



BUSSELTON WATER



# ANNUAL WATER QUALITY REPORT

2020-21

[busseltonwater.wa.gov.au](http://busseltonwater.wa.gov.au)



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# MESSAGE FROM THE MANAGING DIRECTOR



I am pleased to present the 2020-21 Annual 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

2020-21 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 and the many contracted companies that support delivery of our services.

Chris Elliott  
Managing Director

## 2020-21 WATER QUALITY RESULTS AT A GLANCE

Incident management	
Incidents reportable to the Department of Health	Nil
Health related characteristics	
<i>Escherichia coli</i>	100%
<i>Naegleria</i>	100%
Chemical	100%
Pesticides	100%
Radiological	100%
Chlorine Disinfection	100%
Non-health characteristics	
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 on some occasions 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 Management 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 protection of source catchments in collaboration with relevant government agencies and regulators.

## Drinking Water Quality Management Framework

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.

## Memorandum of Understanding

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 how our organisation has performed against agreed requirements specified in the MoU.

Busselton Water is a member of Western Australia's 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 <https://nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines>.

<sup>2</sup> A copy of the Memorandum of Understanding with the Department of Health is available on the Busselton Water website at <https://media4.busseltonwater.wa.gov.au/wp-content/uploads/2020/01/MOU-between-Department-of-Health-and-Busselton-Water-2019.pdf>

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

# OUR GEOGRAPHIC COVERAGE



## Current Extent of Operation

Established in 1906, Busselton Water is a local water corporation. We share a 114 year history and culture with the local community. We provide potable water services to more than 28,000 people within the city of Busselton (doubling to more than 60,000 in peak holiday periods). The Water Corporation purchases bulk water from Busselton to augment their supply to Dunsborough.

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.

## Our Licence Area

Busselton Water's operating licence (WL 3, Version 10) authorises Busselton Water to provide potable water supply services to an area of approximately 688,700ha.

A map of our Operating Licence Area can be viewed on the Economic Regulation Authority website.<sup>4</sup>

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



# SYSTEM ANALYSIS AND MANAGEMENT

## 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 nine 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 2019, 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
2018-2019	5.41
2019-2020	5.60
2020-2021	5.50

## Understanding water quality

Turbidity	Turbidity is the cloudy appearance of water caused by the presence of suspended matter.	The Australian Drinking Water Guidelines specify an aesthetic guideline of 5 Nephelometric Turbidity Units (NTU). If disinfection is required, a turbidity of less than 1 NTU is desirable at the point of disinfection.
Colour	Colour in water originates mainly from natural drainage through soil and vegetation in a catchment.	The Australian Drinking Water Guidelines 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 Australian Drinking Water Guidelines 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 0.5 mg/L.	The Australian Drinking Water Guidelines recommend that based on aesthetic considerations, the levels of Manganese should not exceed 0.1 mg/L.
Total Dissolved Solids	Total dissolved solids (TDS) consist of inorganic (natural) salts and small amounts of organic matter dissolved in water. Total dissolved solids 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 500 mg/L is classified as good.
Microbial Pathogens	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> ) as an indicator of microbial contamination. Thermophilic <i>Naegleria</i> refers to a group of amoebae 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.	<p>The Australian Drinking Water Guidelines state that thermotolerant <i>coliforms/E.coli</i> should not be present in a minimum 100mL sample of drinking water.</p> <p>The Department of Health WA 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.</p>
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.	<p>Testing is undertaken for gross alpha and gross beta radioactivity, where screening levels can be determined.</p> <p>The Australian Drinking Water Guidelines recommend a screening level of 0.5 Becquerel per Litre (Bq/L).</p>
pH	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 Australian Drinking Water Guidelines 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 provide customers with safe drinking water.

#### Pre-oxidation and aeration

Raw water is dosed with a small amount of chlorine, which is a strong oxidizing agent. The water is then aerated through spray nozzles. These two processes oxidise naturally occurring iron and manganese, turning them from their 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 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.





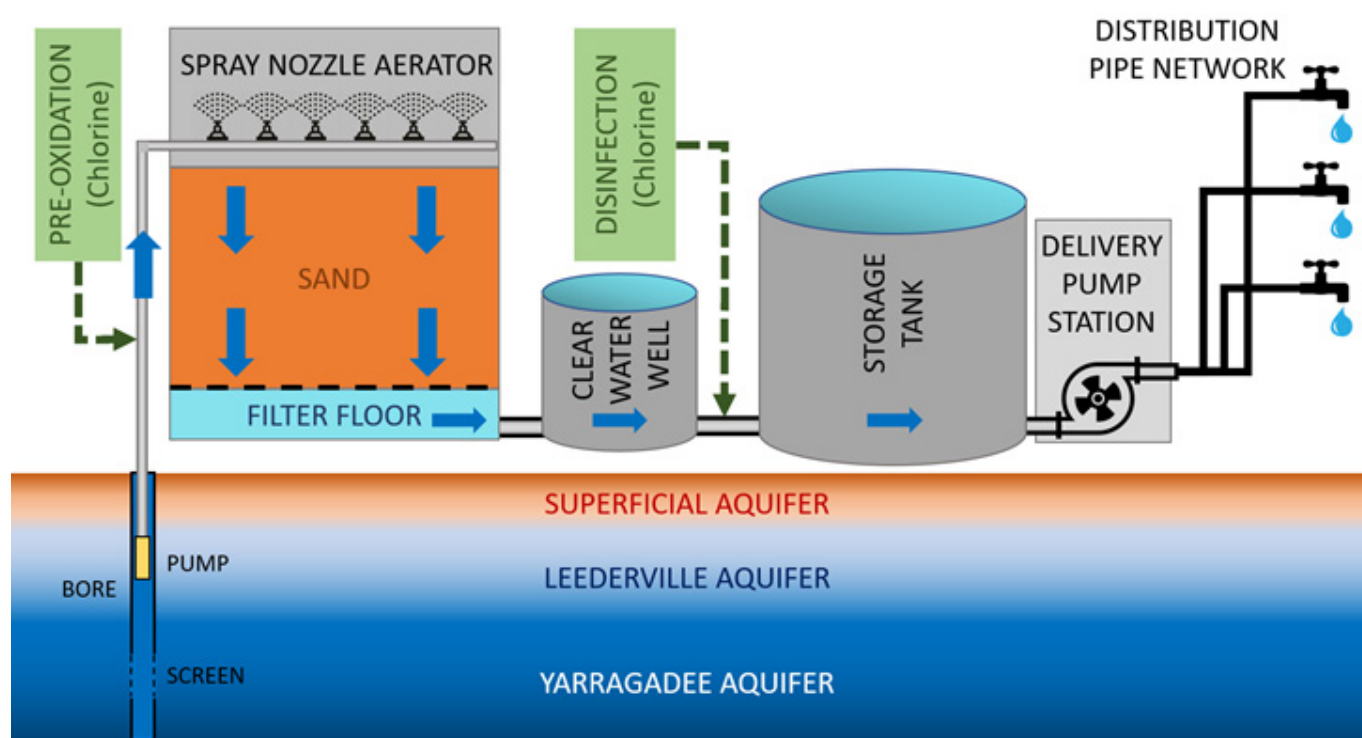
## Our Water Treatment Plants

Busselton Water operates three water treatment plants (Plant 1, Plant 2 and Plant 3).

Chlorine disinfection occurs at each treatment plant to keep the concentration of chlorine in the distribution system at or above 0.4 mg/L to ensure adequate protection against Thermophilic *Naegleria* and other microbiological threats. There is also a chlorine disinfection plant located in the distribution network on the trunk main to the Busselton Airport. The ADWG set 5 mg/L of chlorine as the upper acceptable limit.

For further detail please refer to the Chemical Health results section on page 14.

Note: Busselton Water does not add fluoride to its drinking water.



## 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. (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.

### DISTRIBUTION NETWORK COMPONENTS

Estimated population	Approx. 28,000
Total number of connections	13,886
Total length of pipes	341.5 km
Number of storage tanks	5
Chlorine residual target	0.4 to 0.6 mg/L
Number of water quality localities	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

### Business Continuity

In March 2021 a Water Quality mock event was held with Department of Health participation, which identified some minor improvements including better preparation for incident status communication to stakeholders.



### Water Quality Monitoring and Testing

Busselton Water has a comprehensive water quality 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 17 water quality complaints during 2020-21, with seven relating to taste and odour, eight relating to discoloured water, and two relating to other issues. This equates to 1.8 complaints per 1,000 properties.

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 Health and Disinfection Results

Busselton Water collected 364 samples from the reticulation system for formal assessment 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 1,244 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 (i.e., every two years). Gross alpha and gross beta were tested in April 2020 and results from these samples were 100 per cent compliant. Radiological testing is next scheduled to be undertaken in April 2022.

## 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 0.6 mg/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 0.4 mg/L throughout the distribution system. During the year, Busselton Water collected a total of 1,608 chlorine samples in the distribution network. The minimum free chlorine level was 0.23 mg/L (at Busselton Airport which is slowly establishing consistent flows), and the maximum was 0.81 mg/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.

## Visibility of Water Quality Information

Busselton Water understands the importance of holistic catchment to tap risk management processes that focus on the capabilities and resilience of the entire system, not just reactive measures of quality at the point of supply. As a simple example, the “Ten Commandments for Safe Drinking Water” (after Hrudey & Hrudey 2014)<sup>5</sup> is on display at the operational depot as a reminder to staff.



5 Hrudey S E, Hrudey E J, [Ten Commandments For Safe Drinking Water](#) Canadian Water Network 2020, and American Water and Wastewater Association, 2014

# WATER QUALITY RESULTS

In the period 1 July 2020 to 30 June 2021, there were no water quality incidents reportable to the Department of Health.

Busselton Water collected 364 free chlorine samples during 2020-21 for formal assessment of our water’s chemical health characteristics. An additional 1,244 chlorine (free and total) samples were taken in the distribution network during 2020-21 to manage the disinfection performance achieved within the pipe network. The minimum, average and maximum levels of these additional operational samples were:

CHLORINE SAMPLES – 1 JULY 2020 TO 30 JUNE 2021			
TYPE	Minimum mg/L	Average mg/L	Maximum mg/L
Distributed Chlorine (Free)	0.23	0.52	0.81
Distributed Chlorine (Total)	0.23	0.57	0.78

MICROBIOLOGICAL SAMPLES – 1 JULY 2020 TO 30 JUNE 2021										
CHARACTERISTIC	UNIT	ADWG limit	Number of samples		Total no. of samples (treated + distribution)	Maximum value		Number of non-compliance with ADWG limit		Distribution water Compliance  %
			Treated water (non- assessable)	Distribution water (assessable)		Treated water (non- assessable)	Distribution water (assessable)	Treated water (non- assessable)	Distribution water (assessable)	
<i>Escherichia coli</i>	CFU/ 100mL	0	256	364	620	0	0	0	0	100%
Thermophilic <i>Naegleria</i>	org/ 250mL	ND	256	364	620	ND	ND	0	0	100%
<i>Naegleria fowleri</i>	org/ 250mL	ND	0	0	0	-	-	0	0	100%

CFU = colony forming units



WATER QUALITY RESULTS

Memorandum of Understanding – Drinking Water Quality Report

CHEMICAL HEALTH – 1 JULY 2020 TO 30 JUNE 2021											
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples		Total No. of Samples (Raw + Distribution)	Maximum Value		Number of Non-compliance with ADWG limit		Compliance % Distribution Water
				Raw Water	Distribution Water		Raw Water	Distribution Water	Raw Water	Distribution Water	
Antimony	mg/L	0.003	0.001	NR	16	16	NR	ND	NR	0	100
Arsenic	mg/L	0.01	0.001	NR	16	16	NR	ND	NR	0	100
Barium	mg/L	2	0.01	NR	16	16	NR	0.32	NR	0	100
Beryllium	mg/L	0.06	0.01	NR	16	16	NR	ND	NR	0	100
Boron	mg/L	4	0.05	NR	16	16	NR	0.28	NR	0	100
Bromodichloromethane	mg/L	0.25*	0.001	NR	12	12	NR	ND	NR	0	100
Bromoform	mg/L	0.25*	0.001	NR	12	12	NR	0.009	NR	0	100
Cadmium	mg/L	0.002	0.0001	NR	16	16	NR	ND	NR	0	100
Chlorine (Total)	mg/L	5		NR	364	364	NR	0.78	NR	0	100
Chloroform	mg/L	0.25*	0.001	NR	12	12	NR	ND	NR	0	100
Copper	mg/L	2	0.001	NR	16	16	NR	0.027	NR	0	100
Dibromochloromethane	mg/L	0.25*	0.001	NR	12	12	NR	0.003	NR	0	100
Fluoride	mg/L	1.5	0.1	NR	84	84	NR	0.8	NR	0	100
Lead	mg/L	0.01	0.001	NR	16	16	NR	ND	NR	0	100
Manganese (Soluble)	mg/L	0.5	0.01	92	84	176	0.2	ND	0	0	100
Manganese (Total)	mg/L	0.5	0.01	92	84	176	0.23	0.02	0	0	100
Mercury	mg/L	0.001	0.0001	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	31	NR	31	0.53	NR	0	NR	100
Nitrite	mg/L	3	0.05	31	NR	31	0.27	NR	0	NR	100
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*	0.001	NR	12	12	NR	0.011	NR	0	100
Uranium	mg/L	0.017	0.001	NR	16	16	NR	ND	NR	0	100
<b>TOTAL</b>				<b>246</b>	<b>900</b>	<b>1139</b>			<b>0</b>	<b>0</b>	<b>100%</b>

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 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non-compliance with ADWG limit	Compliance %
Acid Herbicides							
Dicamba	µg/L	100	0.1	5	ND	0	100%
MCPA	µg/L	40	0.1	5	ND	0	100%
2,4-D	µg/L	200	0.1	5	ND	0	100%
2,4,5-T	µg/L	100	0.1	5	ND	0	100%
2,4,6-T	µg/L	20	0.1	5	ND	0	100%
Picloram	µg/L	300	0.2	5	ND	0	100%
Fluazifop	µg/L	No data	0.4	5	ND	0	100%
Clopyralid	µg/L	2000	0.4	5	ND	0	100%
Metsulfuron Methyl	µg/L	40	0.5	5	ND	0	100%
Triclopyr	µg/L	20	0.1	5	ND	0	100%
Flamprop methyl	µg/L	4	0.2	5	ND	0	100%
Bromoxynil	µg/L	10	1	5	ND	0	100%
Base Neutral Pesticides (BNP)							
Diuron	µg/L	20	0.5	5	ND	0	100%
Molinate	µg/L	4	0.1	5	ND	0	100%
Fluometuron	µg/L	70	0.1	5	ND	0	100%
Trifluralin	µg/L	90	0.1	5	ND	0	100%
Dimethoate	ug/L	7	0.1	5	ND	0	100%
Simazine	µg/L	20	0.1	5	ND	0	100%
Atrazine	µg/L	20	0.1	5	ND	0	100%
Propazine	µg/L	50	0.1	5	ND	0	100%
Prometryn	µg/L	No data	0.1	5	ND	0	100%
Terbutryn	µg/L	400	0.1	5	ND	0	100%
Fenitrothion	µg/L	7	0.1	5	ND	0	100%
Chlorpyrifos	ug/L	10	0.1	5	ND	0	100%
Endosulfan I	µg/L	20	0.1	5	ND	0	100%
Fenamiphos	µg/L	0.5	0.1	5	ND	0	100%
Endosulfan II	µg/L	20	0.1	5	ND	0	100%
Endosulfan Sulfate	µg/L	No data	0.1	5	ND	0	100%
Diclofop Methyl	µg/L	5	0.1	5	ND	0	100%
Amitraz	µg/L	9	0.1	5	ND	0	100%
Tebuconazole	µg/L	No data	0.4	5	ND	0	100%
Metolachlor	µg/L	300	0.2	5	ND	0	100%
Hexazinone	µg/L	400	0.4	5	ND	0	100%
Myclobutanil	µg/L	No data	0.4	5	ND	0	100%
Azinphos Methyl	ug/L	30	1	5	ND	0	100%
Propiconazole	µg/L	100	0.4	5	ND	0	100%
Dichlorvos	ug/L	5	0.1	5	ND	0	100%

WATER QUALITY RESULTS

CHEMICAL HEALTH – PESTICIDES – 1 JULY 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non-compliance with ADWG limit	Compliance %
Chlorfenvinphos	µg/L	2	0.2	5	ND	0	100%
Methidathion	µg/L	6	0.1	5	ND	0	100%
Mevinphos	µg/L	5	0.4	5	ND	0	100%
Metribuzin	µg/L	70	0.5	5	ND	0	100%
Terbutylazine	µg/L	10	0.1	5	ND	0	100%
Dichlobenil	µg/L	10	0.1	5	ND	0	100%
Fenarimol	µg/L	40	0.5	5	ND	0	100%
Propyzamide	µg/L	70	0.1	5	ND	0	100%
Napropamide	µg/L	400	0.2	5	ND	0	100%
Triadimefon	µg/L	90	1	5	ND	0	100%
Etridiazole	µg/L	100	0.2	5	ND	0	100%
Vernolate	µg/L	40	0.2	5	ND	0	100%
Pendimethalin	µg/L	400	0.4	5	ND	0	100%
Pirimiphos methyl	µg/L	90	0.1	5	ND	0	100%
Propargite	µg/L	7	0.3	5	ND	0	100%
Organochlorine Pesticides							
Aldrin	µg/L	0.3	0.001	5	ND	0	100%
alpha-BHC (HCH)	µg/L	No data	0.001	5	ND	0	100%
beta-BHC (HCH)	µg/L	No data	0.001	5	ND	0	100%
delta-BHC (HCH)	µg/L	No data	0.001	5	ND	0	100%
Bifenthrin	µg/L	No data	0.05	5	ND	0	100%
Bromophos Ethyl	µg/L	10	0.005	5	ND	0	100%
Chlordane	µg/L	2	0.002	5	ND	0	100%
Chlorothalonil	µg/L	50	0.01	5	ND	0	100%
Chlorpyrifos	µg/L	10	0.005	5	ND	0	100%
Diazinon	ug/L	4	0.01	5	ND	0	100%
Dieldrin	µg/L	0.3	0.001	5	ND	0	100%
Endosulfan I	µg/L	20	0.001	5	ND	0	100%
Endosulfan II	µg/L	20	0.001	5	ND	0	100%
Endosulfan Sulfate	µg/L	20	0.001	5	ND	0	100%
Endrin	µg/L	No data	0.01	5	ND	0	100%
Ethion	ug/L	4	0.01	5	ND	0	100%
Fenitrothion	µg/L	7	0.01	5	ND	0	100%
Fipronil	µg/L	0.7	0.02	5	ND	0	100%
Hexachlorobenzene (HCB)	µg/L	No data	0.001	5	ND	0	100%
Heptachlor Epoxide	µg/L	No data	0.001	5	ND	0	100%
Heptachlor	µg/L	0.3	0.001	5	ND	0	100%
Lindane	µg/L	10	0.001	5	ND	0	100%
Malathion	µg/L	70	0.01	5	ND	0	100%
Methoxychlor	µg/L	30	0.02	5	ND	0	100%
o,p-DDT	µg/L	9	0.001	5	ND	0	100%

WATER QUALITY RESULTS

CHEMICAL HEALTH – PESTICIDES – 1 JULY 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non-compliance with ADWG limit	Compliance %
Oxychlordane	µg/L	No data	0.001	5	ND	0	100%
p,p-DDD	µg/L	No data	0.001	5	ND	0	100%
p,p-DDE	µg/L	No data	0.001	5	ND	0	100%
p,p-DDT	µg/L	9	0.001	5	ND	0	100%
Parathion Ethyl	µg/L	20	0.02	5	ND	0	100%
Parathion Methyl	µg/L	1	0.02	5	ND	0	100%
Trifluralin	µg/L	90	0.01	5	ND	0	100%
Vinclozolin	µg/L	No data	0.02	5	ND	0	100%
TOTAL				420		0	100%

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

# WATER QUALITY RESULTS

CHEMICAL HEALTH – 1 JULY 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non-compliance with ADWG limit	Compliance %
Storage Tanks							
Plasticisers in Water							
Dimethyl phthalate	ug/L	No data	1	5	ND	0	100%
Diethyl phthalate	ug/L	No data	1	5	ND	0	100%
Dibutyl phthalate	ug/L	No data	1	5	ND	0	100%
Benzyl butyl phthalate	ug/L	No data	1	5	ND	0	100%
Di(2-ethylhexyl) adipate	ug/L	10	1	5	ND	0	100%
Di(2-ethylhexyl) phthalate	ug/L	10	1	5	ND	0	100%
Di-n-Octyl phthalate	ug/L	No data	1	5	ND	0	100%
Volatile Organic Carbon in Water							
1,3-Dichloropropene	µg/L	100	1	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%
DCM	µg/L	No data	5	5	ND	0	100%
Ethylbenzene	µg/L	300	0.5	5	ND	0	100%
Hexachlorobutadiene	µg/L	0.7	0.5	5	ND	0	100%
Methyl tert Butyl Ether	µg/L	No data	0.5	5	ND	0	100%
Styrene	µg/L	4	0.5	5	ND	0	100%
Perchloroethene (PCE)	µg/L	No data	0.5	5	ND	0	100%
Toluene	µg/L	800	0.5	5	ND	0	100%
Trichloroethylene (TCE)	µg/L	No data	0.5	5	ND	0	100%
Vinyl Chloride	µg/L	0.3	0.2	5	ND	0	100%
Xylenes (Total)	µg/L	600	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	2	5	ND	0	100%
1,1,1-Trichloroethane	µg/L	No data	0.5	5	ND	0	100%
1,1,1,2-Tetrachloroethane	µg/L	No data	0.5	5	ND	0	100%
1,1,2,2-Tetrachloroethane	µg/L	No data	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	0.5	5	ND	0	100%
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%
1,3,5-Trichlorobenzene	µg/L	30	0.5	5	ND	0	100%
Synthetic Pyrethroids in Water							
Alphamethrin	µg/L	No data	0.05	5	ND	0	100%



# WATER QUALITY RESULTS

CHEMICAL HEALTH – 1 JULY 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non-compliance with ADWG limit	Compliance %
Storage Tanks							
Cyfluthrin	µg/L	50	0.05	5	ND	0	100%
Cyhalothrin	µg/L	No data	0.05	5	ND	0	100%
Cypermethrin	µg/L	200	0.05	5	ND	0	100%
Deltamethrin	µg/L	40	1	5	ND	0	100%
Fenvalerate	µg/L	60	0.05	5	ND	0	100%
Permethrin	µg/L	200	0.05	5	ND	0	100%
Carbamates in Water							
Aminocarb	µg/L	No data	1	5	ND	0	100%
Aldicarb Sulfoxide	µg/L	No data	1	5	ND	0	100%
Carbendazim	µg/L	90	1	5	ND	0	100%
Oxamyl	µg/L	7	2	5	ND	0	100%
Aldicarb Sulfone	µg/L	No data	1	5	ND	0	100%
Methomyl	µg/L	20	2	5	ND	0	100%
Fenuron/Fenuron TCA	µg/L	No data	2	5	ND	0	100%
Aldicarb	µg/L	4	1	5	ND	0	100%
Bromacil	µg/L	400	2	5	ND	0	100%
Mexacarbate	µg/L	No data	1	5	ND	0	100%
Monuron/Monuron TCA	µg/L	No data	2	5	ND	0	100%
Propoxur	µg/L	No data	1	5	ND	0	100%
Carbofuran	µg/L	10	1	5	ND	0	100%
Fluometuron	µg/L	70	1	5	ND	0	100%
Carbaryl	µg/L	30	4	5	ND	0	100%
Diuron	µg/L	20	0.5	5	ND	0	100%
Propachlor	µg/L	70	1	5	ND	0	100%
Propham	µg/L	No data	5	5	ND	0	100%
Siduron	µg/L	No data	1	5	ND	0	100%
Methiocarb	µg/L	7	4	5	ND	0	100%
Linuron	µg/L	No data	5	5	ND	0	100%
EPTC	µg/L	300	5	5	ND	0	100%
Paraquat, Diquat, Amitrole in Water							
Paraquat	µg/L	20	1	5	ND	0	100%
Diquat	µg/L	7	1	5	ND	0	100%
Amitrole	µg/L	0.9	0.9	5	ND	0	100%
Organotins in Water							
Tributyl tin	ngSn/L	1	2	5	ND	0	100%
Monobutyl tin	ngSn/L	No data	5	5	ND	0	100%
Dibutyl tin	ngSn/L	No data	5	5	ND	0	100%

WATER QUALITY RESULTS

CHEMICAL HEALTH – 1 JULY 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non- compliance with ADWG limit	Compliance %
Storage Tanks							
Miscellaneous Organics in Water							
Dalapon	µg/L	No data	2	5	ND	0	100%
Glyphosate	µg/L	No data	1	5	ND	0	100%
Ethylenediaminetetraacetic acid (EDTA)	µg/L	250	20	5	ND	0	100%
Nitrilotriacetic acid (NTA)	µg/L	200	20	5	ND	0	100%
Acrylamide	µg/L	0.2	0.1	5	ND	0	100%
Temephos	µg/L	400	25	5	ND	0	100%
Metals in Water							
Silver - Dissolved	µg/L	100	0.01	5	ND	0	100%
Tin - Dissolved	µg/L	No data	0.01	5	ND	0	100%
Iodide	µg/L	500	0.01	5	ND	0	100%

µg/L    micrograms per litre  
ng/L    nanograms per litre  
ND      Not Detected

## WATER QUALITY RESULTS

CHEMICAL HEALTH – 1 JULY 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non- compliance with ADWG limit	Compliance %
Distribution Network							
Haloacetic Acids in Water							
Chloroacetic acid	ug/L	No data	2	1	ND	0	100%
Dichloroacetic acid	ug/L	100	2	1	ND	0	100%
Trichloroacetic acid	ug/L	100	2	1	ND	0	100%
Nitrosamines in Water							
N-Nitrosodimethylamine	ng/L	100	5	1	ND	0	100%
Miscellaneous Organics in Water							
Bromochloroacetonitrile	ug/L	No data	0.1	1	ND	0	100%
Chloral Hydrate	ug/L	100	2	1	ND	0	100%
Chloropicrin	ug/L	No data	1	1	ND	0	100%
Dibromoacetonitrile	ug/L	No data	0.1	1	ND	0	100%
Dichloroacetonitrile	ug/L	No data	0.1	1	ND	0	100%
Monochloroacetonitrile	ug/L	No data	0.1	1	ND	0	100%
Trichloroacetonitrile	ug/L	No data	0.1	1	ND	0	100%
1,1-Dichloro-2-propanone	ug/L	No data	0.1	1	ND	0	100%
1,1,1-Trichloro-2-propanone	ug/L	No data	0.1	1	ND	0	100%
1,3-Dichloro-2-propanone	ug/L	No data	0.1	1	ND	0	100%
1,1,3-Trichloro-2-propanone	ug/L	No data	0.1	1	ND	0	100%
Low Level PAH in Water							
Benzo(a)pyrene	ug/L	0.01	0.01	1	ND	0	100%
Metals in Water							
Antimony - Dissolved	mg/L	0.003	0.001	1	ND	0	100%
Cadmium - Dissolved	mg/L	0.002	0.0001	1	ND	0	100%
Copper - Dissolved	mg/L	2	0.001	1	ND	0	100%
Chromium (VI)	mg/L	0.05	0.002	1	ND	0	100%
Lanthanum - Dissolved	mg/L	0.002	0.001	7	ND	0	100%
Lead - Dissolved	mg/L	0.01	0.001	1	ND	0	100%
Nickel - Dissolved	mg/L	0.02	0.001	1	ND	0	100%
Zinc - Dissolved	mg/L	3	0.005	1	ND	0	100%
Asbestos Fibres in Water							
Asbestos Fibres	Mf/L	No data	0.2	1	ND	0	100%

WATER QUALITY RESULTS

CHEMICAL HEALTH – 1 JULY 2020 TO 30 JUNE 2021							
CHARACTERISTIC	UNIT	ADWG LIMIT (Health)	Lab Limit of Reporting (LOR)	Number of Samples	Maximum Value	Number of Non-compliance with ADWG limit	Compliance %
Distribution Network							
Miscellaneous Inorganics in Water							
Bromide	mg/L	0.001	0.1	7	0.9	0	100%
Bromate	mg/L	0.02	0.005	7	ND	0	100%
Hydrogen Sulfide	mg/L	No data	0.05	1	ND	0	100%
Cyanide - Total	mg/L	0.08	0.005	1	ND	0	100%
TOTAL				444		0	100%

mg/L    milligrams per litre  
µg/L    micrograms per litre  
Mf/L    million fibres per litre  
mS/cm    MilliSiemens per centimetre  
ngSn/L    nanograms per litre  
ND    Not Detected

WATER QUALITY RESULTS

CHEMICAL NON-HEALTH (AESTHETIC) SAMPLES – 1 JULY 2020 – 30 JUNE 2021											
CHARACTERISTIC	UNIT	ADWG LIMIT (non-health)	Lab Limit of Reporting (LOR)	Number of Samples		Total No. of Samples (Raw + Distribution)	Maximum Value		Number of Non-compliance with ADWG Limit		Distribution Water Compliance %
				Raw Water	Distribution Water		Raw Water	Distribution Water	Raw Water	Distribution Water	
Alkalinity (Bicarbonate)	mg CaCO3/L	-	5	0	0	0	180	180	0	0	100%
Alkalinity (Carbonate)	mg CaCO3/L	-	5	0	0	0	ND	ND	0	0	100%
Alkalinity (Hydroxide)	mg CaCO3/L	-	5	0	0	0	ND	ND	0	0	100%
Alkalinity (Total)	mg CaCO3/L	-	5	0	0	0	180	180	0	0	100%
Aluminium (Soluble)	mg/L	0.2	0.1	0	0	0	ND	ND	0	0	100%
Aluminium (Total)	mg/L	0.2	0.1	0	0	0	0.02	0.02	0	0	100%
Ammonia	mg/L	0.5	0.005	NR	0	0	NR	0.02	NR	0	100%
Calcium	mg/L	200	0.1	NR	0	0	NR	38	NR	0	100%
Chloride	mg/L	250	5	0	NR	0	150	NR	0	NR	100%
Colour True	HU	15	5	0	0	0	19	8	1	0	100%
Electrical Conductivity	uS/cm	-	10	0	0	0	900	690	0	0	100%
Filterable Reactive Phosphorus	mg/L	-	0.01	0	NR	0	0.28	NR	0	NR	100%
Filterable Reactive Phosphorus as PO4	mg/L	-	0.05	0	NR	0	0.86	NR	0	NR	100%
Hardness (as CaCO3)	mg/L	200	5	0	0	0	180	160	0	0	100%
Iron (Soluble)	mg/L	0.3	0.01	0	0	0	0.4	ND	2	0	100%
Iron (Total)	mg/L	0.3	0.01	0	0	0	9.3	0.06	66	0	100%
Magnesium	mg/L	-	0.1	NR	0	0	NR	19	NR	0	100%
pH	pH	6.5-8.5		0	0	0	7.9	8.5	0	0	100%
Salinity (as Total Dissolved Solids)	mg/L	600	5	0	NR	0	570	NR	0	NR	100%
Silica	mg/L	80	0.1	0	NR	0	17	NR	0	NR	100%
Sodium	mg/L	180	0.1	0	NR	0	130	NR	0	NR	100%
Sulfate	mg/L	250	1	0	NR	0	21	NR	0	NR	100%
Total Hardness by Calculation	mg/L	200	5	0	0	0	180	160	0	0	100%
Turbidity	NTU	5	0	0	0	0	1.68	0.43	0	0	100%
Zinc	mg/L	3	0.01	NR	0	0	NR	0.007	NR	0	100%
	TOTAL			0	0	0			69	0	100%

Note 1:

- HU

Hazen Units
- NTU

Nephelometric Turbidity Units
- mg/L

milligrams per litre
- mg CaCO3/L

milligrams per litre as calcium carbonate
- uS/cm

microsiemens per centimetre
- 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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