BUSSELTON WATER

ANNUAL **WATER QUALITY** REPORT

2019-20

busseltonwater.wa.gov.au

BUSSELTON WATER

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MESSAGE FROM THE MANAGING DIRECTOR

It is with pleasure that I present Busselton Water's Annual Water Quality Report for 2019-20.

Our commitment to provide drinking water of the highest quality for our local community is resolute – it is underpinned by our compliance with health related and non-health related water quality criteria in the *Australian Drinking Water Guidelines* (ADWG) and reinforced through our Memorandum of Understanding (MoU) with the Department of Health.

I am pleased that in 2019-20, Busselton Water continued to achieve exceptional water quality results.

This report presents these results and our performance against the ADWG, and also describes the processes we use to collect, treat and distribute drinking water to our customers.

I would like to thank all of those who have contributed to this year's excellent outcomes, particularly Busselton Water's team, representatives from the Department of Health, and the many contracted companies that support the delivery of our services.

Chris Elliott
Managing Director

2019-20 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 ADWG except for the 0.6mg/L aesthetic guideline value for chlorine concentration. This aesthetic guideline value is exceeded to ensure the microbiological safety of our water supply.

OUR COMMITMENT

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:

- endorse and embrace the ADWG, including those guidelines relating to the protection of catchments and sources;
- fulfil all of the requirements of our Operating Licence and MoU[1] with the Department of Health;
- maintain and implement a Drinking Water Quality Management System consistent with the 12 elements of the ADWG Framework, as outlined below;
- 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[2] which are considered best practice, with these elements 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 all elements.

In addition, our Operating Licence, which is issued by the Economic Regulation Authority, incorporates our MoU 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 and the Department of Health executed a revised MoU in December 2019.

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

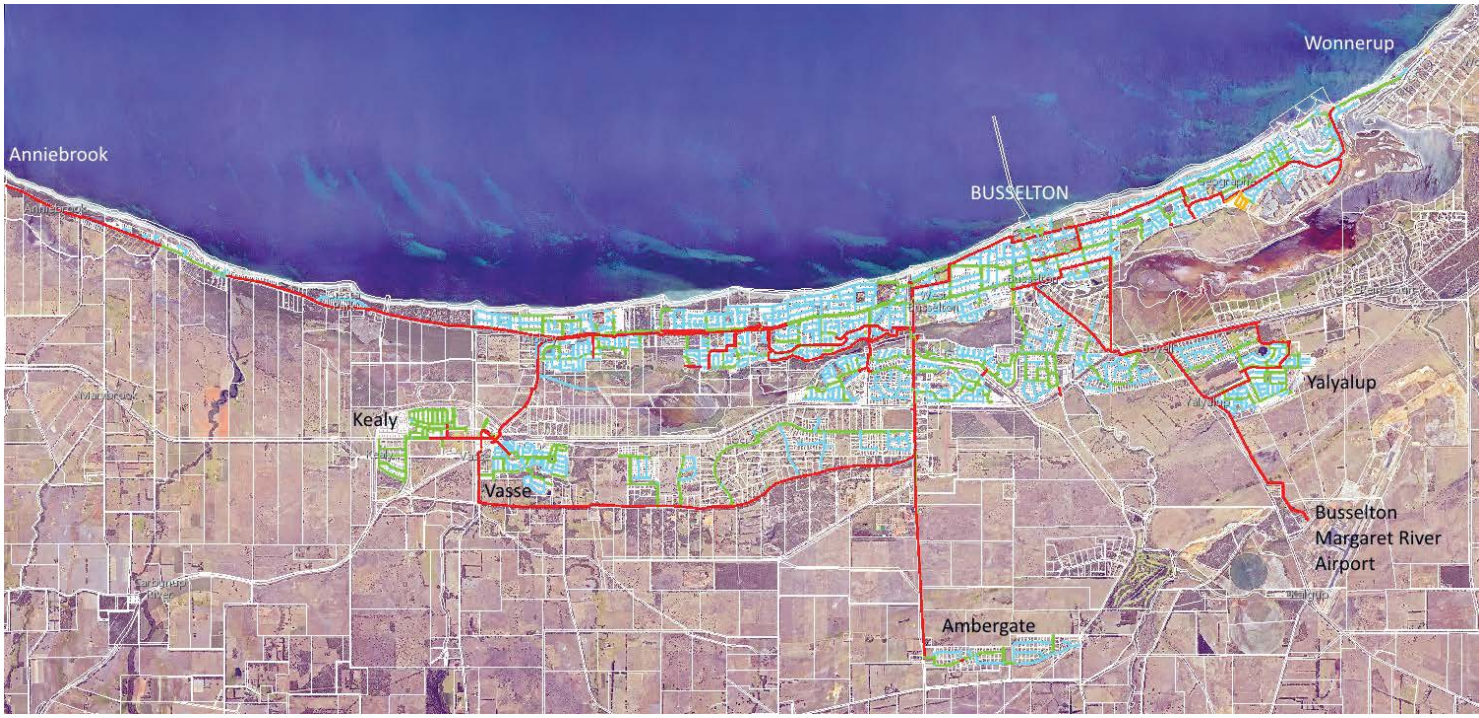
Busselton Water is also a member of Western Australia's Advisory Committee for the Purity of Water[3].

1 A copy of the Memorandum of Understanding with the Department of Health is available on the Busselton Water website.

2 The "Australian Drinking Water Guidelines" published by the National Health and Medical Research Council, Australia's peak health research body, which 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.

3 More information on the Advisory Committee for the Purity of Water can be found at https://ww2.health.wa.gov.au/Articles/A_E /Advisory-Committee-for-the-Purity-of-Water.

OUR GEOGRAPHIC COVERAGE



Our business

Busselton Water is a local water provider in Busselton, a major regional centre located 220 kilometres south of Perth.

We share a long and proud history with our community, forged from over a century of service to our customers. As one of Western Australia's busiest regional water providers, we service a local population of more than 28,000 people and up to 50,000 people during peak periods, as well as provide bulk water supplies to the neighbouring town of Dunsborough.

Our drinking water service area covers 81,200 hectares in and around Busselton, as detailed above. The red, green and blue lines depict our 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 7) authorises our business to provide potable water supply services to an area of approximately 688,700 hectares.

A map of our Operating Licence Area can be viewed on the Economic Regulation Authority website.[4]

4 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 and confined Yarragadee aquifer. There is also 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.

Health, safety and wellbeing

Busselton Water, in conjunction with DWER, developed the Busselton Water Reserves Drinking Water Source Protection Plan (Report WRP 139), released by the then Department of Water in August 2013. The Plan defines the boundaries of Busselton Water's Water Reserve and assigns a Priority 1 to these reserves. This ensures 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, which stipulates annual extraction entitlement limits, licence conditions, and compliance requirements. Busselton Water's consultant hydrogeologist (Rockwater Pty Ltd) reviews this document, and also implements our borefield construction and maintenance plan, including monitoring and reporting requirements, to ensure future operational strategies are sustainable.

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

Financial Year	Extraction (GL)
2008-09	4.49
2009-10	4.23
2010-11	4.30
2011-12	4.30
2012-13	4.59
2013-14	5.05
2014-15	5.18
2015-16	5.38
2016-17	5.15
2017-18	5.35
2018-19	5.41
2019-20	5.60

GL = Gigalitre = one billion litres

Understanding water quality

Measure	Definition	Guidelines
Turbidity	Turbidity is the cloudy appearance of water caused by the presence of suspended matter.	The Australian Drinking Water Guidelines specifies 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 recommends 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 milligrams per litre.	The Australian Drinking Water Guidelines recommends that, based on aesthetic considerations, the levels of manganese should not exceed 0.1 milligrams per litre.
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 milligrams per litre 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 *Escherichia coli* (*E. coli*) as an indicator of microbial contamination. Thermophilic *Naegleria* refers to a group of amoebae which includes *Naegleria fowleri*, the organism that causes the waterborne disease primary amoebic meningoencephalitis. *Naegleria fowleri* is an environmental pathogen which naturally lives in fresh warm water.	The Australian Drinking Water Guidelines states that thermotolerant coliforms/E. coli should not be present in a minimum 100mL sample of drinking water. The Department of Health has notification protocols in place regarding *Naegleria*. Busselton Water is required to immediately notify the Department of Health if *Naegleria* is detected in any microbiological sample.
Radiological	There are natural levels of radiation within the environment. 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 Australian Drinking Water Guidelines recommends a screening level of 0.5 Becquerels per Litre (Bq/L).
pH	pH is the measure of free hydrogen ion concentrations in the water – how acidic or alkaline water is. The range extends from 0 to 14, with 7 being neutral.	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 oxidising 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

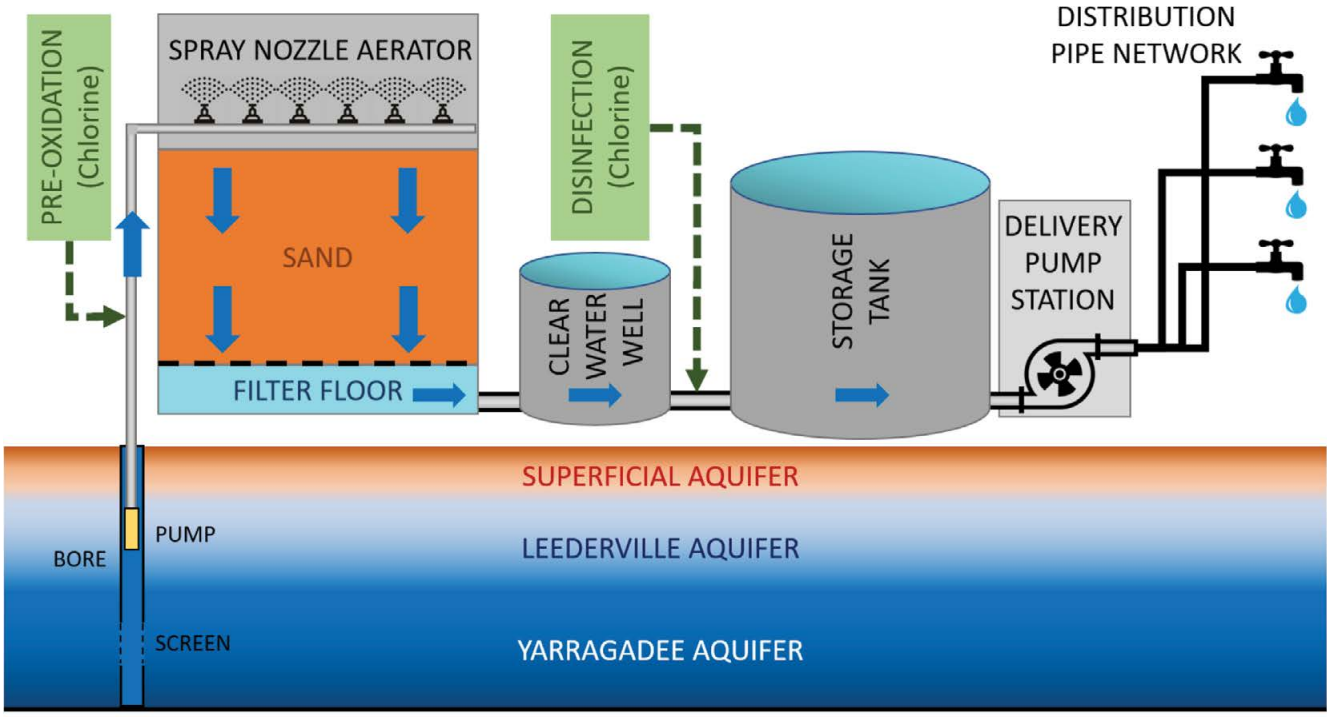
The pre-chlorinated and aerated water is then filtered through sand filters to remove the iron, manganese, turbidity and other impurities. The filtered water is then collected in a clear-water well.

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.

The entire water supply process is shown schematically overleaf.

Water Treatment and Supply Process



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 0.4 milligrams per litre to ensure adequate protection against thermophilic *Naegleria* and other microbiological threats.

The ADWG sets 5 milligrams per litre of chlorine as the upper acceptable limit.

For further detail please refer to the non-health (aesthetic) results section on page 21.

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	335 kilometres
Number of storage tanks	5
Chlorine residual target	0.4-0.6 milligrams per litre
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 requires 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;
- water 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.

There were no water quality incidents reportable to the Department of Health in 2019-20.

Operation of the Busselton water system continued without impact during the period of COVID-19 social distancing restrictions. Busselton Water did not conduct a mock incident scenario in 2019-20 due to intrastate travel and meeting size constraints during COVID-19.

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.

ARL Group commenced water laboratory testing services for Busselton Water on 1 July 2019 for a period of three years, with a potential extension of contract of up to two years. The company was selected using a competitive tendering process.

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, comprising 70 per cent experiential learning, 20 per cent mentorship of employee learning (including development planning), and 10 per cent approved class-based training. This approach allocates significant time to experiential learning and delivers better employee development and business outcomes.

Busselton Water personnel also regularly attend relevant training courses and/or conferences as part of their professional development.

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 customer satisfaction levels. With Busselton Water Customer Advisory Group meetings impacted in 2019-20 by COVID-19 (allowing only one of the two scheduled meetings to be held), online engagement was increased to continue to facilitate feedback from this group.

Water quality complaints remain at a very low level. Busselton Water received 25 water quality complaints during 2019-20, with nine relating to taste and odour, eight relating to discoloured water, and eight 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 371 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 1,244 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 of these requirements. The report in the next section gives more detail on the individual parameters.

In the 2018-19 year, Busselton Water tested the drinking water system for the presence of per- and poly-fluoroalkyl substances commonly referred to as PFAS or PFOS. The testing was conducted due to PFAS/PFOS being identified as a contaminant in the superficial aquifer in a small zone adjacent to the Busselton waste disposal site.

Busselton Water's testing confirmed that per- and poly-fluoroalkyl substances were not present in the confined groundwater aquifers used for the drinking water supply. Testing for these substances was not repeated in 2019-20 as the drinking water bores draw from aquifers that remain confined and protected from surface contamination.

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 with non-health (aesthetic) requirements of the ADWG.

Busselton Water uses chlorine to provide a disinfectant residual in the water distribution system, 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 guideline value for chlorine is 0.6 milligrams per litre. The ADWG also states 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 milligrams per litre throughout the distribution system. During the year, Busselton Water collected 1,244 chlorine samples in the distribution network. The minimum total chlorine level was 0.21 milligrams per litre (in a new street slowly establishing consistent flows) and the maximum was 0.92 milligrams per litre.

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 2019 to 30 June 2020, there were no water quality incidents reportable to the Department of Health.

Chlorine samples – 1 July 2019 to 30 June 2020

Busselton Water collected 175 total chlorine samples during 2019-20 for assessment. An additional 1,244 total chlorine samples were taken in the distribution network during 2019-20 to manage the disinfection performance achieved within the pipe network. The minimum, average and maximum levels of these additional operational samples were:

Type	Minimum mg/L	Average mg/L	Maximum mg/L
Distributed Chlorine (Total)	0.21	0.54	0.92

Microbiological samples – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit	Number of samples		Total number 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)	%
Escherichia coli	CFU/100mL	0	261	371	632	0	0	0	0	100
Thermophilic *Naegleria*	org/250mL	ND	261	371	632	ND	ND	0	0	100
Naegleria fowleri	org/250mL	ND	0	0	0	-	-	0	0	100

ND = Not Detected
CFU = Colony Forming Units

Radiological samples – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG (health) limit	Raw water (bores)				Treated water (storage tanks)			
			Non-compliance (health)	Number of samples	Compliance (health) %	Maximum detected Bq/L	Non-compliance (health)	Number of samples	Compliance (health) %	Maximum detected Bq/L
Gross alpha	Bq/L	0.5	0	7	100	0.13	0	5	100	0.14
Gross beta	Bq/L	0.5	0	7	100	0.16	0	5	100	0.26

Bq/L = Becquerels per litre

Memorandum of Understanding – Drinking Water Quality Report

Chemical Health – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit (health)	Lab Limit of Reporting (LOR)	Number of samples		Total number 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	%
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	0.33	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	0.23	NR	0	100
Bromate	mg/L	0.02	0.005	NR	7	7	NR	ND	NR	0	100
Bromide	mg/L	-	0.05	NR	7	7	NR	ND	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	0.007	NR	0	100
Cadmium	mg/L	0.002	0.0001	NR	16	16	NR	ND	NR	0	100
Chlorine (Total)	mg/L	5		NR	175	175	NR	0.77	NR	0	100
Chloroform	mg/L	0.25*	0.001	NR	12	12	NR	0.006	NR	0	100
Copper	mg/L	2	0.01	NR	16	16	NR	0.008	NR	0	100
Dibromochloromethane	mg/L	0.25*	0.001	NR	12	12	NR	0.002	NR	0	100
Fluoride[1]	mg/L	1.5	0.1	NR	84	84	NR	0.6	NR	0	100
Lanthanum	mg/L	0.002	0.001	NR	7	7	NR	ND	NR	0	100
Lead	mg/L	0.01	0.001	NR	16	16	NR	ND	NR	0	100
Manganese (Soluble)	mg/L	0.1	0.01	82	84	166	0.09	0.09	0	0	100
Manganese (Total)	mg/L	0.1	0.01	82	84	166	0.09	0.09	0	0	100
Mercury	mg/L	0.001	0.0002	NR	16	16	NR	ND	NR	0	100
Molybdenum	mg/L	0.05	0.01	NR	16	16	NR	ND	NR	0	100
Nickel	mg/L	0.02	0.01	NR	16	16	NR	ND	NR	0	100
Nitrate	mg/L	50	0.05	27	NR	27	0.09	NR	0	0	100
Nitrite	mg/L	3	0.05	27	NR	27	0.07	NR	0	0	100
Selenium	mg/L	0.01	0.001	NR	16	16	NR	ND	NR	0	100
Silver	mg/L	0.1	0.01	NR	16	16	NR	ND	NR	0	100
Total Trihalomethanes	mg/L	0.25*	0.001	NR	12	12	NR	0.01	NR	0	100
Uranium	mg/L	0.017	0.001	NR	16	16	NR	ND	NR	0	100
			TOTAL	**218**	**732**	**950**			**0**	**0**	**100**

mg/L = milligrams per litre
NTU = Nephelometric Turbidity Units
ND = Not Detected
NR = Not required to be sampled
Chlorine Total is a Busselton Water in-house test. All others are accredited test results.
*The concentration of trihalomethanes, either individually or in total, in drinking water should not exceed 0.25 mg/L

1 Fluoride occurs naturally in the groundwater supplied into the Busselton system. Natural fluoride concentrations vary from bore to bore. An average concentration of 0.4 milligrams per litre is delivered into the system with variations occurring depending on which bores are running in combination. Busselton Water does not fluoridate the water supply.

Chemical Health: Pesticides – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit (health)	Lab Limit of Reporting (LOR)	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %
				Distribution water			
Organochlorine pesticides							
Aldrin	µg/L	0.0003	0.001	5	ND	0	100
Methoxychlor	µg/L	0.3	0.02	5	ND	0	100
Organochlorine pesticides							
Alpha Endosulfan	µg/L	20	0.1	5	ND	0	100
Beta Endosulfan	µg/L	20	0.1	5	ND	0	100
Endosulfan Sulphate	µg/L		0.1	5	ND	0	100
Heptachlor	µg/L	0.3	0.001	5	ND	0	100
Heptachlor Epoxide	µg/L	0.3	0.001	5	ND	0	100
Dieldrin	µg/L	0.3	0.001	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
Organophosphate pesticides							
Diazinon (Dimpylate)	µg/L	0.004	0.01	5	ND	0	100
Dichlorvos	µg/L	0.005	0.5	5	ND	0	100
Methidathion	µg/L	0.006	0.05	5	ND	0	100
Azinphos-methyl (Guthion)	µg/L	0.03	0.05	5	ND	0	100
Fenthion	µg/L	0.007	1	5	ND	0	100
Dimethoate	µg/L	0.007	0.15	5	ND	0	100
Ethion	µg/L	0.004	0.05	5	ND	0	100
Organophosphate pesticides							
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.01	0.009	5	ND	0	100
Parathion-ethyl (Parathion)	µg/L	0.02	0.004	5	ND	0	100
Fenitrothion	µg/L	0.007	0.1	5	ND	0	100
Acid herbicides							
Picloram	µg/L	300	0.2	5	ND	0	100
Triclopyr	µg/L	20	0.01	5	ND	0	100
2,4-D	µg/L	200	0.1	5	ND	0	100
Clopyralid	µg/L	2000	0.4	5	ND	0	100
2,4,5-T	µg/L	100	0.1	5	ND	0	100
MCPA	µg/L	40	0.1	5	ND	0	100
Bromoxynil	µg/L	10	1	5	ND	0	100
Dicamba	µg/L	100	0.1	5	ND	0	100

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

Chemical Health: Volatile Organic Compounds (Part 1) – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit (health)	Lab Limit of Reporting (LOR)	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %
				Distribution water			
Fumigants							
1,3-dichloropropene	µg/L	100	0.5	5	ND	0	100
Halogenated aliphatics							
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
Vinyl chloride (Chloroethene)	µg/L	0.3	0.2	5	ND	0	100
Carbon tetrachloride	µg/L	3	0.5	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	no data	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
Dichloromethane (Methylene chloride)	µg/L	4	1	5	ND	0	100
Halogenated aromatics							
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
Vinyl chloride (Chloroethene)	µg/L	0.3	0.2	5	ND	0	100
Carbon tetrachloride	µg/L	3	0.5	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	no data	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
Dichloromethane (Methylene chloride)	µg/L	4	1	5	ND	0	100
Monocyclic aromatic hydrocarbons							
Ethylbenzene	µg/L	300	0.5	5	ND	0	100
Toluene	µg/L	800	0.5	5	ND	0	100
Xylenes (Total)	µg/L	600	3	5	ND	0	100
Benzene	µg/L	1	0.5	5	ND	0	100
Styrene (Vinyl benzene)	µg/L	30	0.5	5	ND	0	100

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

Chemical Health: Volatile Organic Compounds (Part 2) – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit (health)	Lab Limit of Reporting (LOR)	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %
				Distribution water			
Semi-volatile organic compounds							
Fenarimol	µg/L	40	0.5	5	ND	0	100
Malathion	µg/L	70	0.01	5	ND	0	100
Metolachlor	µg/L	300	0.2	5	ND	0	100
Napropamide	µg/L	400	0.2	5	ND	0	100
Propachlor	µg/L	70	1	5	ND	0	100
Triadimefon	µg/L	90	1	5	ND	0	100
Vernolate	µg/L	40	0.2	5	ND	0	100
Additional semi-volatile organic compounds							
Chlorothalonil	µg/L	50	0.01	5	ND	0	100
Diclofop-methyl	µg/L	5	0.1	5	ND	0	100
Etridiazole	µg/L	100	0.2	5	ND	0	100
Flamprop-methyl	µg/L	4	0.2	5	ND	0	100
Fluometuron	µg/L	70	0.1	5	ND	0	100
Pendimethalin	µg/L	400	0.4	5	ND	0	100
Primiphos methyl	µg/L	no data	0.1	5	ND	0	100
Propargite	µg/L	7	0.3	5	ND	0	100
Propyzamide	µg/L	70	0.1	5	ND	0	100
Pesticides / herbicides							
Aldicarb	µg/L	4	1	5	ND	0	100
Carbendazim	µg/L	90	1	5	ND	0	100
Diuron	µg/L	20	5	5	ND	0	100
Fipronil	µg/L	0.7	0.02	5	ND	0	100
Fluazifop	µg/L	no data	0.4	5	ND	0	100
Methiocarb	µg/L	7	4	5	ND	0	100
Methomyl	µg/L	20	2	5	ND	0	100
Metsulfuron methyl	µg/L	40	0.5	5	ND	0	100
Oxamyl	µg/L	7	2	5	ND	0	100

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

Chemical Health: Volatile Organic Compounds (Part 3) – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit (health)	Lab Limit of Reporting (LOR)	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %
				Distribution water			
Glyphosate							
Glyphosate	µg/L	1000	1	5	ND	0	100
Paraquat, diquat and 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
Acrylamide in water							
Acrylamide	µg/L	0.2	0.1	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
Organotins							
Dibutyl tin	µg/L	no data	5	5	ND	0	100
Tributyl tin	µg/L	1	2	5	ND	0	100

µg/L = micrograms per litre
ND = Not Detected

Chemical Health: Other Organic Compounds – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit (health)	Lab Limit of Reporting (LOR)	Number of samples	Maximum value	Number of non-compliance with ADWG limit	Compliance %
				Distribution water			
Other semi-volatile organic compound analytes							
Temephos	µg/L	400	0.5	5	ND	0	100
Propiconazole	µg/L	100	0.4	5	ND	0	100
Bromacil	µg/L	400	2	5	ND	0	100
Triazines							
Simazine	µg/L	20	0.1	5	ND	0	100
Hexazinone	µg/L	400	0.4	5	ND	0	100
Atrazine	µg/L	20	0.1	5	ND	0	100
Amitraz	µg/L	9	0.1	5	ND	0	100
Terbutryn	µg/L	400	0.01	5	ND	0	100
Metribuzin	µg/L	70	0.5	5	ND	0	100
Terbuthylazine	µg/L	10	0.01	5	ND	0	100
Semi-volatile organic compounds							
Chlorfenvinphos	µg/L	2	0.2	5	ND	0	100
Mevinphos	µg/L	5	0.4	5	ND	0	100
Parathion Ethyl	µg/L	20	0.02	5	ND	0	100
Parathion methyl	µg/L	20	0.02	5	ND	0	100
Hexachlorobutadiene	µg/L	0.7	0.5	5	ND	0	100
Carbaryl	µg/L	30	4	5	ND	0	100
Carbofuran	µg/L	10	1	5	ND	0	100
Trifluralin	µg/L	90	0.1	5	ND	0	100
Synthetic phthalates							
Di(2-ethylhexyl) adipate	µg/L	no data	1	5	ND	0	100
Di(2-ethylhexyl) phthalate	µg/L	10	1	5	ND	0	100
Synthetic pyrethroids							
Permethrin	µg/L	200	0.05	5	ND	0	100
Cyfluthrin	µg/L	50	0.05	5	ND	0	100
Cypermethrin	µg/L	200	0.05	5	ND	0	100
Deltamethrin	µg/L	1000	1	5	ND	0	100
Fenvalerate	µg/L	30	0.05	5	ND	0	100

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

Chemical Non-Health (Aesthetic) Samples – 1 July 2019 to 30 June 2020

Characteristic	Unit	ADWG limit (aesthetic)	Lab Limit of Reporting (LOR)	Number of samples		Total number 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/L	-	5	27	16	43	190	150	0	0	100
Alkalinity (Carbonate)	mg/L	-	5	27	16	43	ND	ND	0	0	100
Alkalinity (Hydroxide)	mg/L	-	5	27	16	43	ND	ND	0	0	100
Alkalinity (Total)	mg/L	-	5	27	16	43	190	150	0	0	100
Aluminium (Soluble)	mg/L	0.2	0.1	27	16	43	ND	ND	0	0	100
Aluminium (Total)	mg/L	0.2	0.1	27	16	43	ND	ND	0	0	100
Ammonia	mg/L	0.5	0.005	NR	16	16	NR	0.23	NR	0	100
Calcium	mg/L	-	0.2	NR	16	16	NR	28	NR	0	100
Chloride	mg/L	250	5	27	NR	27	140	NR	0	NR	100
Colour True	HU	15	5	82	84	166	22	ND	1	0	100
Electrical Conductivity	uS/cm	-	10	82	84	166	830	680	0	0	100
Filterable Reactive Phosphorus	mg/L	-	0.01	27	NR	27	0.03	NR	0	NR	100
Filterable Reactive Phosphorus as PO4	mg/L	-	0.05	27	NR	27	0.06	NR	0	NR	100
Hardness (as CaCO3)	mg/L	200	5	27	16	43	150	120	0	0	100
Iron (Soluble)	mg/L	0.3	0.01	82	84	166	3.5	ND	6	0	100
Iron (Total)	mg/L	0.3	0.01	82	84	166	8.3	0.05	56	0	100
Magnesium	mg/L	-	0.1	NR	16	16	NR	17	NR	0	100
pH	pH	6.5-8.5		82	168	250	8	8.3	0	0	100
Salinity (as Total Dissolved Solids)	mg/L	600	5	82	NR	82	540	NR	0	NR	100
Silica	mg/L	80	0.1	26	NR	26	14	NR	0	NR	100
Sodium	mg/L	180	0.1	26	NR	26	120	NR	0	NR	100
Sulphate	mg/L	250	1	26	NR	26	20	NR	0	NR	100
Total Hardness by Calculation	mg/L	200	5	26	16	42	150	120	0	0	100
Turbidity	NTU	5	0.05	81	175	256	2.29	0.3	0	0	100
Zinc	mg/L	-	0.01	NR	16	16	NR	0.008	NR	0	100
			TOTAL	**947**	**871**	**1,818**			**63**	**0**	**100**

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

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