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For the

Rottnest Island Authority

Quarterly Drinking Water Report to the Department of Health by the Rottnest Island Authority

January – March 2018

Submission Date: 30th April 2018

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1. Water Provider Information

Rottnest Island Authority Contact Details	
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1.1. System Information

1.1.1. Consumers

The water demand on Rottnest Island is related to tenancy and is highly seasonal, being low in winter and high in summer. Historical data indicates that over 660,000 visits are typically made to the island on a yearly basis, with a low season minimum of 24,200 visitors/month (August) and a high season maximum of 118,784 visitors/month (January 2018).

The number of beds on the island for guests is approximately 2,150, with the average length of stay being 3.5 nights. In addition to this, there are approximately 250 permanent residents on the island, which also fluctuates in accordance with high and low seasons.

1.1.2. Distribution System & Water Supply

The Rottnest Island distribution system is relatively small, consisting of approximately 22km of mains. Water is sourced from 15 freshwater bores located in the Wadjemup bore field and 6 saline (seawater) bores located in the Longreach bore field. The freshwater bores typically produce less than 15% of the island's water, and is utilised as a supplementary contingency water supply, secondary to the saline production bores.

Water abstracted from the saline bores feeds into the desalination plant, where reverse osmosis occurs. The desalinated water is then disinfected with chlorine, ensuring the provision of safe drinking water to Rottnest Island customers. The quality and purity of the chlorine gas used for the disinfection of supplied drinking water, is ensured to be of high quality by only engaging approved product suppliers for the island.

Regular maintenance of the chlorine dosing unit is also completed by a qualified third party at the frequencies mandated by the manufacturer. In addition to this, the quality and performance of disinfection occurring within the drinking water supply is regularly monitored by qualified Hydraulic Technicians. This ensures that the drinking water produced on Rottnest Island meets the standard requirements agreed between the RIA and the Department of Health (DoH)'s Memorandum of Understanding (MOU) 2003, in line with the Australian Drinking Water Guideline Values.

The water demand on Rottnest is highly seasonal, and the monthly consumption can range from approximately 6,000kL in July to 25,000kL in January. The combined storage capacity of the drinking water infrastructure on site is 14,000kL, which is able to maintain approximately 28 days of water storage.

The island's bitumen catchment runoff collection system, which previously supplied the drinking water to storage tanks, was decommissioned from the drinking water supply chain in 2007. The runoff from the bitumen catchment however continued to supplement irrigation of the Golf Course but as of mid-2017 is now fully decommissioned. Tank 6 had minor structural repairs in 2012 whilst Tank 3 was refurbished early 2013, both of which are also used to store irrigation water for the golf course, separately from the drinking water supply chain.

Remote locations outside the main settlement, such as the outer island ablutions, Wadjemup lighthouse and the Research House, are supplied with water via a tanker. The supplied water in these areas is deemed not suitable for drinking and warning signs are posted accordingly.

Image 1 Example of Public Signage

1.1.3. Sampling Schedule & Procedure

A comprehensive sampling schedule is in place and the distribution sampling points are RI2/001, R12/002, R12/003, R12/004, R12/005, R12/006, R12/007 and R12/008.

The sampling procedures are carried out in accordance with guidelines established to meet the requirements of the Department of Health for the supply of drinking water. Where opportunities exist to further monitor and assess drinking water supply, these are implemented as appropriate. As such, additional testing parameters were suggested by the Department of Health in November 2017 which identified the presence of bromate in the distribution system with levels above the Australian drinking guidelines (ADWG). The findings resulted in the formation of a specialist working group who implemented a series of proposed corrective actions to address and mitigate this issue. More information is supplied in section 4.3.

Testing of the island's drinking fountains was also suggested as ongoing sampling points against defined parameters in the ADWG which have now been added to the monthly sampling regime.

2. Performance Summary

Water Quality Meeting the *Australia Drinking Water Guidelines v.3.4* (2017) (ADWG) January - March 2018			
	[1]No. of Analyses Completed	No. of Analyses Within Guidelines	No. of Non-conformances to Guidelines
Microbial			
Bacterial (*E.coli*)	84	84	0
Amoeba (Thermophilic *Naegleria)*	33	33	0
Chemical & Physical			
Health	330	322	8
Aesthetic	443	391	52
Radiological			
Gross Alpha		Not Scheduled	
Gross Beta		Not Scheduled	

[1] As screened against respective guideline – health / aesthetic

3. Microbial Performance

During the January - March 2018 reporting period, there were no incidents where exceedances of the Microbial Health ADWG occurred.

3.1. Microbial – Compliance Summary

Rottnest Island Distribution System January - March 2018				
Microbial Characteristic	**MoU Compliance Criteria**	**No. of Analyses**	**No. of Analyses Complying with MoU**	**% Compliance**
Bacterial				
E.coli	Non Detect	84	84	100%
Amoeba				
Thermophilic *Naegleria*	Non Detect	33	33	100%

3.2. Microbial – Exception Notifications

Microbial Water Quality Exceptions January - March 2018						
Population Served	**Date**	**Microbial Characteristic**	**MoU Alert Level**	**Remedial Action**	**DoH Notified**	**Close Out Date**
No Exceptions						

3.3. Microbial Incident Specific Information

There were no non-conformances with the MoU or ADWG criteria for *E.coli* or Thermophilic *Naegleria* during this reporting period.

4. Chemical: Health Related Performance

During the January - March 2018 reporting period, there were 10 incidents where exceedances of the Chemical Health ADWG occurred for routine prescribed monitoring. Details are included in table 4.2 Chemical: Health Related - Exception Notifications

4.1. Chemical: Health Related - Compliance Summary

Rottnest Island Distribution System January - March 2018					
Health Characteristic	**ADWG Guideline (mg/L)**	**No. of Analyses**	**No. of Analyses Complying with ADWG**	**% Compliance with ADWG**	**Max Value of Analysis (mg/L)**
Antimony (Sb)	0.003	45	45	100%	<0.001
Cadmium (Cd)	0.002	45	44	98%	0.015
Chlorine (Cl_2) *(in house testing)*	5	54	54	100%	1.9
Copper (Cu)	2	45	44	98%	4.7
Fluoride (F)	1.5	1	1	100%	<0.1
Lead (Pb)	0.01	45	41	91%	0.036
Manganese (Mn)	0.5	25	25	100%	0.064
Nickel (Ni)	0.02	45	43	96%	0.065
Nitrate (NO_3) (Nitrate as nitrate)	50	3	3	100%	0.013
Nitrite (NO_2)	3	11	11	100%	<0.05
Trihalomethanes (THMs)	0.25	11	11	100%	0.018

4.2. Chemical: Health Related - Exception Notifications

Chemical: Health Related Water Quality Exceptions January - March 2018					
Date	**Chemical Characteristic**	**MoU Alert Level**	**Remedial Action**	**DoH Notified**	**Close Out Date**
Jan 2018	Bromate	Level 2	Bromate Action Plan	Yes	On Going
Feb 2018	Bromate	Level 2	Bromate Action Plan	Yes	On Going
March 2018	Bromate	Level 2	Bromate Action Plan	Yes	On Going
Feb 2018	Cadmium	Level 2	KB Fountain tagged out and scheduled for decommissioning	Yes	13/03/18
March 2018	Copper	Level 2	GB fountain was flushed and re-tested, within range	Yes	27/03/18
Jan 2018	Lead	Level 2	KB Fountain tagged out pending further testing	Yes	13/03/18
Feb 2018	Lead	Level 2	KB fountain was decommissioned.	Yes	13/03/18
March 2018	Lead	Level 2	GB fountain decommissioned and new design fountain put in service April 2018	Yes	13/03/18
March 2018	Lead	Level 2	Investigative sample taken on the GB Fountain delivery line	Yes	12/4/18
Jan 2018	Nickel	Level 2	KB Fountain tagged out pending further testing	Yes	13/03/18
Feb 20018	Nickel	Level 2	KB fountain was decommissioned.	Yes	13/03/18

4.3. Chemical: Health Related Incident Specific Information

During the quarter, there were 8 exceedances of routine monitoring parameters set in the Memorandum of Understanding (MOU) agreed between the RIA and DoH for Rottnest Island, being Cadmium (1 sample), Copper (1 sample), Lead (4 samples) and Nickel (2 samples). There was also identified exceedance at all distribution monitoring points for bromate.

Cadmium: The Cadmium exceedance was reported at the Kingston Barracks fountain at 0.015mg/L, above the ADWG recommend max level to be 0.002 mg/L. The Kingston Barracks fountain was tagged out of service and is scheduled for decommissioning as part of the new drinking fountain replacement project.

Copper: The exceedance for Copper at the Geordie Bay fountain was reported at 4.7mg/L, above the ADWG recommend max level to be 2 mg/L. The location where the copper was detected was flushed and retested, results of the retest came back within ADWG at 0.089mg/L

Lead:. The drinking fountain sampling regime procedure requires that each site is drawn two (2) samples. The first sample is taken and, following a five (5) minute flush the second sample is taken Post Flush respectively called sample 1 and sample 2. Eg Basin 1 and Basin 2.

First flush samples taken at the Kingston Barracks and the Geordie Bay fountains returned traces of lead, followed by secondary post flush samples returning no lead results. In both cases, the drinking fountains were immediately tagged out of service with further testing undertaken. The detection of lead in the first draw samples suggest that the metal is produced locally at the tap itself or the delivery pipe via fittings.

The first location, Kingston Barracks, had exceedance levels 0.018mg/L on 29/01/18 and 0.016mg/L on 07/02/18 with ADWG being a maximum of 0.01mg/L. The investigations is now concluded at this location, with the Kingston Barracks fountain tagged out of service and scheduled for decommissioning as part of the new drinking fountain replacement project.

The second location which was investigated is the Geordie Bay drinking fountain, with initial exceedance level of 0.026 mg/L on 13/03/18, secondary testing showed exceedance level of 0.036 mg/L. Preliminary investigations have eliminated the actual drinking fountain pipe and fittings which are currently out of service. The original drinking fountain was decommissioned in March 2018 following the installation of a purposely designed drinking fountain at this location. Subsequent tests have returned all sample points were below ADWG guideline values.

Nickel: The exceedance for Nickel at the Kingston Barracks drinking fountain was reported on 29/1/18 at 0.065 mg/L with ADWG recommend max level to be 0.02 mg/L. A subsequent sample taken on 7/2/18 showed results of 0.058 mg/L. Last samples taken in March 2018 were all within ADWG guideline values. The Kingston Barracks fountain was tagged out of service and is scheduled for decommissioning as part of the new drinking fountain replacement project.

Bromate management

Bromate testing is usually required in a disinfection systems that utilises ozonation technologies, however this process is not undertaken in the production of drinking water on Rottnest Island. As such, the requirement for routine bromate analysis was not identified when developing the drinking water monitoring schedule.The RIA commissioned a specific drinking water working group in January 2018 which established a bromate remediation action plan based on available knowledge and resources.

A stringent flushing regime combined with a series of engineering actions has seen bromate levels decrease to below the lab's detection limit in Tank 5 for March, with significant decreased levels below the ADWG at all sampling locations in the distributions system. Bromate levels continue to decrease in the drinking fountains with only 1 sample point returning a bromate exceedance level, the Army Jetty, above the ADWG guideline values in March 2018. Updates to the Action Plan shall be provided in future Quarterly Drinking Water reports.

During the first quarter of the year, 130 bromate samples were taken from the distribution system, of which 2 sample locations had been added to investigate the possible presence of bromate at the desalination plant. Trace bromate levels were detected in all sampling locations in the earlier stages of the investigation, but the desalination plant (pre and post calcite), Tank 7 and Tank 4 were never detected above the ADWG.

From the designated sample points (R12/001 to R12/008), 84 samples were taken over the quarter with ADWG exceedances returned in 48 of these sample points between January 10th and February 27th. The maximum reading was 0.1mg/L at Kingston Barracks & Geordie Bay. The minimum reading was below the lower detection limit of 0.005mg/L and the average reading was 0.023 mg/L.

A flushing regime was introduced in late January at both Kingston and Longreach which demonstrated immediate reduction in bromate levels at these two locations. Further flushing points were added throughout the distribution system in late February which returned bromate levels to below the ADWG in all designated sample locations in March 2018 for the distribution system.

A further 30 bromate samples were taken from the island's 9 drinking fountain points, with bromate levels in exceedance at all sample location in Feb 2018. Following the flushing regime introduced, the bromate levels had been reduced to below ADWG at 8 of the 9 locations in March 2018.

5. Chemical: Aesthetic Performance

5.1. Chemical: Aesthetic – Compliance Summary

Rottnest Island Distribution System January - March 2018					
Aesthetic Characteristic	**ADWG Guideline (mg/L unless stated)**	**No. of Analyses**	**No. of Analyses Complying with ADWG**	**% Compliance with ADWG**	**Max Value of Analysis (mg/L)**
Aluminium (Al)	0.2	3	3	100%	<0.01
Ammonia (NH_3)	0.5	11	11	100%	<0.005
Chloride (Cl)	250	69	69	100%	210
Chlorine (Cl_2) *(in house testing)*	0.6	47	6	13%	1.62
Colour	15 (HU)	6	6	100%	<5
Copper (Cu)	1	45	44	98%	4.7
Hardness ($CaCO_3$)	200	1	1	100%	12
Iron (Fe)	0.3	25	20	80%	3.8
Manganese (Mn)	0.1	25	25	100%	0.064
pH	6.5 – 8.5	31	26	84%	9.7
Sodium (Na)	180	104	104	100%	120
Sulphate	250	11	11	100%	3
Sulphide (H_2S)	0.05	3	3	100%	<0.01
TDS	600	11	11	100%	430
Turbidity	5 (NTU)	6	6	100%	0.2
Zinc (Zn)	3	45	45	100%	1.1

NS – Not Scheduled

5.2. Chemical: Aesthetic - Incident Specific Information

There were 12 instances where analytical results exceeded the aesthetic guidelines for chemical and physical properties, these are summarised below:

- **Copper:** 1 out of 45 copper samples reported values above >1mg/L, the ADWG Aesthetic value. Results ranged from <0.001 – 4.7mg/L. It is important to note that 1 copper level exceeds the aesthetic guideline and ADWG values, the remaining 44 results have been below the human health ADWG and aesthetic guidelines.
- **Iron:** 5 out of 25 samples reported iron concentrations above the ADWG value of 0.3mg/L. The maximum concentration was 3.8mg/L at R12/005.

  As iron has a taste threshold of approximately 0.3 mg/L in water; this may cause taste and odour problems. Having noted this, there have been no complaints regarding water quality during the reporting period and results have remained below the Health ADWG.

  Investigations are currently being conducted to determine the cause of the high levels as a proactive measure should any customers begin to detect a decrease in the quality of taste to the drinking water.
- **pH:** 26 out of 31 samples reported pH values outside the ADWG range of 6.5 to 8.5. The maximum pH value was recorded at R12/002 (9.7 pH units), the lowest value at R12/008 (6.4 pH units).

  A higher pH can be due to longer retention times in the water main, and can also be a characteristic of distribution systems that are constructed partly of concrete tanks and cement-mortar lined pipes; typical of the Rottnest Island distribution system. The ADWG indicates that pipes constructed of these materials can significantly increase pH, and a higher pH value may be tolerated, provided monitoring indicates no deterioration in microbial quality.

  As discussed in Section 3, there were no non-conformances with the MoU criteria for *E.coli* or Thermophilic *Naegleria* during this reporting period, or the previous reporting period.
- **Chlorine:** 41 out of 47 samples reported chlorine values outside the ADWG range of 0.6. The maximum chlorine value was recorded at R12/003 was 1.66 mg/L the lowest value at R12/008 was 0.39 mg/L. Rottnest Island have higher levels than the average 0.6mg /L as outlined in the ADWG aesthetic guideline and in accordance with the ADWG in order to maintain an effective disinfectant residual throughout the distribution system.

Whilst some monitoring locations reported analytical concentrations exceeding the guideline values for aesthetic water quality, it is important to note that aesthetic issues do not pose a risk to human health where there is no associated human health guideline value. The copper result exceeding both aesthetic and human health guideline values has been discussed in Section 4.3.

6. Radiological Performance

No radiological samples were required during the reporting period. The next round of radiological samples are due in 2019 and will be reported during the appropriate reporting cycle.

6.1. Radiological – Compliance Summary

Rottnest Island Distribution System January - March 2018				
Radiological Characteristic	**MoU Compliance Criteria**	**No. of Analyses**	**No. of Analyses Complying with MoU**	**% Compliance**
Gross Alpha	< 0.5 Bq/L	NA	NA	NA
Gross Beta	< 0.5 Bq/L	NA	NA	NA

7. Planned Sample Summary

7.1. Planned Sample – Compliance Summary

Planned Samples [1] January - March 2018								
Microbial			**Chemical[2]**			**Radiological**		
Planned	**Taken**	**% Taken**	**Planned**	**Taken[3]**	**% Taken**	**Planned**	**Taken**	**% Taken**
77	84	100%	436	773	100%	NA	NA	NA

[1] A planned sample is defined as being included in the Sampling Program for this period.
[2] Physical number of samples taken for this period.
[3] Includes DoH recommended Bromate monitoring samples

7.2. Planned Sample - Exception Notifications

Planned Sample Exceptions January - March 2018			
Sampling Point	**Date Due**	**Characteristic**	**Reason for Missing Sample**
No Exceptions			

8. Comments