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# Contents

Message from the CEO Our commitment Drinking Water Quality Policy Drinking Water Quality Management Framework Our licence area System analysis and management Our water source		
Our commitment	5	
Drinking Water Quality Policy	5	
Drinking Water Quality Management Framework	5	
Our licence area	6	
System analysis and management	7	
Our water source	7	
Understanding water quality	8	
Water treatment	9	
Our water treatment plants	10	
Distribution network	11	
Multi barrier approach	11	
Incident responses	11	
Water quality monitoring and testing	12	
Development, training and innovation	12	
Our customers	12	
Review	13	
Microbiological and disinfection health results	13	
Chemical health results	13	
Radiological health results	13	
Non-health (aesthetic) results	13	
Water quality results	14	

## MESSAGE FROM THE CEO

I am pleased to present the 2017-18 Water Quality Report on behalf of Busselton Water.

Our commitment to compliance with health related and non-health related water quality criteria in the Australian Drinking Water Guidelines (ADWG) is firmly established. Our application of the ADWG is reinforced through our Memorandum of Understanding (MoU) with the Department of Health.



Busselton Water continued to achieve exceptional water quality results in 2017-18 as detailed in this report and summarised in the table below.

In addition to presenting water quality results and performance against the ADWG, this report describes the processes Busselton Water uses to collect, treat and distribute drinking water to our customers. I wish to thank everyone who has contributed to these excellent results, particularly staff and representatives from Department of Health, GHD Pty Ltd and Rockwater Pty Ltd.

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Chris Elliott Chief Executive Officer

2017-18 WATER QUALITY RESULTS AT A GLANCE									
Incident management									
Incidents reportable to the Department of Health	Nil								
Health related characteristics	Compliance								
Escherichia coli	100%								
Naegleria	100%								
Chemical	100%								
Pesticides	100%								
Radiological	100%								
Chlorine Disinfection	100%								
Non-health characteristics	Compliance								
Aesthetic characteristics (excluding chlorine)*	100%								

\* Busselton Water achieved full compliance with Australian Drinking Water Guidelines except for the 0.6 mg/L aesthetic guideline value for chlorine concentration. This aesthetic guideline value is exceeded to ensure the microbiological safety of our water supply.

## **OUR COMMITMENT**

We are committed to achieving 100 per cent compliance, with health related and non-health related water quality criteria in the ADWG.

To enable us to achieve this, we will:

- systematically monitor and report water quality performance;
- be prepared for incidents including regular testing of our response plans;
- fulfil all the requirements of our Operating Licence and MoU with the Department of Health; and
- review and implement the Drinking Water Quality Improvement Plan.

# Drinking Water Quality Policy

#### Busselton Water is committed to:

Providing our current and future customers with high quality, safe drinking water consistent with the ADWG.

# In pursuit of our commitments, we will:

- endorse and embrace the ADWG including protection of catchments and sources;
- fulfil all the requirements of our Operating Licence and MoU with the Department of Health;

- maintain and implement

   a Drinking Water Quality
   Management System consistent
   with the 12 elements of the
   ADWG Framework;
- systematically monitor and report water quality performance;
- prepare for incidents and regularly test our response plans;
- ensure our own water extraction is sustainable; and
- champion the protection of our source catchments in collaboration with relevant government agencies and regulators.

#### Framework for Management of Drinking Water Quality

Busselton Water bases its Drinking Water Quality Management System on the ADWG Framework for Management of Drinking Water Quality, endorsed by the National Health and Medical Research Council. The Framework provides benchmark water quality guidelines and values for designing a structured system for drinking water quality management. It aims to ensure a safe and reliable water supply. There are 12 elements within the ADWG Framework<sup>1</sup> which are considered best practice. These elements are divided into four sections:

- 1. Commitment to drinking water quality management.
- 2. System analysis and management.
- 3. Supporting requirements.
- 4. Review.

Busselton Water regularly assesses its performance against these elements.

In addition, our Operating Licence issued by the Economic Regulation Authority, incorporates our MoU<sup>2</sup> with the Department of Health. The MoU describes the Department of Health requirements for compliance with the microbiological, health, chemical and radiological criteria.

Busselton Water provides the Department of Health with a quarterly water quality report, outlining our organisation has performed against agreed requirements specified in the MoU.

Busselton Water is a member of the Advisory Committee for the Purity of Water<sup>3</sup>.

<sup>1</sup> The "Australian Drinking Water Guidelines" published by the National Health and Medical Research Council, Australia's peak health research body, provides an authoritative reference on what defines safe, good quality drinking water; how it can be achieved; and how it can be assured. It is available for download from <a href="https://nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines">https://nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines</a>.

<sup>2</sup> A copy of the Memorandum of Understanding with the Department of Health is available on the Busselton Water website.

<sup>3</sup> 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

## **OUR COMMITMENT**



#### **Our licence area**

Established in 1906, Busselton Water is a local water corporation that shares a 112-year history and culture with the local community. We provide potable water services to more than 26,000 people within the city of Busselton (doubling to more than 50,000 in peak holiday periods), as well as bulk water supplies to the neighbouring town of Dunsborough. Busselton Water's operating licence (WL 3, Version 7) authorises Busselton Water to provide potable water supply services to an area of approximately 688,700ha.

We currently provide drinking water within a serviced area of 81,200ha, centred around Busselton as shown above. Red, green and blue lines depict water distribution pipes of various sizes, with red being the largest mains pipes and blue being the smallest. A map of our operating licence area can be viewed on the Economic Regulation Authority website.<sup>4</sup>

4 https://www.erawa.com.au/cproot/12840/2/Operating%20area%20map%20-%20WL3%20-%20Busselton%20Water.PDF

#### **Our water source**

Busselton Water sources the bulk of its raw water from the deep, confined, Yarragadee aquifer. There is some draw from the base of the shallower Leederville aquifer which extends from about 10 to 275 metres in depth. Below this the Yarragadee aquifer extends to over 800 metres in depth.

Busselton Water extracts this raw water under licences (GWLs 110850 and 110851), issued by the Department of Water and Environmental Regulation (DWER). There are eight production bores pumping the raw water to treatment plants for filtration and disinfection before the treated water is stored in tanks and reticulated to customers.

#### Source protection

Busselton Water, in conjunction with DWER, developed the Busselton Water Reserves Drinking Water Source Protection Plan (Report WRP 139) released by the Department of Water, predecessor of DWER, in August 2013. The Plan defines the boundaries of Busselton Water's Water Reserve and assigns a Priority 1 to these reserves. This identifies that due to the confined nature of this drinking water source, there is no risk of contamination from overlying land uses. The purpose of proclaiming the water reserves was to ensure the bore locations are under legislative protection.



Busselton Water is also bound by DWER's Groundwater Licence Operating Strategy (GLOS), issued March 2014, stipulating annual extraction entitlement limits, licence conditions and compliance requirements. Busselton Water's consultant Hydrogeologists (Rockwater Pty Ltd) review this document along with the implementation of the borefield construction and maintenance plan, monitoring and reporting requirements, to ensure future operational strategies are sustainable in the long term.

Extraction of water in accordance with the operating strategy is shown as follows:

Financial Year	Extraction (gigalitres)
2008-2009	4.49
2009-2010	4.23
2010-2011	4.30
2011-2012	4.30
2012-2013	4.59
2013-2014	5.05
2014-2015	5.18
2015-2016	5.38
2016-2017	5.15
2017-2018	5.35

## Understanding water quality

Turbidity	Turbidity is the cloudy appearance of water caused by the presence of suspended matter.	The ADWG specify an aesthetic guideline of 5 Nephelometric Turbidity Units (NTU). If disinfection is required, the turbidity of less than 1NTU is desirable at the point of disinfection.
Colour	Colour in water originates mainly from natural drainage through soil and vegetation in a catchment.	The ADWG value for colour is based on the colour that is noticeable in a glass. This is generally accepted as 15 Hazen Units (HU).
Iron	Iron occurs naturally in water as a result of contact with soil or rock in the catchment. Iron in the water does not present a health hazard.	The ADWG recommend that based on aesthetic consideration, the concentration of Iron should not exceed 0.3 milligrams per litre (mg/L).
Manganese	Manganese in water can come from contact with soil or rock in the catchment. Manganese is not considered a health concern unless the concentration exceeds 0.5mg/L.	The ADWG recommend that based on aesthetic considerations, the levels of manganese should not exceed 0.1mg/L.
Total dissolved solids (TDS)	TDS consist of inorganic (natural) salts and small amounts of organic matter dissolved in water. TDS comprise sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silicon, organic matter, fluoride, iron, manganese, nitrate and phosphate.	Treated water quality containing TDS levels of below 500mg/L is classified as good.
Microbiological pathogens and disinfection	Thermophilic <i>Naegleria</i> refers to a group of amoeba which includes <i>Naegleria fowleri</i> , the organism that causes the waterborne disease primary amoebic meningoencephalitis. <i>Naegleria fowleri</i> is an environmental pathogen which naturally lives in fresh warm water. The most common and widespread health risk associated with drinking water is contamination by microorganisms. Organisms associated with the gut of humans and mammals cause the usual waterborne diseases. Tests are undertaken for <i>Escherichia coli</i> ( <i>E. coli</i> ).	The Department of Health has notification protocols in place regarding <i>Naegleria</i> . Busselton Water is required to immediately notify the Department of Health if <i>Naegleria</i> is detected in any microbiological sample. The ADWG state that thermotolerant coliforms/ <i>E.coli</i> should not be present in a minimum 100mL sample.
Radiological	There are natural levels of radiation within the environment, and groundwater sources such as that sourced from the Yarragadee aquifer can have higher background levels than that of surface water systems.	Testing is undertaken for gross alpha and gross beta radioactivity, where screening levels can be determined. The ADWG recommend a screening level of 0.5 becquerel per litre (Bq/L).
pН	pH is a measure of how acidic/basic water is. The range goes from 0-14, with 7 being neutral. pH is the measure of free hydrogen ion concentrations in the water.	The suggested aesthetic pH target from the ADWG is 6.5 to 8.5.

### Water treatment

Busselton Water uses a three-step process to treat raw water from the deep groundwater aquifers to produce customers with safe drinking water.

#### Pre-treatment and aeration

Raw water is dosed with a small amount of chlorine then aerated via spray aerators. This oxidises naturally occurring iron and manganese, turning it from its soluble form into small solids.

#### Filtration

The pre-chlorinated and aerated water is then filtered through sand filters to remove the iron, manganese, turbidity and other impurities. The filtered water is then collected in a clear-water well.

#### Disinfection

A further dose of chlorine is then added to water pumped from the clear-water well. This dose maintains the disinfection level required to preserve microbiological safety before the water is stored in tanks and pumped into the distribution system. Chlorine is approved for use in drinking water supplies and Busselton Water sources chlorine gas from an ISO 9001-accredited manufacturer.

The process is shown schematically overleaf.









# Our water treatment plants

Busselton Water operates three water treatment plants.

Chlorine disinfection occurs at each treatment plant to keep the concentration of chlorine in the distribution system at or above 0.4mg/L to ensure adequate protection against Thermophilic *Naegleria* and other microbiological threats. The ADWG set 5mg/L of chlorine as the upper acceptable limit.

For further detail please refer to the non-health (aesthetic) results section on page 19.

### WATER TREATMENT AND SUPPLY PROCESS



### **Distribution network**

Busselton Water's distribution network delivers drinking water to customers within the City of Busselton and transfers bulk water to neighbouring Dunsborough. The network operates as one large, interconnected system. Materials used in the reticulation network have been approved either under Australian Standard AS/NZS 4020: 2005. (Testing of Products for Use in Contact with Drinking Water) or as scheduled in the MoU with the Department of Health.

Strict protocols established by Busselton Water in conjunction with the Department of Health and the Department of Mines, Industry Regulation and Safety assure the:

- safety and integrity of water distributed to customers;
- safe handling of chlorine at the water treatment plants; and
- safety of chemicals used and materials in contact with drinking water.

The distribution network has the following components:

Estimated population	Approx. 26,000
Total number of connections	13,474
Total length of pipes	325km
Number of storage tanks	5
Chlorine residual target	0.4 to 0.6 mg/L
Number of distribution water quality zones	1



### **Multi-barrier approach**

Preventing contamination and minimising potential hazards is an essential part of providing our customers with safe drinking water. The ADWG require the implementation of a multi-barrier approach as the most effective way of ensuring the safety of drinking water.

Busselton Water's barriers include:

- protection of groundwater;
- treatment;
  - chlorine disinfection; and
- backflow prevention.

Busselton Water maintains and operates these multiple barriers, ensuring they are robust and that high quality drinking water is delivered to our customers.

#### **Incident responses**

While every effort is made to prevent water quality incidents from occurring, there will inevitably be times when our systems fail due to equipment malfunction, human error, extreme weather conditions or unforeseen events. Busselton Water has incident response plans to manage such events with the minimum possible impact on water quality.

In the event of a water quality incident, Busselton Water activates its Water Quality Incident Response Plan. This comprehensive plan is applied to manage water quality incidents and is consistent with the MoU between Busselton Water and the Department of Health.

To maintain our preparedness to deal with any water quality incidents, as part of our compliance with the MoU with the Department of Health, a mock event simulating water source contamination was held in June 2018. It tested the effectiveness of staff and BW's Business Continuity and Emergency Response Plans.

There were no water quality incidents reportable to the Department of Health in 2017-18.

# Water quality monitoring and testing

Busselton Water has a comprehensive monitoring program which has been reviewed and endorsed by the Department of Health.

Key parameters monitored by Busselton Water are:

- **microbiological** including Thermophilic *Naegleria* and *Escherichia coli*;
  - chemical health including:
     a large range of parameters with health-related guideline values defined by the ADWG; and
  - pesticides which are monitored and tested on an annual basis to monitor the risk of groundwater contamination by pesticides and agricultural chemicals used in proximity to our bores or in the aquifer recharge area;
- chemical non-health

   (aesthetic) including a large range of parameters with non-health guideline values defined by the ADWG; and
- radiological health monitored and tested on an annual basis.



# Development, training and innovation

Busselton Water utilises training in accordance with the National Water Industry Training package. Water quality operational staff progress towards Certificate III in Water Industry Operations.

Busselton Water adopts a best practice 70/20/10 development approach. This approach allocates more time to experiential learning and delivers better employee development and business outcomes. It consists of 70 per cent experiential learning, 20 per cent mentorship of employee learning (including development planning), and 10 per cent approved class-based training.

Personnel regularly attend relevant training courses and/or conferences.

Busselton Water continued to derive benefit from innovative detection of backflow from residential customers' properties using radio frequency water meters.

#### **Our customers**

We strive to deliver excellence in customer service and continue to improve our existing levels of customer satisfaction. Busselton Water holds Customer Advisory Group meetings twice per year.

Water quality complaints remain at a very low level. Busselton Water received 18 water quality complaints during 2017-18, with seven relating to taste and odour, seven relating to discoloured water, and four relating to customers' water use for non-drinking purposes.

All customer complaints were investigated through personal contact with the customer. All complaints were resolved through either flushing the pipe network in the immediate vicinity of the customer's property or improving the customer's understanding of how drinking water quality is managed.

## REVIEW

Busselton Water monitors water quality by taking weekly water samples.

# Microbiological and disinfection health results

Busselton Water collected 364 samples from the reticulation system during the reporting period and 100 per cent of these samples were compliant with no detections of either *Escherichia coli* or Thermophilic *Naegleria*. A further 1,038 samples were taken to assess chlorine levels.

### **Chemical health results**

There are many chemical parameters that have health-related guideline values in the ADWG. Busselton Water achieved 100 per cent compliance with all these requirements. The report in the next section gives more detail on the individual parameters.

### **Radiological health results**

Groundwater radiological testing is carried out in accordance with parameters and frequencies based on the ADWG and in consultation with the Department of Health.

Groundwater radiological testing is only required periodically. Gross alpha and gross beta are tested annually in April and results from these samples were 100 per cent compliant.



#### Non-health (aesthetic) results

Except for chlorine as described below, Busselton Water achieved 100 per cent compliance.

Busselton Water uses chlorine to provide a disinfectant residual in the water distribution system. Disinfection is designed to kill pathogenic microorganisms, thereby preventing waterborne diseases.

Chlorination is the most commonly used process for disinfection and was endorsed by the National Health and Medical Research Council for use as a drinking water treatment chemical in 1983. The ADWG aesthetic upper guiding value for chlorine is 0.6mg/L. The ADWG state that "In some supplies it may be necessary to exceed the aesthetic guideline in order to maintain an effective disinfectant residual throughout the system." Busselton Water closely manages chlorine dosing levels to maintain a minimum residual chlorine level of 0.4mg/L throughout the distribution system at all times. During the year, Busselton Water collected 1,038 chlorine samples in the distribution network. The minimum total chlorine level was 0.28mg/L, and the maximum was 0.9mg/L.

There are many parameters with aesthetic guideline values in the ADWG. Results of individual parameters are outlined in the next section of this report.

## WATER QUALITY RESULTS

In the period 1 July 2017 to 30 June 2018, there were no reportable incidents.

#### CHLORINE SAMPLES - 1 JULY 2017 TO 30 JUNE 2018

Busselton Water collected 510 total chlorine samples during 2017-18 for formal assessment of our water's chemical health characteristics. An additional 1,038 total chlorine samples were taken in the distribution network during 2017-18 to manage the disinfection performance achieved within the pipe network. The minimum average and maximum levels of these additional operational samples were:

ТҮРЕ	Minimum mg/L	Average mg/L	Maximum mg/L
Distributed Chlorine (Total)	0.28	0.58	0.90

#### MICROBIOLOGICAL SAMPLES - 1 JULY 2017 TO 30 JUNE 2018

CHARACTERISTIC	UNIT	LINIT ADW		Number c	f samples	Total no. of	Maximu	m value	Numt non-con with AD <sup>1</sup>	Compliance %
			Treated water (non- assessable)	Distribution water (assessable)	(treated + distribution)	Treated water (non- assessable)	Distribution water (assessable)	Treated water (non- assessable)	Distribution water (assessable)	distribution water
Escherichia coli	CFU/ 100mL	0	247	364	611	0	0	0	0	100%
Thermophilic <i>Naegleria</i>	org/ 250mL	ND	242	357	599	ND	ND	0	0	100%
Naegleria fowleri	org/ 250mL	ND	0	0	0	-	-	0	0	100%

mg/L = milligrams per litre ND = Not Detected

Twelve Thermophilic Naegleria samples scheduled for 27 December 2017 were not taken because the PathWest laboratory was closed between Christmas and New Year.

#### RADIOLOGICAL SAMPLES - 1 JULY 2017 TO 30 JUNE 2018

CHARACTERISTIC	UNIT	UNIT ADWG (Health)		Raw Wate	er (Bores)		Treated Water (Storage Tanks)				
			Non- Compliance (Health)	No. of Samples	% Compliance (Health)	Maximum Detected Bq/L	Non- Compliance (Health)	No. of Samples	% Compliance (Health)	Maximum Detected Bq/L	
Gross Alpha	Bq/L	0.5	0	7	100%	0.171	0	5	100%	0.186	
Gross Beta	Bq/L	0.5	0	7	100%	0.147	0	5	100%	0.130	

CHEMICAL	. HEALTH –	1 JULY 201	7 TO 30 v	JUNE 2018

		ADWG	Laboratory Limit of	Number of samples		Total no. of samples	Maximum value		Number of non-compliance		Compliance %
CHARACTERISTIC	UNIT	(Health)	Reporting (LOR)	Raw water	Distribution water	(raw + distribution)	Raw water	Distribution water	Raw water	Distribution water	distribution water
Antimony	mg/L	0.003	0.001	NR	16	16	NR	ND	NR	0	100%
Arsenic	mg/L	0.007	0.001	NR	16	16	NR	ND	NR	0	100%
Barium	mg/L	0.7	0.001	NR	16	16	NR	0.33	NR	0	100%
Beryllium	mg/L	-	0.001	NR	16	16	NR	ND	NR	0	100%
Boron	mg/L	4	0.005	NR	16	16	NR	0.23	NR	0	100%
Bromodichloromethane	mg/L	0.25*	0.0005	NR	12	12	NR	ND	NR	0	100%
Bromoform	mg/L	0.25*	0.0005	NR	12	12	NR	0.0091	NR	0	100%
Cadmium	mg/L	0.002	0.0001	NR	16	16	NR	ND	NR	0	100%
Chlorine (Total)	mg/L	5		NR	510	510	NR	0.9	NR	0	100%
Chloroform	mg/L	0.25*	0.0005	NR	12	12	NR	ND	NR	0	100%
Copper	mg/L	2	0.001	NR	16	16	NR	0.023	NR	0	100%
Dibromochloromethane	mg/L	0.25*	0.0005	NR	12	12	NR	0.0014	NR	0	100%
Fluoride	mg/L	1.5	0.1	NR	84	84	NR	0.5	NR	0	100%
Lead	mg/L	0.01	0.001	NR	16	16	NR	ND	NR	0	100%
Manganese (Soluble)	mg/L	0.5	0.005	80	80	160	0.16	ND	0	0	100%
Manganese (Total)	mg/L	0.5	0.005	80	80	160	0.099	ND	0	0	100%
Mercury	mg/L	0.001	0.00005	NR	16	16	NR	ND	NR	0	100%
Molybdenum	mg/L	0.05	0.001	NR	16	16	NR	ND	NR	0	100%
Nickel	mg/L	0.02	0.001	NR	16	16	NR	ND	NR	0	100%
Nitrate	mg/L	50	0.05	26	NR	26	0.21	NR	0	NR	
Nitrite	mg/L	3	0.005	26	NR	26	0.047	NR	0	NR	
Selenium	mg/L	0.01	0.001	NR	16	16	NR	ND	NR	0	100%
Silver	mg/L	0.1	0.001	NR	16	16	NR	ND	NR	0	100%
Total Trihalomethanes	mg/L	0.25*	0.0005	NR	12	12	NR	0.004	NR	0	100%
Uranium	mg/L	0.02	0.001	NR	16	16	NR	ND	NR	0	100%
TOTAL				212	1,038	1,250			0	0	100%

mg/L = milligrams per litre NTU = Nephelometric turbidity units

Note 1: ND = Not Detected Note 2: NR = Not required to be sampled Note 3: Chlorine Total is a Busselton Water in-house test. All others are accredited test results. Note 4: \*The concentration of trihalomethanes, either individually or in total, in drinking water should not exceed 0.25 mg/L

# WATER QUALITY RESULTS

#### CHEMICAL HEALTH - PESTICIDES - 1 JULY 2017 TO 30 JUNE 2018

CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Laboratory Limit of Reporting	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %
		(nealui)	(LOR)		Distribu	ition water	
Low Level Organochlorine Pesticides							
Aldrin	µg/L	0.3	0.01	5	ND	0	100%
Methoxychlor	µg/L	0.3	0.1	5	ND	0	100%
Ultra Low Level Organochlorine Pesticid	les						
Alpha Endosulfan	µg/L	20	0.005	5	ND	0	100%
Beta Endosulfan	µg/L	20	0.005	5	ND	0	100%
Endosulfan Sulphate	µg/L	20	0.005	5	ND	0	100%
Heptachlor	µg/L	0.3	0.002	5	ND	0	100%
Heptachlor Epoxide	µg/L	0.3	0.002	5	ND	0	100%
Dieldrin	µg/L	0.3	0.002	5	ND	0	100%
p,p'-DDT	µg/L	9	0.001	5	ND	0	100%
Alpha Chlordane	µg/L	2	0.002	5	ND	0	100%
Gamma Chlordane	µg/L	2	0.002	5	ND	0	100%
Low Level Organophosphate Pesticides							
Diazinon (Dimpylate)	µg/L	4	0.01	5	ND	0	100%
Dichlorvos	µg/L	5	0.5	5	ND	0	100%
Methidathion	µg/L	6	0.05	5	ND	0	100%
Azinphos-methyl (Guthion)	µg/L	30	0.05	5	ND	0	100%
Fenthion	µg/L	7	1	5	ND	0	100%
Dimethoate	µg/L	7	0.15	5	ND	0	100%
Ethion	µg/L	4	0.05	5	ND	0	100%
Ultra Low Level Organophosphate Pesti	cides		· · · · · ·				
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	10	0.009	5	ND	0	100%
Parathion-ethyl (Parathion)	µg/L	20	0.004	5	ND	0	100%
Fenitrothion	µg/L	7	0.1	5	ND	0	100%
Low Level Acid Herbicides							
Picloram	µg/L	300	0.01	5	ND	0	100%
Triclopyr	µg/L	20	0.01	5	ND	0	100%
2,4-D	µg/L	30	0.01	5	ND	0	100%
Clopyralid	µg/L	2000	0.01	5	ND	0	100%
2,4,5-T	µg/L	100	0.01	5	ND	0	100%
МСРА	µg/L	40	0.01	5	ND	0	100%
Bromoxynil	µg/L	10	0.01	5	ND	0	100%
Dicamba	µg/L	100	0.01	5	ND	0	100%

mg/L = milligrams per litre $<math>\mu g/L = micrograms per litre$ ND = Not Detected

#### CHEMICAL HEALTH - VOLATILE ORGANIC COMPOUNDS - 1 JULY 2017 TO 30 JUNE 2018

CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Laboratory Limit of Reporting	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %
		(Health)	(LOR)		Distribu	tion water	
Volatile Organic Compounds							
cis-1,3-dichloropropene	µg/L	100	0.5	5	ND	0	100%
trans-1,3-dichloropropene	µg/L	100	0.5	5	ND	0	100%
Ethylbenzene	µg/L	300	0.5	5	ND	0	100%
Toluene	µg/L	800	0.5	5	ND	0	100%
Tetrachloroethene	µg/L	50	0.5	5	ND	0	100%
(Perchloroethylene,PCE)							
1,2,3-trichlorobenzene	µg/L	30	0.5	5	ND	0	100%
1,2,4-trichlorobenzene	µg/L	30	0.5	5	ND	0	100%
Trichloroethene (Trichloroethylene,TCE)	µg/L	no data	0.5	5	ND	0	100%
Vinyl chloride (Chloroethene)	µg/L	0.3	0.3	5	ND	0	100%
m/p-xylene	µg/L	600	1	5	ND	0	100%
o-xylene	µg/L	600	0.5	5	ND	0	100%
1,1,1-trichloroethane	µg/L	no data	0.5	5	ND	0	100%
Benzene	µg/L	1	0.5	5	ND	0	100%
Carbon tetrachloride	µg/L	3	0.5	5	ND	0	100%
Chlorobenzene	µg/L	300	0.5	5	ND	0	100%
1,2-dichlorobenzene	µg/L	1500	0.5	5	ND	0	100%
1,3-dichlorobenzene	µg/L	no data	0.5	5	ND	0	100%
1,4-dichlorobenzene	µg/L	40	0.3	5	ND	0	100%
1,1-dichloroethane	µg/L	no data	0.5	5	ND	0	100%
1,2-dichloroethane	µg/L	3	0.5	5	ND	0	100%
1,1-dichloroethene	µg/L	30	0.5	5	ND	0	100%
cis-1,2-dichloroethene	µg/L	60	0.5	5	ND	0	100%
trans-1,2-dichloroethene	µg/L	60	0.5	5	ND	0	100%
Dichloromethane (Methylene chloride)	µg/L	4	5	5	ND	0	100%
Styrene (Vinyl benzene)	µg/L	30	0.5	5	ND	0	100%
Other							
Amitrole	mg/L	9	0.001	5	ND	0	100%
Glyphosate	mg/L	1000	0.01	5	ND	0	100%
Diuron	µg/L	20	1	5	ND	0	100%
Diquat	mg/L	7	0.005	5	ND	0	100%
Paraquat	mg/L	20	0.005	5	ND	0	100%
Acrylamide	mg/L	0.2	0.00005	5	0.00008	0	100%
Organotins							
Tributyltin	mg/L	1	0.000002	5	ND	0	100%
Dibutyltin	mg/L	no data	0.000005	5	ND	0	100%
Chelating Agents							
Ethylenediamine tetraacetic acid	µg/L	250	20	5	ND	0	100%
Nitrilotriacetic acid	µg/L	200	20	5	ND	0	100%

mg/L = milligrams per litre $<math>\mu g/L = micrograms per litre$ ND = Not Detected

#### CHEMICAL HEALTH - OTHER ORGANIC COMPOUNDS - 1 JULY 2017 TO 30 JUNE 2018

CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Laboratory Limit of Reporting	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %				
			(LOR)	Distribution water							
Low Level Other Semi-Volatile Organic Compounds											
Propiconazole Isomer 1	µg/L	100	1	5	ND	0	100%				
Propiconazole Isomer 2	µg/L	100	1	5	ND	0	100%				
Temephos	µg/L	400	1	5	ND	0	100%				
Bromacil	µg/L	400	1	5	ND	0	100%				
Low Level Triazines											
Simazine	µg/L	20	0.01	5	ND	0	100%				
Hexazinone	µg/L	400	0.01	5	ND	0	100%				
Atrazine	µg/L	20	0.01	5	ND	0	100%				
Ametryn	µg/L	70	0.01	5	ND	0	100%				
Terbutryn	µg/L	400	0.01	5	ND	0	100%				
Metribuzin	µg/L	70	0.01	5	ND	0	100%				
Terbuthylazine	µg/L	10	0.01	5	ND	0	100%				
Low Level Semi-Volatile Organic Compounds (by Full 8270 Method)											
Hexachlorobutadiene	µg/L	0.7	0.01	5	ND	0	100%				
Chlorfenvinphos-cis	µg/L	2	0.05	5	ND	0	100%				
Chlorfenvinphos-trans	µg/L	2	0.01	5	ND	0	100%				
Carbaryl	µg/L	30	0.01	5	ND	0	100%				
Carbofuran	µg/L	10	0.01	5	ND	0	100%				
Trifluralin	µg/L	90	0.01	5	ND	0	100%				
Mevinphos-cis/trans	µg/L	5	0.1	5	ND	0	100%				
Parathion methyl	µg/L	0.7	0.01	5	ND	0	100%				
Low Level Phthalates											
Bis(2-ethylhexyl)phthalate	µg/L	10	10	5	ND	0	100%				
Low Level Synthetic Pyrethroids											
Esfenvalerate	µg/L	30	0.5	5	ND	0	100%				
Cyfluthrin	µg/L	50	2	5	ND	0	100%				
Cypermethrin	µg/L	200	2	5	ND	0	100%				
Deltamethrin	µg/L	40	0.5	5	ND	0	100%				
cis-Permethrin	µg/L	200	0.5	5	ND	0	100%				
trans-Permethrin	µg/L	200	0.5	5	ND	0	100%				

mg/L = milligrams per litre µg/L = micrograms per litre ND = Not Detected

CHARACTERISTIC	UNIT	ADWG LIMIT	Lab Limit of	Number of samples		Total no. of samples	Maximum value		Number of non-compliance with ADWG limit		Compliance %
			(LOR)	Raw water	Distribution water	distribution)	Raw water	Distribution water	Raw water	Distribution water	water
Alkalinity (Bicarbonate)	mg/L	-	5	26	16	42	220	190	0	0	100%
Alkalinity (Carbonate)	mg/L	-	5	26	16	42	ND	ND	0	0	100%
Alkalinity (Hydroxide)	mg/L	-	5	26	16	42	ND	ND	0	0	100%
Alkalinity (Total)	mg/L	-	5	26	16	42	180	150	0	0	100%
Aluminium (Soluble)	mg/L	0.2	0.02	26	16	42	0.07	ND	0	0	100%
Aluminium (Total)	mg/L	0.2	0.02	26	16	42	ND	ND	0	0	100%
Ammonia	mg/L	0.5	0.005	NR	16	16	NR	0.011	NR	0	100%
Calcium	mg/L	-	0.2	NR	16	16	NR	28	NR	0	100%
Chloride	mg/L	250	1	26	NR	26	150	NR	0	NR	
Colour True	HU	15	1	80	84	164	37	ND	0	0	100%
Electrical Conductivity	uS/cm	-	2	80	84	164	790	630	0	0	100%
Filterable Reactive Phosphorus	mg/L	-	0.005	26	NR	26	0.017	NR	0	NR	
Filterable Reactive Phosphorus as PO4	mg/L	-	0.01	26	NR	26	0.05	NR	0	NR	
Hardness	mg/L	200	5	26	16	42	130	120	0	0	100%
Iron (Soluble)	mg/L	0.3	0.005	80	84	164	9	0.022	18	0	100%
Iron (Total)	mg/L	0.3	0.005	80	84	164	8.7	0.048	18	0	100%
Magnesium	mg/L	-	0.1	NR	16	16	NR	14	NR	0	100%
рН	pН	6.5-8.5	NR	80	493	573	7.9	8.4	0	0	100%
Salinity (as Total Dissolved Solids)	mg/L	500	10	80	NR	80	440	NR	0	NR	
Silica	mg/L	-	0.05	26	NR	26	18	NR	0	NR	
Sodium	mg/L	180	0.5	26	NR	26	110	NR	0	NR	
Sulphate	mg/L	250	1	26	NR	26	21	NR	0	NR	
Total Hardness by Calculation	mg/L	200	1	26	16	42	130	120	0	0	100%
Turbidity	NTU	5	NR	80	510	590	4.46	0.44	0	0	100%
Zinc	mg/L	-	0.005	NR	16	16	0	0.016	0	0	100%
TOTAL				924	1,531	2,455					100%

#### CHEMICAL NON-HEALTH (AESTHETIC) SAMPLES - 1 JULY 2017 TO 30 JUNE 2018

Note 1: HU = Hazen Units NTU = Nephelometric Turbidity Units mg/L = milligrams per litre ND = Not Detected NR = Not required to be sampled Note 2: pH and Turbidity are Busselton Water in-house tests. All others are accredited test results.



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