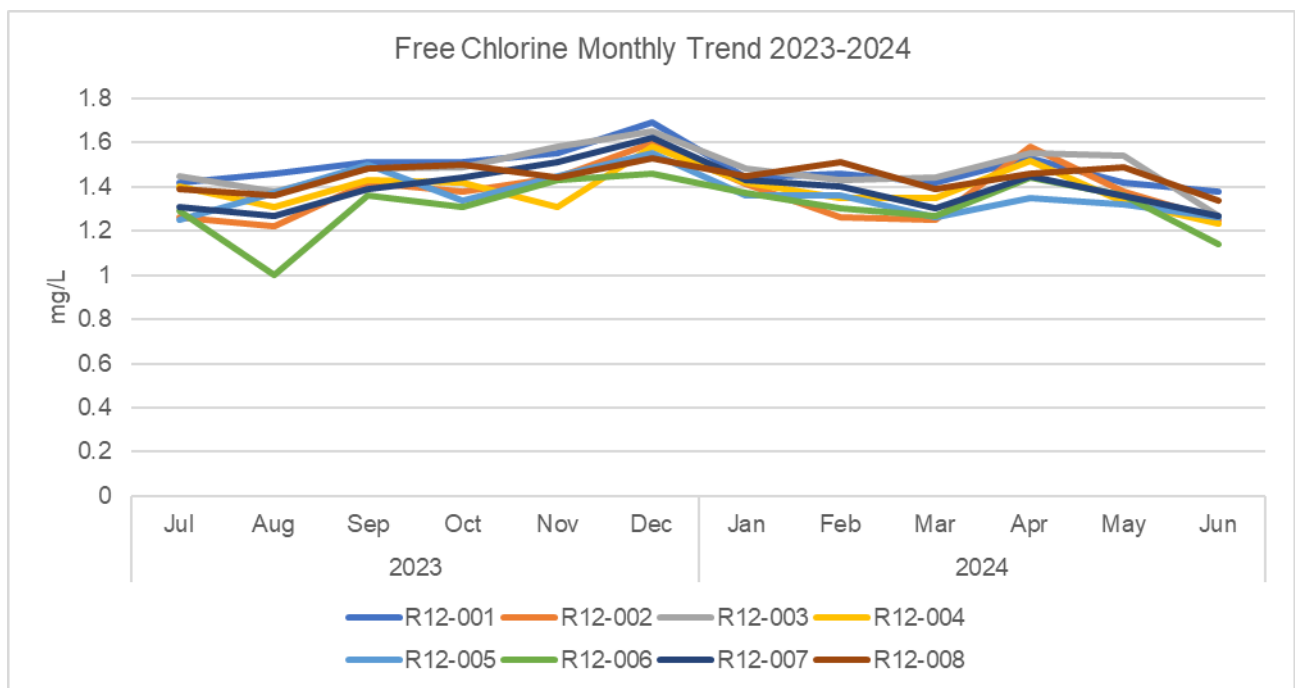


Figure C.1: Free chlorine trends during the 2023 – 2024 monitoring period (ADWG limit 5.0 mg/L)

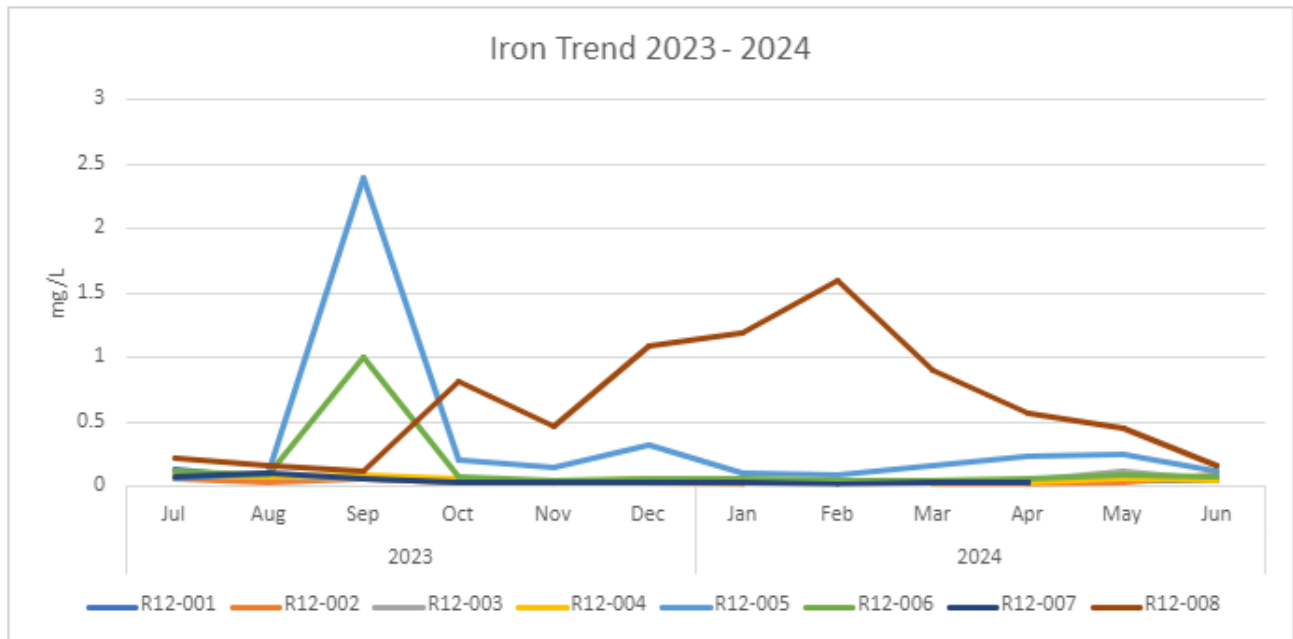


Figure C.2: Iron trends during the 2023 – 2024 monitoring period (ADWG limit 0.3 mg/L)

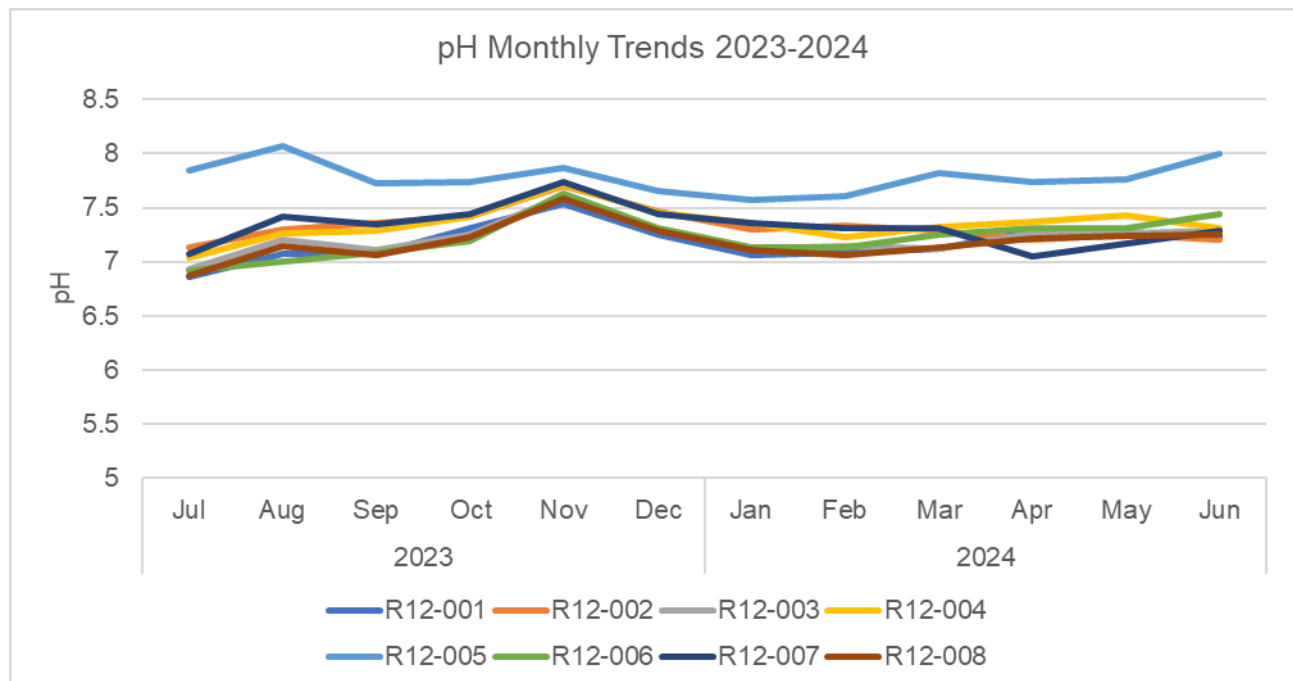


Figure C.3: pH trends 2023-2024 monitoring period (ADWG limit 0.3 mg/L)

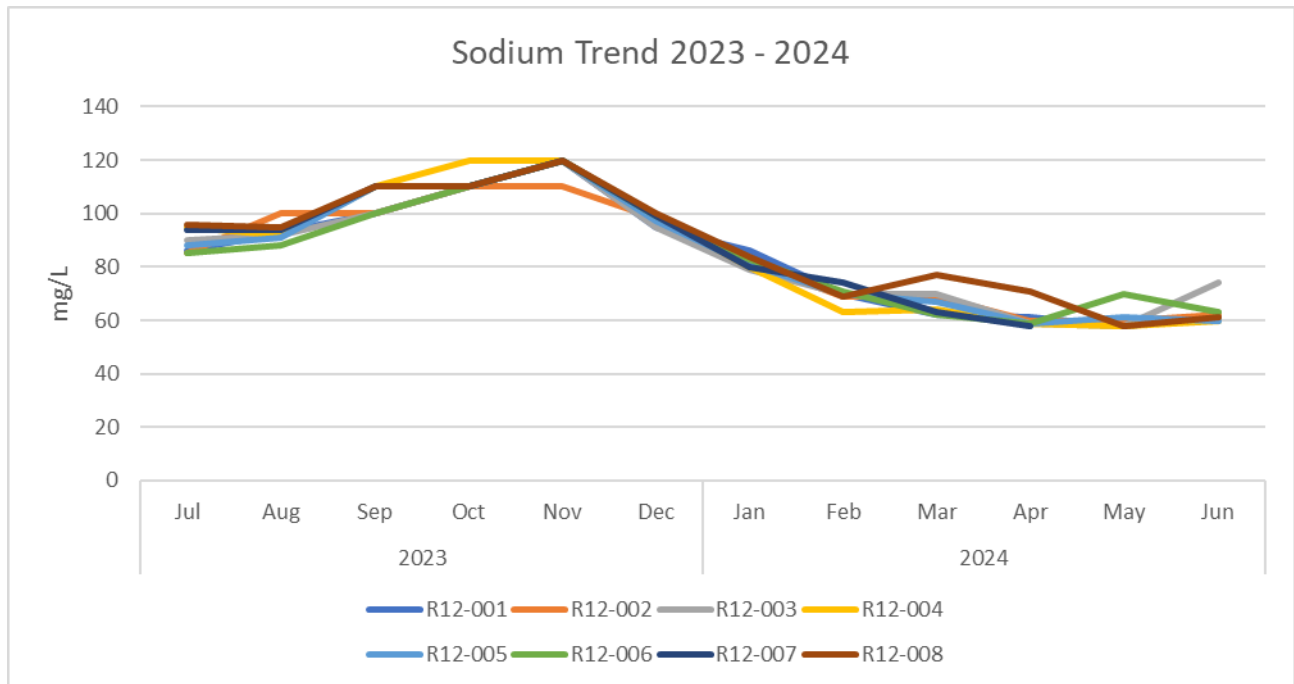


Figure C.3: sodium trends 2023-2024 monitoring period (ADWG limit 0.3 mg/L)