Water Quality Annual Report 2019/20

GWMWater

2019/2020 Annual Report for Water Quality

GWMWater is delivering our vision for a healthy environment and thriving communities through continued investment in capital works programs that improve water quality and supply for a productive and liveable region.

The towns of Brim, Beulah and Woomelang were upgraded from a regulated water supply to drinking water in August 2019 with water supplied from the Warracknabeal water treatment plant. Supply from the Warracknabeal water treatment plant was also extended to the Sea Lake community, ensuring improved water quality from the Grampians headworks.

This financial year saw the completion of the South-West Loddon Project. The South West Loddon system can source water from either the Waranga Channel or the Grampians headworks. This is a new supply for rural customers and includes provision to towns serviced by Coliban Water such as Inglewood, Bridgewater and Laanecoorie.

Construction of the East Grampians pipeline is set to commence in February 20201. This pipeline will provide water from Lake Fyans, Mt Cole Reservoir and the Mt William headworks for stock and domestic use. It will also inherently improve the quality of water supplied to towns such as Wickliffe and Streatham as well as providing a new water supply to Maroona and Rossbridge.

Planning for the upgrade of water supplied to Ultima to drinking water is well advanced. Water treatment services are to be provided by Lower Murray Water from its Swan Hill water treatment plant. Water quality improvements for Moyston are also in advanced planning stages with water to be supplied from Ararat. Elmhurst and Kaniva will be upgraded by the end of 2023 to complete water quality upgrade commitments made in the 2018-2023 Water Price Review, with the most appropriate technical solution still under investigation.

Blue-green algae emerged as an issue in the Murray River again this summer although it did not reach levels that gave rise to any serious disruption. Over the past decade there has been increased incidences of blue-green algae events that are projected to increase in frequency and duration due to water and land use intensification and climate stressors. GWMWater is undertaking investigations to determine the best ways to protect customers from water quality events in the Murray River.

GWMWater's is committed to the Hazard Analysis Critical Control Point (HACCP) principle of risk management ensures the standard of drinking water supplied. End to end monitoring is supported by a program of regular internal audits, verification of critical alarms and daily

checks. The reticulation system delivering treated water to the customer's meter is regularly maintained and sampled to ensure the water supplied meets targeted water quality standards.

Funding has been received from the Department of Health and Human Services to investigate an extension of the fluoridation program in the Wimmera and Southern Mallee. A feasibility study will be undertaken over the next six months and will give priority to larger centres or centres connected to common water treatment plants.

Mark Williams
Managing Director

Section 23 of the Safe Drinking Water Act 2003 requires Grampians Wimmera Mallee Water Corporation (GWMWater) to make available for inspection by the public the results of any water quality monitoring program conducted on any drinking water supplied by GWMWater. Customers and members of the public may access drinking water quality data by contacting GWMWater either by telephone on 1300 659 961 or by the internet at www.gwmwater.org.au.

Revision	Revision Date	Details	Authorised
1	27/07/2020	Draft for internal review	Matthew Kube
2	31/07/2020	Water Regulation review	Mark Ferguson
3	19/09/2020	Department of Health and Human Services review	Renwick Chan
4	23/09/2020	Water Regulation review	Mark Ferguson
4	25/09/2020	Executive Manager Infrastructure review	Nalaka Vitharana
5	29/09/2020	Review by Senior Leadership Team	Senior Leadership Team
6	12/10/2020	Managing Director review and sign off	Mark Williams
7	12/10/2020	Final copy to Department of Health and Human Services	

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1 Introduction

Grampians Wimmera Mallee Water Corporation (trading as GWMWater) is a government-owned corporation, created by an order of the Victorian Government under the *Water Act 1989*. On 1 July 2004, GWMWater assumed the responsibilities of the predecessor organisations Grampians Water and Wimmera Mallee Water. The vision and mission of GWMWater are:

Vision
'Healthy environment, thriving community.'

Mission
'Through partnerships with our stakeholders, we will provide affordable services using our precious resources to ensure a productive and liveable region.'

GWMWater provides water supplies to a population of around 59,000 customers living in 71 urban areas throughout the region. Domestic and stock water supplies are provided to 11,000 rural customers living throughout the region. The region covers an area of 62,000 km^2, with a population density of less than one person/km^2.

GWMWater employs approximately 200 people throughout its operational region, with the corporate office being located in Horsham, Victoria.

1.1 *Safe Drinking Water Act 2003*

1.1.1 Background

The *Safe Drinking Water Act 2003* (the Act) and the Safe Drinking Water Regulations 2015 (the Regulations) is the legislative framework for assuring drinking water quality in Victoria.

The Act is based on:
a) Adoption of 'catchment-to-tap' risk management obligations.
b) Standards are applicable to all drinking water samples for key water quality criteria.
c) Information disclosure obligations for water suppliers.
d) Adoption of systemic community consultation processes.

This approach is consistent with regulatory best practice for the management of complex and inter-dependent risks.

1.1.2 Purpose and Outline

The Act:
a) Requires water suppliers and water storage managers to prepare and implement Risk Management Plans (RMP) to manage risk in relation to drinking water and some types of non-potable water.
b) Provides for the auditing of those plans by approved auditors.
c) Requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations.

d) Requires water suppliers to disclose to the public information concerning the quality of drinking water.
e) Provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors.
f) Requires the reporting of known or suspected contamination of drinking water to the Department of Health and Human Services (DHHS).

1.1.3 Definitions

The Act provides the following definitions for water quality classification:

Drinking Water
Water that is intended for human consumption or for purposes connected with human consumption, such as the preparation of food or the making of ice for consumption or for the preservation of unpackaged food, whether or not the water is used for other purposes.

Regulated Water
Regulated water is defined as water that is not drinking water but may in circumstances be mistaken as being drinking water according to Section 6 (2) in the Act.

1.1.4 Safe Drinking Water Regulations 2015

This annual report includes the specific requirements from the Regulations.

The objective of the Regulations is to give effect to key aspects of the Act. In particular, the Regulations:
a) Specifies the major elements to be incorporated in risk management plans.
b) Specifies the standards relating to the quality of drinking water supplied to customers by water suppliers.
c) Specifies criteria for approval of auditors.
d) Specifies details to be included in annual reports.

1.1.5 *Health Fluoridation Act 1973*

The *Health Fluoridation Act 1973* governs the addition of fluoride to drinking water. Fluoridation of drinking water supplies requires a preventive risk management approach. For this purpose, the Code of practice for fluoridation of drinking water supplies, second edition (2018) supports utilities in the adoption and safe operation of fluoride addition to drinking water supplies.

1.2 Australian Drinking Water Guidelines 2011

The Australian Drinking Water Guidelines 2011 (ADWG) provide a framework for the management of drinking water supplies and is designed to assure safety at point of use. The ADWG has been developed after consideration of the best available scientific evidence.

The ADWG provides an authoritative reference of what comprises safe, good quality water, how it can be achieved and how it can be assured. The ADWG is concerned with both health and aesthetic quality.

The ADWG is the authoritative reference of what constitutes safe, good quality water, and aligns with the Victorian's Safe Drinking Water Regulatory Framework. They are consistent with the Act, and provide a basis for determining the quality of water to be supplied to consumers in all parts of Australia. These determinations need to consider the diverse array of regional or local factors, and take into account economic, political and cultural issues, including customer expectations and willingness and the ability to pay.

The ADWG are intended for use by the Australian community and all agencies with responsibilities associated with the supply of drinking water, including catchment and water resource managers, drinking water suppliers, water regulators and health authorities.

1.3 Characterisation of the System

GWMWater's operational area is shown in Figure 1. Key components of the water supply system include:

1. Headworks system, comprising the area in and around the Grampians Ranges and the Wimmera River. The main storages are Lake Bellfield, Taylors Lake, Lake Wartook and Rocklands Reservoir. The total catchment area is 400,000 hectares with a maximum reservoir operating capacity of 522,000 megalitres.
2. GWMWater provides water to the majority of towns through two extensive pipeline systems.
    a. The Wimmera Mallee Pipeline (WMP) system, as follows:
        i. Supply Systems 1,2,3,4,6 and the newly completed South West Loddon Pipeline, all originate from the Grampians headworks and consist of 9270 kilometres of pipeline; and
        ii. Supply System 5, draws water from the Murray River and consists of approximately 860 kilometres of pipeline.
    b. The Northern Mallee Pipeline (NMP) system consisting of 3,390 kilometres of pipeline which draws water from the Murray River.
3. A total of 1,390 kilometres of reticulation pipeline servicing the 71 urban water supplies.
4. Thirty two towns receive water that is classified as drinking water (Table 1-1). The fully treated water is supplied by 15 water treatment plants owned and operated by GWMWater, and a further 4 water treatment plants operated under a Build, Own, Operate and Transfer (BOOT) agreement. These BOOT plants are located at Halls Gap, Ararat, Great Western and Stawell, and are operated by Trility as of 23 June 2014, an independent private sector owner and operator.
5. The Mallee Towns Project of Brim, Beulah and Woomelang receive fully treated water from the Warracknabeal WTP, resulting in these communities being formally declared drinking water towns on 30 August 2019 in the Victorian Government Gazette S344.

6. GWMWater also supplies regulated water to 39 towns (Table 1-2). These supplies are harvested from a range of sources, including surface water and groundwater. Regulated supplies have low-level or no treatment, and is not intended for human consumption, drinking or food preparation.

1.4 Source of Water

GWMWater sources water from a range of surface water catchments, rivers and groundwater aquifers across the region. The catchments located within National Parks and State Forest are co-managed with Parks Victoria and the Department of Land, Water and Planning (DELWP). GWMWater also works in partnership with the Catchment Management Authority, local government, Goulburn Murray Water, Coliban Water, and Wannon Water to address issues affecting water quality in the catchments from where water is sourced.

The Safe Drinking Water Regulations 2015 require water suppliers to detail the methodology used to quantify microbial hazards in source waters. GWMWater conducted sanitary surveys and vulnerability assessments of raw water source based on the drinking water source assessment and treatment requirements: manual for the application of Health-Based Treatment Targets, developed by Water Services Association of Australia (WSAA). GWMWater has a Hazard Analysis and Critical Control Points (HACCP) Plan for operation of the water treatment plants and supply system to ensure the delivery of safe drinking water. Sanitary surveys, vulnerability assessment and HACCP are continuously reviewed, audited and improved.

Table 1-1 and Table 1-2 provide a summary of the source waters by water supply for both drinking water and regulated water.

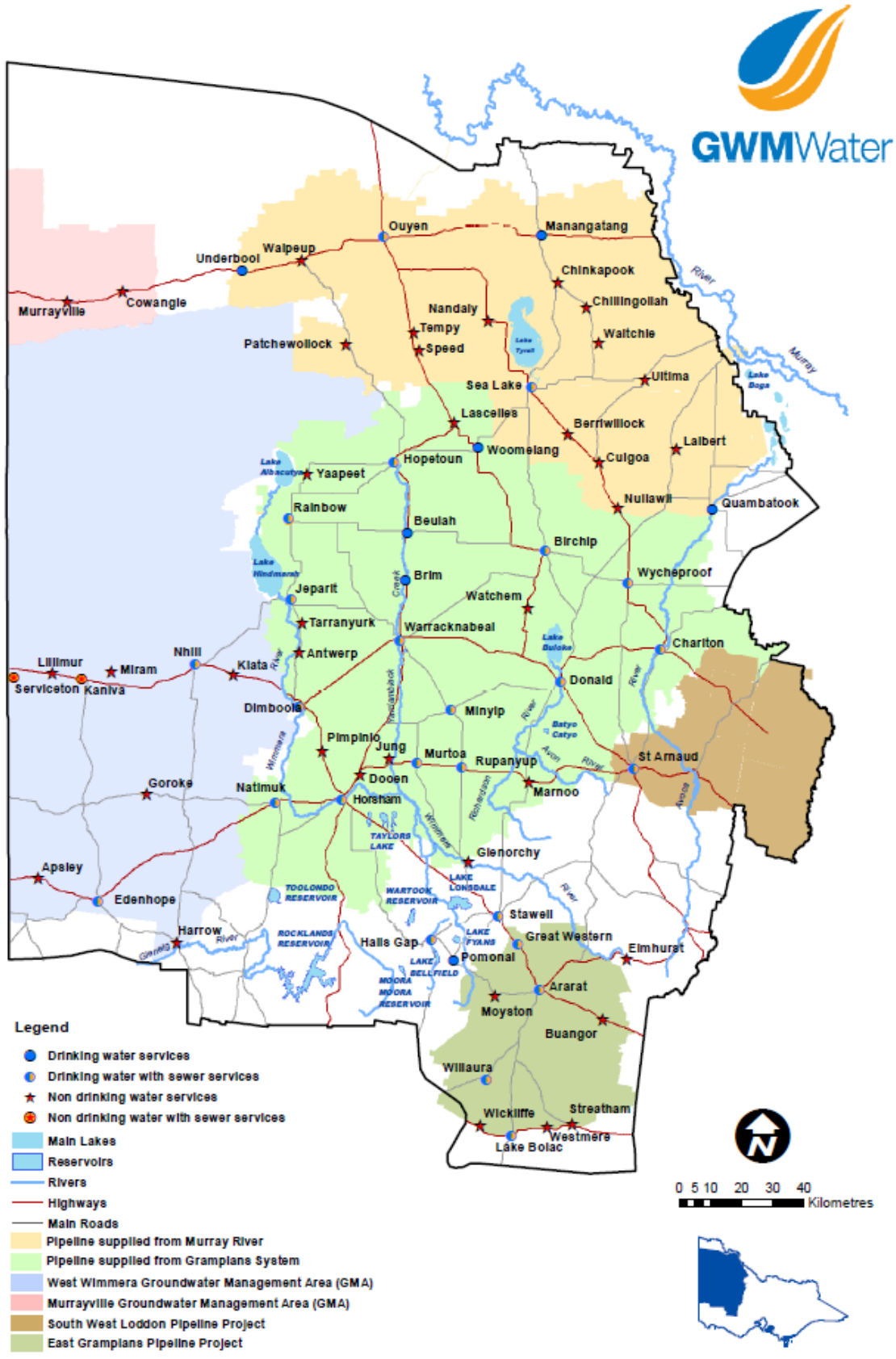

Figure 1 - GWMWater's Operational Area.

Table 1-1 - Water Source for Drinking Water Supplies.

Locality	Source Water	Raw Water Storage	Treatment Plant	Population
Ararat	Surface water (Lake Fyans, Mt Cole Reservoir, Langi Ghiran Reservoir)	Copes Hill and Olivers Gully earthen storages	Ararat WTP	7200
Beulah	Grampians Headworks (WMP)	2 x poly lined steel tanks	Warracknabeal WTP	360
Birchip	Grampians Headworks (WMP)	1 x lined earthen storages	Birchip WTP	760
Brim	Grampians Headworks (WMP)	2 x poly lined steel tanks	Warracknabeal WTP	190
Charlton	Grampians Headworks (WMP)	1 x lined earthen storages	Charlton WTP	1140
Dimboola	Grampians Headworks (WMP)	2 x lined earthen storages	Dimboola WTP	1870
Donald	Grampians Headworks (WMP)	2 x lined steel tanks	St Arnaud WTP	1620
Edenhope	Groundwater (bores)	N/A – Fed directly from bores	Edenhope WTP	1020
Great Western	Surface water (Lake Fyans)	1 x earthen storage	Great Western WTP	430
Halls Gap	Surface water (Lake Bellfield, Dairy Creek)	Lake Bellfield and Dairy Creek earthen storages	Halls Gap WTP	470
Hopetoun	Grampians Headworks (WMP)	1 x lined earthen storages	Hopetoun WTP	590
Horsham	Surface and bore water (Lake Wartook and Laharum Bores)	1 x lined earthen storages	Mt Zero WTP	15730
Jeparit	Grampians Headworks (WMP)	2 x lined steel tanks	Rainbow WTP	370
Lake Bolac	Surface water (Mt William Creek, Stony Creek, Masons Creek) & Groundwater (bores)	1 x poly lined steel tanks	Willaura WTP	360
Manangatang	Surface water (Murray River via NMP)	N/A – Fed directly from pipeline	Manangatang WTP	260
Minyip	Grampians Headworks (WMP)	2 x poly lined steel tanks	Murtoa WTP	570
Murtoa	Grampians Headworks (WMP)	2 x lined earthen storages	Murtoa WTP	940
Natimuk	Surface and bore water (Lake Wartook and Laharum bores)	1 x poly lined steel tank	Mt Zero WTP	560
Nhill	Grampians Headworks (WMP)	2 x lined steel storages elevated tank	Dimboola WTP	2360
Ouyen	Surface water (Murray River via NMP)	2 x earthen storages	Ouyen WTP	1290
Pomonal	Surface water (Lake Bellfield)	1 x concrete tank	Halls Gap WTP	350
Quambatook	Surface water (Goulburn & Loddon Rivers) via Normanville Pipeline	1 x earthen storage	Quambatook WTP	270
Rainbow	Grampians Headworks (WMP)	2 x lined earthen storages	Rainbow WTP	740
Rupanyup	Grampians Headworks (WMP)	2 x poly lined steel tanks	Murtoa WTP	580
Sea Lake	Grampians Headworks (WMP)	2 x lined steel tanks	Warracknabeal WTP	690
St Arnaud	Grampians Headworks (WMP)	Volcano lined storage & St Arnaud earthen storage	St. Arnaud WTP	2200
Stawell	Surface water (Lake Fyans, Lake Bellfield, Fyans Creek)	3 x earthen storages	Stawell WTP	5970
Underbool	Surface water (Murray River via NMP)	2 x earthen storages	Underbool WTP	200
Warracknabeal	Grampians Headworks (WMP)	2 x lined earthen storages	Warracknabeal WTP	2510
Willaura	Surface water (Mt William Creek, Stony Creek, Masons Creek) and Groundwater (bores)	2 x earthen storages at Willaura and Mt Pleasant	Willaura WTP	290
Woomelang	Grampians Headworks (WMP)	2 x poly lined steel tanks	Warracknabeal WTP	220

Locality	Source Water	Raw Water Storage	Treatment Plant	Population
Wycheproof	Grampians Headworks (WMP)	2 x poly lined steel tanks	Charlton WTP	640

WMP – Wimmera Mallee Pipeline **NMP – Northern Mallee Pipeline**

Table 1-2 - Water Source for Regulated Water Supplies.

Water Supply	Source Water	Raw Water Storage	Population
Antwerp	Grampians Headworks (WMP)	2 x poly lined steel tanks	70
Apsley	Groundwater (bores)	1 x elevated steel tank	300
Berriwillock	Surface water (Murray River via NMP)	2 x earthen storages	200
Buangor	Surface water (McLeods Creek)	1 x earthen storage	110
Chillingollah	Surface water (Murray River via NMP)	1 x earthen storage	10
Chinkapook	Surface water (Murray River via NMP)	1 x concrete tank	40
Cowangie	Groundwater (bores)	1 x elevated tank	40
Culgoa	Surface water (Murray River via NMP)	1 x earthen storage	110
Dooen	Grampians Headworks (WMP)	2 x poly tanks	260
Elmhurst	Surface water (Hickmans Creek)	1 x earthen storage	200
Glenorchy	Grampians Headworks (WMP)	2 x elevated steel tanks	140
Goroke	Groundwater (bores)	2 x elevated steel tanks	320
Harrow	Groundwater (bores) & surface water (Glenelg River)	2 x poly lined steel tanks	220
Jung	Grampians Headworks (WMP)	2 x poly lined steel tanks	260
Kaniva	Groundwater (bores)	1x elevated concrete tank	680
Kiata	Groundwater (bores)	2 x concrete tanks	70
Lalbert	Surface water (Murray River via NMP)	2 x poly lined steel tanks	160
Lascelles	Grampians Headworks (WMP)	2 x lined steel tanks	100
Lillimur	Groundwater (bores)	1x elevated steel tank	120
Marnoo	Grampians Headworks (WMP)	1 x earthen storage	130
Miram	Groundwater (bores)	1 x elevated steel tank	380
Moyston	Surface water (Mt William, Stony and Masons Creeks) and Groundwater (bores)	1 x earthen storage	300
Murrayville	Groundwater (bores)	1 x elevated tank	40
Nandaly	Surface water (Murray River via NMP)	1 x concrete tank	90
Nullawil	Surface water (Murray River via NMP)	2 x lined steel tanks	100
Patchewollock	Surface water (Murray River via NMP)	2 x earthen storages	140
Pimpinio	Grampians Headworks (WMP)	2 x lined earthen storages 1 x elevated tank storage	200
Serviceton	Groundwater (bores)	1 x elevated steel tank	130
Speed	Surface water (Murray River via NMP)	1 x concrete tank	80
Streatham	Groundwater (bores)	1 x earthen storage	170
Tarranyurk	Grampians Headworks (WMP)	2 x lined steel tanks	30
Tempy	Surface water (Murray River via NMP)	1 x steel tank 1 x concrete tank	60
Ultima	Surface water (Murray River via NMP)	2 x poly lined steel tanks	190
Waitchie	Surface water (Murray River via NMP)	1 x concrete tank	50
Walpeup	Surface water (Murray River via NMP)	2 x earthen storages	170
Watchem	Grampians Headworks (WMP)	2 x poly lined steel tanks	120
Westmere	Groundwater (bores)	1 x earthen storage	40
Wickliffe	Surface water (Mt William, Stony and Masons Creeks) and Groundwater (bores)	1 x earthen storage	120
Yaapeet	Grampians Headworks (WMP)	2 x poly lined steel tanks	90

WMP – Wimmera Mallee Pipeline **NMP – Northern Mallee Pipeline**

2 Quality Management System

2.1 Water Treatment

The water treatment processes utilised at the drinking water treatment plants are shown in Table 2-1.

Table 2-1 - Water Treatment Processes and Chemicals in Drinking Water Towns.

Water Sampling Localities	Treatment Processes	Chemicals that can be added	Comments
Ararat*^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction, fluoridation	Lime, potassium permanganate, powder activated carbon, aluminium sulphate (alum), polymer, chlorine, hydrofluorosilicic acid	
Beulah	Receives water from Warracknabeal WTP, booster disinfection	Chlorine	Receives water from Warracknabeal WTP.
Birchip*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, aluminium chlorohydrate (Megapac 23), polymer, chlorine	
Brim	Receives water from Warracknabeal WTP, booster disinfection	Chlorine	Receives water from Warracknabeal WTP.
Charlton*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, aluminium chlorohydrate (Megapac 23), polymer, chlorine	
Dimboola*	Coagulation, flocculation, dissolved air flotation, filtration disinfection, pH correction	Sodium hydroxide, aluminium chlorohydrate (Megapac 23), polymer, chlorine	
Donald	Receives water from St Arnaud WTP, booster disinfection	Chlorine	Receives water from St Arnaud WTP.
Edenhope*	Coagulation, flocculation, dissolved air flotation, filtration, desalination, disinfection	Aluminium chlorohydrate (Megapac 23), polymer, chlorine	
Great Western*^	Microfiltration, disinfection, pH correction	Sulphuric acid, polyaluminium chloride (PACl), polymer, sodium hydroxide, chlorine	
Halls Gap*^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, aluminium sulphate (alum), polymer, chlorine	
Hopetoun*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Soda ash, aluminium chlorohydrate (Megapac 23), polymer, chlorine	
Horsham*	Powdered activated carbon dosing, coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction, fluoridation	Lime, aluminium chlorohydrate (Megapac 23), polymer, chlorine, carbon dioxide, hydrofluorosilicic acid	
Jeparit	Receives water from Rainbow WTP, booster disinfection	Chlorine	Receives water from Rainbow WTP.
Lake Bolac	Receives water from Willaura WTP		Receives water from Willaura WTP.
Manangatang*	Coagulation, flocculation, multimedia filtration, microfiber filtration (2 µm), disinfection	Ultrion 44560 coagulant, chlorine	

Water Sampling Localities	Treatment Processes	Chemicals that can be added	Comments
Minyip	Receives water from Murtoa WTP, booster disinfection	Chlorine	Receives water from Murtoa WTP.
Murtoa*	Coagulation, flocculation, dissolved air flotation, filtration, pH correction, disinfection	Sodium hydroxide, Aluminium chlorohydrate (Megapac 23), polymer, chlorine	
Natimuk	Receives water from Horsham WTP, booster disinfection	Chlorine	Receives water from Horsham WTP.
Nhill	Receives water from Dimboola WTP, booster disinfection	Chlorine	Receives water from Dimboola WTP.
Ouyen*	Microfiltration, disinfection	Aluminium chlorohydrate (Megapac 23), chlorine	
Pomonal	Receives water from Halls Gap WTP, booster disinfection	Chlorine	Receives water from Halls Gap WTP.
Quambatook*	Coagulation, flocculation, dissolved air flotation, filtration, granular activated carbon filtration, pH correction, disinfection	Aluminium chlorohydrate (Megapac 23), hydrochloric acid, chlorine	
Rainbow*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection	Aluminium chlorohydrate (Megapac 23), chlorine	
Rupanyup	Receives water from Murtoa WTP, booster disinfection	Chlorine	Receives water from Murtoa WTP.
Sea Lake	Receives water from Warracknabeal WTP, booster disinfection	Chlorine	Receives water from Warracknabeal WTP.
St Arnaud*	Coagulation, flocculation, dissolved air flotation, filtration, pH correction, disinfection	Aluminium chlorohydrate (Megapac 23), polymer, sodium hydroxide, chlorine	
Stawell*^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, aluminium sulphate (alum), polymer, chlorine	
Underbool*	Coagulation, flocculation, sand filters, pH correction	Hydrochloric acid, Ultrion 44560 coagulant, chlorine	
Warracknabeal*	Coagulation, flocculation, dissolved air flotation, filtration, pH correction, disinfection	Lime, aluminium chlorohydrate (Megapac 23), chlorine	
Willaura*	Coagulation, flocculation, microfiltration, pH correction, disinfection	Soda ash, calcite, aluminium chlorohydrate (Megapac 23), sodium hypochlorite, carbon dioxide, ammonia	
Woomelang	Receives water from Warracknabeal WTP, booster disinfection	Chlorine	Receives water from Warracknabeal WTP.
Wycheproof	Receives water from Charlton WTP, booster disinfection	Chlorine	Receives water from Charlton WTP.

^ Operated by Trility under a BOOT Contract
** Localities with a Water Treatment Plant*

Table 2-2 - Water Treatment Processes and Chemicals in Regulated Towns.

Water Supply	Treatment Processes	Chemicals used in Treatment
Berriwillock	Coagulation	PolyDADMAC
Culgoa	Coagulation	PolyDADMAC
Glenorchy	Coagulation	PolyDADMAC
Jung	Coagulation, disinfection	PolyDADMAC, chlorine
Lalbert	Coagulation, disinfection	PolyDADMAC, chlorine
Lascelles	Coagulation	PolyDADMAC
Marnoo	Coagulation	PolyDADMAC
Murrayville	Disinfection	Chlorine
Nullawil	Coagulation, disinfection	PolyDADMAC, chlorine
Ultima	Coagulation, disinfection	PolyDADMAC, chlorine
Walpeup	Disinfection	Chlorine
Watchem	Coagulation, disinfection	PolyDADMAC, sodium hypochlorite, hydrochloric acid
Yaapeet	Coagulation	PolyDADMAC

2.2 Water Treatment Changes

The Mallee Towns Drinking Water Supply Project concluded this year, with the upgrade of three regulated supplies (Brim, Beulah and Woomelang) and one disinfection only town (Sea Lake) to a treated drinking water supply. The towns received fully treated water from early 2019, however formal removal of the regulated status of the towns occurred on 30 August 2019. The water supplies are now sourced from Lake Bellfield that is treated at the Warracknabeal WTP and piped to towns where it undergoes booster chlorination.

2.3 Water Treatment Issues

The Code of practice for fluoridation of drinking water supplies, second edition was updated in 2018, and states that the operating target of fluoride should be 0.9 ± 0.1 mg/L. The current Horsham fluoridation plant (built in November 2006) currently doses at or slightly below 0.6 mg/L, and does not meet the new code. To better align with the code of practise, the fluoride plant is planned to be upgraded:

- In the 2023-2028 water plan by the installation of a new fluoride plant at Mt Zero.
- In the 2020/2021 year, increase reliability of dosing by:
    - Shifting the dosing point to before clear water storage to allow dosing buffer
    - Reducing the hydraulic lag between dosing point and fluoride system
    - Updating the programming, alarms and interlocks to better monitor the dosing.

The Ararat Fluoride Plant will also undergo minor works in 2020 to meet the fluoride code.

The Murray River experienced a blue-green algae bloom again this year, from December 2019 to the end of January 2020. The predominant species was the non-toxic, but taste and odour producing *Dolichospermum crassum*. The bloom caused a temporary shutdown of the Manangatang water treatment plant for only a couple of days, which resulted in little impact to customers. In cases where the water treatment plant is shut down, water is carted from another drinking water treatment plant to the Manangatang clear water storage.

GWMWater is looking at several infrastructure options that will lower the risk of future water quality issues from the Murray River.

GWMWater has a management plan that is utilised during algae events. The management plan outlines various strategies including operational changes to supply networks, communications, carting water and optimising plant performance in the event of wide-spread blooms.

3 Drinking Water Quality Results

For the 2019/2020 year, the sampling frequency and drinking water quality standards for *Escherichia coli*¸ trihalomethanes and turbidity were as specified in Schedule 2 under the Regulations (Table 3-2). The water quality standards are discussed below.

The water sampling program for the entire region is based on ADWG recommendations, specific risks, historical data and operational changes, from catchment to tap. The water sampling points are located within a water sampling locality and are designed to ensure that the samples collected are representative of the supply system. The sampling program is reviewed on a regular basis to align with changes in the risk profile of each locality. Samples are sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. The current sampling program was implemented in February 2017 and was reviewed before the commencement of 2020.

Regulation 6 of the Regulations states that a water sampling locality is:

- An area supplied with drinking water.
- A discrete area of similar water quality – generally water entering the area is supplied from a common source.
- Inclusive of all consumers supplied with drinking water of similar water quality.
- Able to be described by its boundaries.

Table 3-1 – Changes in water quality sampling frequency (2018/2019 compared with 2019/2020).

Town(s)	Parameter(s)	Change	Reason
Beulah, Brim, Woomelang	*E. coli*, THMs, turbidity, chlorine, pH, EC	Added as weekly to schedule	Declared drinking water towns 30 August 2019.
Beulah, Brim, Woomelang	Aluminium	Added as monthly to schedule	Declared drinking water towns 30 August 2019.
Beulah, Brim, Woomelang	Hardness	Added as quarterly to schedule	Declared drinking water towns 30 August 2019.
Beulah, Brim, Woomelang	Metals (arsenic, lead, copper)	Added as yearly to schedule	Declared drinking water towns 30 August 2019.
Edenhope	Metals (arsenic, lead, copper)	From quarterly to annually	Historic trends showed no elevation compared with other towns and so deemed lower risk and sampling frequency brought to be in-line with other towns.
All drinking water towns	Zinc	Added at beginning of 2020	Added to better meet ADWG that by leaching from pipes Zinc can affect aesthetic quality of water

Town(s)	Parameter(s)	Change	Reason
Birchip, Charlton, Dimboola, Donald, Great Western, Halls Gap, Jeparit, Manangatang, Murtoa, Ouyen, Pomonal, Rainbow, Rupanyup, St Arnaud, Stawell, Warracknabeal, Wycheproof	Hardness	From quarterly to biannual	Risk assessment for hardness was deemed to be low risk and historic trends showed frequency of sampling could be reduced for these towns.
Qumabatook, Willaura	Hardness	From quarterly to annually	Risk assessment for hardness was deemed to be low risk and historic trends showed frequency of sampling could be reduced for these towns.
Minyip	Iron	Removed from schedule	Iron is only measured at towns that have higher risk occurring, mostly due to historic changes in the supply of water in the reticulation system. Historic trends showed no elevation compared with other towns and so was removed from the schedule.

Table 3-2 – Summary of Water Quality data for 2019/2020.

Parameter	Sampling frequency	Benchmark compliance standard	All Standards met	Comments
Escherichia coli (*E. coli*)	Weekly	No *Escherichia coli* per 100 mL of drinking water, with the exception of any false positive samples.	Yes	All localities were compliant for the period. Refer to Section 3.1 for details.
Trihalomethanes (THM)	Monthly	Must not exceed 0.25 mg/L.	Yes	All localities were compliant for the period. Refer to Section 3.2 for details.
Turbidity	Weekly	95th percentile of results for samples in any 12 months must be ≤ 5.0 NTU.	Yes	All localities were compliant for the period. Refer to Section 3.3 for details.

3.1 *Escherichia coli* (*E. coli*)

The health impacts and epidemiology of thermotolerant coliforms, and specifically *E. coli*, are described in detail in the ADWG fact sheet.

E. coli is used as a specific indicator of faecal contamination and hence is a measure used to determine the safety of water for drinking. *E. coli* should not be detected in a sample of drinking water. If detected, immediate action is taken.

As required by the Regulations, one sample of drinking water collected each week per water sampling locality and two samples for larger towns each week per water sampling locality is required. All samples of drinking water collected in any 12 months period must contain no *E. coli* per 100 mL, with the exception of any false positive sample. A false positive occurs where the water supplier can demonstrate treatment and control systems were in place and the false positive is more than likely the result of an external factor such as sampling error.

3.1.1 Results

E. coli sampling and analysis was undertaken as a minimum, on a weekly basis for all drinking water supplies. There were no missed samples for *E. coli* in this reporting period.

Samples from Willaura and St. Arnaud recorded a reading of 1 *Escherichia coli*/100 mL on the 15/07/2019 and 17/07/2019, respectively. DHHS was accordingly provided a Section 22 notification. The investigation found that there were no contributing factors in accordance with (c)(i)(ii)(iii) or (iv) in Schedule 2 to cause the *E. coli* results. As such, the *E. coli* reading was deemed to be a false positive and no further action was required. Please refer to the Emergency, Incident and Event Management section for further information.

All other samples met the standard for the reporting period of 2019/2020 (Table 3-3).

Table 3-3 – Results for Escherichia coli in Drinking Water: 1 July 2019 – 30 June 2020. All samples of drinking water collected in any 12 months period must contain no E. coli/100 mL, with the exception of any false positive samples.

Sampling Locality	Sampling Frequency	No. of Samples	Max (*Escherichia coli*/100 mL)	No. of samples where standard was not met (S 18)
Ararat*	Twice-weekly	104	0	0
Beulah#	Weekly	43	0	0
Birchip	Weekly	52	0	0
Brim#	Weekly	43	0	0
Charlton	Weekly	52	0	0
Dimboola	Weekly	52	0	0
Donald	Weekly	52	0	0
Edenhope	Weekly	52	0	0
Great Western	Weekly	52	0	0
Halls Gap	Weekly	52	0	0
Hopetoun	Weekly	52	0	0
Horsham*	Twice-weekly	104	0	0
Jeparit	Weekly	52	0	0
Lake Bolac	Weekly	52	0	0
Manangatang	Weekly	52	0	0
Minyip	Weekly	52	0	0
Murtoa	Weekly	52	0	0
Natimuk	Weekly	52	0	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (*Escherichia coli*/100 mL)	No. of samples where standard was not met (S 18)
Nhill	Weekly	52	0	0
Ouyen	Weekly	52	0	0
Pomonal	Weekly	52	0	0
Quambatook	Weekly	52	0	0
Rainbow	Weekly	52	0	0
Rupanyup	Weekly	52	0	0
Sea Lake	Weekly	52	0	0
St. Arnaud	Weekly	52	1	0^
Stawell*	Twice-weekly	104	0	0
Underbool	Weekly	52	0	0
Warracknabeal	Weekly	52	0	0
Willaura	Weekly	52	1	0^
Woomelang#	Weekly	43	0	0
Wycheproof	Weekly	52	0	0

** Due to the population size of these towns two samples are taken.*

 # Declared drinking water 30/08/2019.

^ The readings of 1 E. coli/100 mL *were found to be a false positive.*

3.2 Trihalomethanes (THMs)

Trihalomethanes (THMs) are present in drinking water, principally as the result of a reaction between organic and inorganic material in the water with chlorine, and to a lesser extent chloramines.

Based on health considerations, the concentration of THMs, either individually or in total, in drinking water should not exceed 0.25 mg/L. The ADWG states that THM concentrations fluctuating occasionally up to 1.0 mg/L are unlikely to pose a significant health risk.

3.2.1 Results

THM sampling and analysis was undertaken on a minimum monthly basis for all drinking water supplies. There were no missed samples for THM and all sites met the standard for this reporting period (Table 3-4).

Table 3-4 – Results for Trihalomethanes in Drinking Water: 1 July 2019 – 30 June 2020. The concentration of THM must not exceed 0.25 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat*	Twice-monthly	24	0.08	0.06	0
Beulah#	Monthly	10	0.08	0.06	0
Birchip	Monthly	12	0.06	0.04	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Brim#	Monthly	10	0.12	0.08	0
Charlton	Monthly	12	0.08	0.06	0
Dimboola	Monthly	12	0.06	0.05	0
Donald	Monthly	12	0.08	0.07	0
Edenhope	Monthly	12	0.09	0.06	0
Great Western	Monthly	12	0.16	0.11	0
Halls Gap	Monthly	12	0.09	0.05	0
Hopetoun	Monthly	12	0.06	0.04	0
Horsham*	Twice-monthly	24	0.13	0.09	0
Jeparit	Monthly	12	0.09	0.07	0
Lake Bolac	Monthly	12	0.04	0.02	0
Manangatang	Monthly	12	0.04	0.03	0
Minyip	Monthly	12	0.10	0.07	0
Murtoa	Monthly	12	0.08	0.06	0
Natimuk	Monthly	12	0.17	0.14	0
Nhill	Monthly	12	0.06	0.05	0
Ouyen	Monthly	12	0.10	0.07	0
Pomonal	Monthly	12	0.07	0.06	0
Quambatook	Monthly	12	0.19	0.15	0
Rainbow	Monthly	12	0.07	0.04	0
Rupanyup	Monthly	12	0.09	0.06	0
Sea Lake	Monthly	12	0.09	0.07	0
St. Arnaud	Monthly	12	0.05	0.04	0
Stawell*	Twice-monthly	24	0.08	0.06	0
Underbool	Monthly	12	0.06	0.04	0
Warracknabeal	Monthly	12	0.06	0.05	0
Willaura	Monthly	12	0.06	0.02	0
Woomelang#	Monthly	10	0.09	0.07	0
Wycheproof	Monthly	12	0.07	0.06	0

** Due to the population size of these towns two samples are taken every month.*

 # Declared drinking water 30/08/2019.

3.3 Turbidity

Turbidity is caused by the presence of very fine suspended matter, such as clay, silt, colloidal particles, plankton and other microscopic organisms in water. High turbidity can result in a water sample having a 'muddy' or 'milky' appearance.

Turbidity is a measurement of the light scattering property of water, and the degree of scattering is dependent on the amount, size and composition of the suspended matter.

The ADWG fact sheet contains a detailed account of turbidity and its implications for water supply. The Regulations require that the 95th percentile of results for samples in any 12-month period must not exceed five Nephelometric Turbidity Units (NTU).

3.3.1 Results

Turbidity sampling and analysis is undertaken as a minimum, on a weekly basis for all drinking water supplies. There were no missed samples for turbidity for the reporting period of 2019/2020 and all sites met the standard (Table 3-5).

Table 3-5 – Results for turbidity in Drinking Water: 1 July 2019 – 30 June 2020. The 95th percentile of results for samples in any 12 month period must be less than or equal to 5.0 NTU.

Sampling Locality	Sampling Frequency	No. of Samples	Max (NTU)	Max 95th percentile in any 12 months (NTU)	No. of 95th percentile of results in any 12 months above standard (S 18)
Ararat*	Twice-weekly	104	0.12	0.25	0
Beulah#	Weekly	43	0.12	N/A	N/A
Birchip	Weekly	52	0.13	0.30	0
Brim#	Weekly	43	0.18	N/A	N/A
Charlton	Weekly	52	0.11	0.20	0
Dimboola	Weekly	52	0.10	0.17	0
Donald	Weekly	52	0.10	0.17	0
Edenhope	Weekly	52	0.12	0.17	0
Great Western	Weekly	52	0.13	0.20	0
Halls Gap	Weekly	52	0.14	0.20	0
Hopetoun	Weekly	52	0.16	0.54	0
Horsham*	Twice-weekly	104	0.13	0.30	0
Jeparit	Weekly	52	0.14	0.27	0
Lake Bolac	Weekly	52	0.12	0.30	0
Manangatang	Weekly	52	0.13	0.42	0
Minyip	Weekly	52	0.13	0.47	0
Murtoa	Weekly	52	0.14	0.30	0
Natimuk	Weekly	52	0.11	0.37	0
Nhill	Weekly	52	0.11	0.20	0
Ouyen	Weekly	52	0.10	0.10	0
Pomonal	Weekly	52	0.11	0.20	0
Quambatook	Weekly	52	0.15	0.30	0
Rainbow	Weekly	52	0.17	0.20	0
Rupanyup	Weekly	52	0.10	0.50	0
Sea Lake	Weekly	52	0.10	4.09	0
St. Arnaud	Weekly	52	0.11	0.17	0
Stawell*	Twice-weekly	104	0.11	0.20	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (NTU)	Max 95th percentile in any 12 months (NTU)	No. of 95th percentile of results in any 12 months above standard (S 18)
Underbool	Weekly	52	0.12	0.30	0
Warracknabeal	Weekly	52	0.10	0.17	0
Willaura	Weekly	52	0.11	0.27	0
Woomelang#	Weekly	43	0.23	N/A	N/A
Wycheproof	Weekly	52	0.11	0.37	0

** Due to the population size of these towns two samples are taken every month.*

 # Declared drinking water 30/08/2019, less than 12 months of required results for percentile calculation.

3.4 Other chemicals, pathogens, algal toxins or substance that may pose a risk to human health

Regulation 12(b) requires the water supplier to ensure that the drinking water supplied to customers does not contain any chemical, toxin, pathogen or other substance at the levels that may pose a risk to human health. The ADWG fact sheet contains a detailed account of other water quality standard and its implications for water supply.

3.4.1 Algal toxins, pesticides and radiological parameters

The sampling of Algal toxins, pesticides and radiological parameters is risk-based. All tests of pesticides, algal toxins or radiological parameters in raw water storages and reservoirs for drinking water supplies were well within ADWG values.

3.4.2 Chlorine

Chlorine is used extensively as a disinfectant for drinking water supplies. Based on health considerations, the guideline value for total chlorine in drinking water is 5 mg/L. The fact sheets in ADWG provide a detailed account of the health impacts and other considerations relating to chlorine.

3.4.2.1 Results

Free chlorine was measured in localities with chlorination system, and total chlorine was measured in chloramination systems. In both cases the minimum chlorine concentration GWMWater targets at the end of the reticulation system is 0.2 mg/L and to not exceed the ADWG upper limit of 5.0 mg/L at any point. All samples for chlorine met the standard for this reporting period (Table 3-6).

There was one missed result for chlorine during the reporting period under Regulation 13 of the Safe Drinking Water Regulations 2015 at Wycheproof on 1/7/2019. Investigation found that chlorine levels in recent samples in the reticulation and at online analysers at the entry point to the town were within the ADWG, there were no microorganisms detected in the sample, and the WTP was operating with all controls in place at the time.

When the sampler takes field measurements of free chlorine it is recorded on a chain of custody paper and returned to the laboratory with the sample bottle. In this case, a temporary sampler did not record the free chlorine value for this sample. This gap in procedure has been rectified to minimise the risk of missed samples.

Table 3-6 - Concentrations of chlorine in Drinking Water for 1 July 2019 – 30 June 2020. The concentrations of chlorine should not exceed 5.0 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat*	Twice-weekly	104	1.4	0.6	0
Beulah#	Weekly	43	1.7	1.1	0
Birchip	Weekly	52	1.5	0.9	0
Brim#	Weekly	43	1.0	0.6	0
Charlton	Weekly	52	1.1	0.6	0
Dimboola	Weekly	52	1.3	0.8	0
Donald	Weekly	52	1.7	1.1	0
Edenhope	Weekly	52	1.1	0.8	0
Great Western	Weekly	52	2.0	0.7	0
Halls Gap	Weekly	52	1.5	1.0	0
Hopetoun	Weekly	52	1.4	0.8	0
Horsham*	Twice-weekly	104	1.6	0.9	0
Jeparit	Weekly	52	1.7	0.8	0
Lake Bolac	Weekly	52	2.3	1.2	0
Manangatang	Weekly	52	1.5	1.0	0
Minyip	Weekly	52	1.3	0.9	0
Murtoa	Weekly	52	0.9	0.6	0
Natimuk	Weekly	52	1.5	0.9	0
Nhill	Weekly	52	2.0	0.8	0
Ouyen	Weekly	52	1.4	0.8	0
Pomonal	Weekly	52	1.2	0.7	0
Quambatook	Weekly	52	1.3	0.7	0
Rainbow	Weekly	52	1.5	1.1	0
Rupanyup	Weekly	52	1.3	0.9	0
Sea Lake	Weekly	52	1.5	1.1	0
St. Arnaud	Weekly	52	2.0	1.2	0
Stawell*	Twice-weekly	104	1.2	0.5	0
Underbool	Weekly	52	1.6	1.1	0
Warracknabeal	Weekly	52	1.1	0.7	0
Willaura	Weekly	52	2.3	1.7	0
Woomelang#	Weekly	43	1.1	0.7	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Wycheproof	Weekly	51	1.4	0.9	0

** Due to the population size of these towns two samples are taken every week.*

 # Declared drinking water 30/08/2019.

3.4.3 Chloroacetic acids

Chloroacetic acids (monochloroacetic acid, dichloroacetic acid and trichloroacetic acid) are produced in drinking water as disinfection by-products (DBPs) of the reaction between chlorine and naturally occurring humic and fulvic acids. The fact sheets in ADWG provide a detailed account of the health impacts and other considerations relating to chloroacetic acids.

3.4.3.1 Results

The sampling of these parameters is based on ADWG recommendations, risks, historical data and any operational changes. There were no missing samples for chloroacetic acids during this reporting period and all samples met the standard.

Table 3-7 - Concentrations of Monochloroacetic Acid in Drinking Water for 1 July 2019 – 30 June 2020. The concentrations of monochloroacetic acid should not exceed 0.15 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Great Western	Monthly	12	0.006	0.005	0
Manangatang	Monthly	12	0.005	0.005	0
Ouyen	Monthly	12	0.005	0.005	0
Quambatook	Monthly	12	0.005	0.005	0

Table 3-8 - Concentrations of Dichloroacetic Acids in Drinking Water of 1 July 2019 – 30 June 2020. The dichloroacetic acid should not exceed 0.1 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Great Western	Monthly	12	0.060	0.046	0
Manangatang	Monthly	12	0.019	0.012	0
Ouyen	Monthly	12	0.035	0.021	0
Quambatook	Monthly	12	0.038	0.020	0

Table 3-9 - Concentrations of Trichloroacetic Acids in Drinking Water for 1 July 2019 – 30 June 2020. The trichloroacetic acid should not exceed 0.1 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Great Western	Monthly	12	0.061	0.045	0
Manangatang	Monthly	12	0.020	0.013	0
Ouyen	Monthly	12	0.046	0.030	0
Quambatook	Monthly	12	0.017	0.010	0

3.4.4 Lead

Lead can be present in drinking water as a result of dissolution from natural sources, or from household plumbing systems containing lead. Lead concentrations in drinking water can be reduced by conventional methods of water treatment using coagulants or lime softening.

Based on health considerations, the guideline value of lead in drinking water should not exceed 0.01 mg/L. The fact sheets in the ADWG provide a detailed account of the health impacts and other considerations relating to lead.

3.4.4.1 Results

The sampling of lead is based on ADWG recommendations, risks and historical data. All samples for lead met the standard for the 2019/2020 reporting period (Table 3-10).

There was one missed result for lead during the reporting period at Jeparit under Regulation 13 of the Safe Drinking Water Regulations 2015. There was a sample for a metals suite (arsenic, lead, zinc and copper) not taken due to the sampler not being able to access the sampling point. This has now been rectified, and the sample was rescheduled for July 2020.

Table 3-10 - Concentrations of Lead in Drinking Water for 1 July 2019 – 30 June 2020. The lead should not exceed 0.01 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat	Yearly	1	0.001	0.001	0
Beulah#	Yearly	1	0.002	0.002	0
Birchip	Yearly	1	0.001	0.001	0
Brim#	Yearly	1	0.001	0.001	0
Charlton	Yearly	1	0.001	0.001	0
Dimboola	Yearly	1	0.001	0.001	0
Donald	Yearly	1	0.001	0.001	0
Edenhope*	Yearly	3	0.001	0.001	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Great Western	Yearly	1	0.001	0.001	0
Halls Gap	Yearly	1	0.001	0.001	0
Hopetoun	Yearly	1	0.001	0.001	0
Horsham	Yearly	1	0.001	0.001	0
Jeparit	Yearly	0	N/A	N/A	N/A
Lake Bolac	Yearly	1	0.001	0.001	0
Manangatang	Yearly	1	0.001	0.001	0
Minyip	Yearly	1	0.001	0.001	0
Murtoa	Yearly	1	0.001	0.001	0
Natimuk	Yearly	1	0.001	0.001	0
Nhill	Yearly	1	0.001	0.001	0
Ouyen	Yearly	1	0.001	0.001	0
Pomonal	Yearly	1	0.001	0.001	0
Quambatook	Yearly	1	0.001	0.001	0
Rainbow	Yearly	1	0.001	0.001	0
Rupanyup	Yearly	1	0.001	0.001	0
Sea Lake	Yearly	1	0.001	0.001	0
St. Arnaud	Yearly	1	0.001	0.001	0
Stawell	Yearly	1	0.001	0.001	0
Underbool	Yearly	1	0.001	0.001	0
Warracknabeal	Yearly	1	0.001	0.001	0
Willaura	Yearly	1	0.001	0.001	0
Woomelang#	Yearly	1	0.001	0.001	0
Wycheproof	Yearly	1	0.001	0.001	0

Declared drinking water 30/08/2019.

** 3 Samples taken as sampling frequency changed from quarterly to yearly at beginning of 2020*

3.4.5 Nitrite and Nitrate

Nitrite: Based on health considerations, the concentration of nitrite in drinking water should not exceed 3 mg-NO_2/L, equivalent to 0.913 mg N/L.

Nitrate: Based on health considerations, the guideline value of 50 mg-NO_3/L, equivalent to 11.3 mg/L, has been set to protect bottle-fed infants under three months of age and up to 100 mg-NO_3/L, equivalent to 22.6 mg N/L can be safely consumed by adults.

A detailed description of nitrite and nitrate and its implications in a water supply can be found by reference to the ADWG.

3.4.5.1 Results

Nitrite and Nitrate were only measured in chloramination systems, Willaura and Lake Bolac. All the results for nitrite (Table 3-11) and nitrate (Table 3-12) met the standard for this reporting period.

Table 3-11 - Concentrations of Nitrite in Drinking Water for 1 July 2019 – 30 June 2020. Nitrite should not exceed 3 mg-NO_2/L (0.913 mg N/L).

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg N/L)	Average (mg N/L)	No of samples where standard was not met (S 18)
Lake Bolac	Weekly	52	0.42	0.12	0
Willaura	Monthly	12	0.00	0.00	0

Table 3-12 - Concentrations of Nitrate in Drinking Water for 1 July 2019 – 30 June 2020. Nitrate should not exceed 50 mg-NO_3/L (11.3 mg N/L).

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg N/L)	Average (mg N/L)	No of samples where standard was not met (S 18)
Lake Bolac	Weekly	52	0.17	0.10	0
Willaura	Monthly	12	0.11	0.08	0

3.4.6 Copper

The concentration of copper should not exceed 1 mg/L based on aesthetic considerations but would not be a health consideration unless the concentration exceeds 2 mg/L. Copper can occur naturally in catchments as it is widely distributed in rocks and soils as carbonate and sulphide minerals. A detailed description of copper and its implications in a water supply can be found by reference to the ADWG.

3.4.6.1 Results

The sampling of copper is based on ADWG recommendations, risks, historical data and any operational changes. All samples for copper met the standard for the reporting period (Table 3-13).

There was one missed result for copper during the reporting period at Jeparit under Regulation 13 of the Safe Drinking Water Regulations 2015. There was a sample for a metals suite (arsenic, lead, zinc and copper) not taken due to the sampler not being able to access the sampling point. This has now been rectified, and the sample was rescheduled for July 2020.

Table 3-13 - Concentrations of Copper in Drinking Water for 1 July 2019 – 30 June 2020. Copper should not exceed 1 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat	Yearly	1	0.006	0.006	0
Beulah#	Yearly	1	0.023	0.023	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Birchip	Yearly	1	0.002	0.002	0
Brim#	Yearly	1	0.006	0.006	0
Charlton	Yearly	1	0.021	0.021	0
Dimboola	Yearly	1	0.002	0.002	0
Donald	Yearly	1	0.005	0.005	0
Edenhope*	Yearly	3	0.007	0.005	0
Great Western	Yearly	1	0.019	0.019	0
Halls Gap	Yearly	1	0.014	0.014	0
Hopetoun	Yearly	1	0.073	0.073	0
Horsham	Yearly	1	0.002	0.002	0
Jeparit	Yearly	0	N/A	N/A	N/A
Lake Bolac	Yearly	1	0.180	0.180	0
Manangatang	Yearly	1	0.032	0.032	0
Minyip	Yearly	1	0.001	0.001	0
Murtoa	Yearly	1	0.001	0.001	0
Natimuk	Yearly	1	0.006	0.006	0
Nhill	Yearly	1	0.003	0.003	0
Ouyen	Yearly	1	0.005	0.005	0
Pomonal	Yearly	1	0.035	0.035	0
Quambatook	Yearly	1	0.002	0.002	0
Rainbow	Yearly	1	0.009	0.009	0
Rupanyup	Yearly	1	0.011	0.011	0
Sea Lake	Yearly	1	0.140	0.140	0
St. Arnaud	Yearly	1	0.007	0.007	0
Stawell	Yearly	1	0.006	0.006	0
Underbool	Yearly	1	0.002	0.002	0
Warracknabeal	Yearly	1	0.006	0.006	0
Willaura	Yearly	1	0.180	0.180	0
Woomelang#	Yearly	1	0.004	0.004	0
Wycheproof	Yearly	1	0.003	0.003	0

 # Declared drinking water 30/08/2019.

** 3 Samples taken as sampling frequency changed from quarterly to yearly at beginning of 2020*

3.4.7 Arsenic

The concentration of arsenic should not exceed 0.01 mg/L in drinking water based on health consideration. Arsenic is naturally occurring element, which can be introduced into water through dissolution of minerals and ore from industrial effluent and atmospheric deposition.

A detailed description of arsenic and its implications in a water supply can be found by reference to the ADWG.

3.4.7.1 Results

The sampling of arsenic is based on ADWG recommendations, risks, historical data and any operational changes. All samples for arsenic met the standard for the reporting period (Table 3-14).

There was one missed result for arsenic during the reporting period at Jeparit under Regulation 13 of the Safe Drinking Water Regulations 2015. There was a sample for a metals suite (arsenic, lead, zinc and copper) not taken due to the sampler not being able to access the sampling point. This has now been rectified, and the sample was rescheduled for July 2020.

Table 3-14 - Concentrations of Arsenic in Drinking Water for 1 July 2019 – 30 June 2020. Arsenic should not exceed 0.1 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat	Yearly	1	0.001	0.001	0
Beulah#	Yearly	1	0.001	0.001	0
Birchip	Yearly	1	0.001	0.001	0
Brim#	Yearly	1	0.001	0.001	0
Charlton	Yearly	1	0.001	0.001	0
Dimboola	Yearly	1	0.001	0.001	0
Donald	Yearly	1	0.001	0.001	0
Edenhope*	Yearly	3	0.002	0.002	0
Great Western	Yearly	1	0.001	0.001	0
Halls Gap	Yearly	1	0.001	0.001	0
Hopetoun	Yearly	1	0.001	0.001	0
Horsham	Yearly	1	0.001	0.001	0
Jeparit	Yearly	0	N/A	N/A	N/A
Lake Bolac	Yearly	1	0.001	0.001	0
Manangatang	Yearly	1	0.001	0.001	0
Minyip	Yearly	1	0.001	0.001	0
Murtoa	Yearly	1	0.001	0.001	0
Natimuk	Yearly	1	0.001	0.001	0
Nhill	Yearly	1	0.001	0.001	0
Ouyen	Yearly	1	0.001	0.001	0
Pomonal	Yearly	1	0.001	0.001	0
Quambatook	Yearly	1	0.001	0.001	0
Rainbow	Yearly	1	0.001	0.001	0
Rupanyup	Yearly	1	0.001	0.001	0
Sea Lake	Yearly	1	0.001	0.001	0
St. Arnaud	Yearly	1	0.001	0.001	0
Stawell	Yearly	1	0.001	0.001	0
Underbool	Yearly	1	0.001	0.001	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Warracknabeal	Yearly	1	0.001	0.001	0
Willaura	Yearly	1	0.001	0.001	0
Woomelang#	Yearly	1	0.001	0.001	0
Wycheproof	Yearly	1	0.001	0.001	0

Declared drinking water 30/08/2019.

** 3 Samples taken as sampling frequency changed from quarterly to yearly at beginning of 2020*

3.4.8 Fluoride

Fluoride is added to some water supplies to help protect teeth against dental decay. Based on health considerations, the concentration of fluoride in fluoridated drinking water supplies should not exceed 1.5 mg/L and Under s. 5 (3) of the *Health (Fluoridation) Act 1973*, fluoride added to drinking water must not result in an average optimum concentration of 1 mg/L. A detailed description of fluoride and its implications in a water supply can also be found by reference to the ADWG.

GWMWater has three fluoridated water supplies, including Ararat, Horsham and Natimuk. Fluoridation was installed at the Horsham WTP in November 2006 and Ararat WTP in August 2016. Natimuk receives treated water from Horsham.

3.4.8.1 Results

The sampling of fluoride is based on ADWG recommendations, the Code of practice for fluoridation of drinking water supplies, risks, historical data and any operational changes. There were no missed samples for fluoride during the reporting period, no water supplies exceeded the ADWG health-based guideline value for fluoride, and the average fluoride concentration delivered did not exceed the 1 mg/L (0.1 mg/L over the optimum range of 0.9 mg/L) designated by the *Health (Fluoridation) Act 1973* (Table 3-15).

Table 3-15 - Fluoride Results in Drinking Water for 1 July 2019 – 30 June 2020. The total concentration of fluoride should not exceed 1.5 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	Target Optimum operating concentration (mg/L)	No. of samples where standard was not met (S 18)
Ararat*	Twice-weekly	104	1.00	0.92	0.9	0
Horsham*	Twice-weekly	104	0.74	0.57	0.9	0
Natimuk	Weekly	52	0.66	0.58	0.9	0

** Due to the population size of these towns two samples are taken.*

3.4.9 Aluminium

Aluminium sulphate (Alum) and aluminium chlorohydrate (Megapac 23) are general-purpose coagulants that are used in water treatment, to remove turbidity, natural organic matter (including colour), microorganisms and many inorganic chemicals. These coagulants

are aluminium based, however, under normal operation, no aluminium is released in the final drinking water.

As stated in the ADWG, based on aesthetic problems caused by post-flocculation, the concentration of acid-soluble aluminium in drinking water should not exceed 0.2 mg/L. Water authorities are strongly encouraged to keep acid-soluble aluminium concentrations as low as possible, preferably below 0.1 mg/L. There are no health-based guideline values set for aluminium at this time.

3.4.10 Results

Risk based sampling was conducted at localities that have coagulation as part of the treatment process. Samples were collected as a minimum of a monthly basis, and acid-soluble aluminium was analysed. There were no missed samples for aluminium acid-soluble during the reporting period and all samples met the standard (Table 3-16).

Table 3-16 – Aluminium acid-soluble in Drinking Water for 1 July 2019 – 30 June 2020. Aluminium acid-soluble should not exceed 0.2 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat	Twice-monthly	24	0.06	0.04	0
Beulah#	Monthly	10	0.07	0.02	0
Birchip	Monthly	12	0.05	0.02	0
Brim#	Monthly	10	0.05	0.03	0
Charlton	Monthly	12	0.05	0.03	0
Dimboola	Monthly	12	0.03	0.02	0
Donald	Monthly	12	0.06	0.02	0
Edenhope	Monthly	12	0.02	0.01	0
Great Western	Monthly	12	0.05	0.03	0
Halls Gap	Monthly	12	0.03	0.02	0
Hopetoun	Monthly	12	0.09	0.02	0
Horsham	Twice-monthly	24	0.04	0.03	0
Jeparit	Monthly	12	0.10	0.03	0
Lake Bolac	Monthly	12	0.06	0.03	0
Manangatang	Monthly	12	0.01	0.01	0
Minyip	Monthly	12	0.03	0.02	0
Murtoa	Monthly	12	0.05	0.02	0
Natimuk	Monthly	12	0.05	0.03	0
Nhill	Monthly	12	0.03	0.02	0
Ouyen	Monthly	12	0.01	0.01	0
Pomonal	Monthly	12	0.03	0.02	0
Quambatook	Monthly	12	0.04	0.02	0
Rainbow	Monthly	12	0.07	0.03	0
Rupanyup	Twice-monthly	12	0.03	0.01	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Sea Lake	Monthly	12	0.04	0.02	0
St. Arnaud	Monthly	12	0.06	0.02	0
Stawell	Twice-monthly	24	0.07	0.04	0
Underbool	Monthly	12	0.08	0.02	0
Warracknabeal	Monthly	12	0.05	0.03	0
Willaura	Monthly	12	0.05	0.03	0
Woomelang#	Monthly	10	0.05	0.03	0
Wycheproof	Monthly	12	0.05	0.02	0

** Due to the population size of these towns two samples are taken.*

 # Declared drinking water 30/08/2019.

4 Aesthetic Parameters

Individual monitoring results for 2019/2020 that exceed the aesthetic guideline value set out in ADWG are highlighted in the tables in this section.

4.1 pH

The aesthetic parameter, pH is a measure of the hydrogen ion concentration of water. It is measured on a logarithmic scale from 0 to 14. A pH of seven is neutral, while a pH greater than seven is alkaline, and a pH less than seven is acidic.

The ADWG suggests that, based on the need to reduce corrosion and encrustation in pipework, drinking water should have a pH value between pH 6.5 and pH 8.5.

4.1.1 Results

Sampling and laboratory analysis for pH during the reporting period was undertaken on a weekly basis for all drinking water towns (Table 4-1). There were no missed samples for pH during the reporting period.

There were 6.4% of results which did not satisfy the aesthetic guideline values set out in the ADWG. This was particularly the case at Brim, Charlton, Donald, Hopetoun, Jeparit, Lake Bolac, Manangatang, Minyip, Rainbow, Rupanyup and Sea Lake, which each had more than 3 samples outside the recommended guideline values. These results related to reticulation sampling locations located at dead ends with low flow. Ad-hoc flushing was carried out to freshen up the end mains and GWMWater will review its flushing program to ensure water is kept circulated in these locations. The average pH sampled to all towns was within the expected ADWG range and continuous monitoring at the WTPs showed no deviations in critical control limits of pH.

Table 4-1 - pH Results for Drinking Water for 1 July 2019 – 30 June 2020. pH value should be between pH 6.5 and pH 8.5.

Sampling Locality	Sampling Frequency	No. of Samples	Max pH	Min pH	Average pH
Ararat*	Twice-weekly	104	8.2	6.7	7.3
Beulah#	Weekly	43	7.5	6.1	7.0
Birchip	Weekly	52	8.2	6.1	6.9
Brim#	Weekly	43	9.6	6.7	7.9
Charlton	Weekly	52	9.4	6.5	7.7
Dimboola	Weekly	52	8.8	6.5	7.4
Donald	Weekly	52	8.9	6.4	7.4
Edenhope	Weekly	52	8.9	6.9	7.6
Great Western	Weekly	52	8.4	6.3	7.4
Halls Gap	Weekly	52	8.4	6.5	7.2
Hopetoun	Weekly	52	9.7	6.2	7.3
Horsham*	Twice-weekly	104	8.4	6.4	7.3
Jeparit	Weekly	52	9.4	6.2	7.5

Sampling Locality	Sampling Frequency	No. of Samples	Max pH	Min pH	Average pH
Lake Bolac	Weekly	52	9.4	7.0	7.9
Manangatang	Weekly	52	7.4	6.4	6.9
Minyip	Weekly	52	10.0	6.3	7.8
Murtoa	Weekly	52	8.4	6.4	7.4
Natimuk	Weekly	52	8.7	6.5	7.3
Nhill	Weekly	52	8.8	6.6	7.4
Ouyen	Weekly	52	7.9	7.0	7.3
Pomonal	Weekly	52	7.8	6.4	7.2
Quambatook	Weekly	52	8.5	6.8	7.4
Rainbow	Weekly	52	9.8	6.2	7.1
Rupanyup	Weekly	52	7.6	6.2	7.0
Sea Lake	Weekly	52	9.9	6.3	7.3
St Arnaud	Weekly	52	8.7	6.4	7.4
Stawell*	Twice-weekly	104	8.0	6.2	7.2
Underbool	Weekly	52	8.1	6.8	7.4
Warracknabeal	Weekly	52	8.8	6.5	7.5
Willaura	Weekly	52	8.8	6.6	7.4
Woomelang#	Weekly	43	8.4	6.3	7.3
Wycheproof	Weekly	52	8.6	6.2	7.2

** Due to the population size of these towns two samples are taken.*

 # Declared drinking water 30/08/2019.

4.2 Colour

In natural waters, colour is mainly due to the presence of Dissolved Organic Matter (DOM), which originates from soil and decaying vegetation.

The dissolution of metals in pipes and fittings can also discolour drinking water. In bore water, 'red water' is a frequent problem, caused by the oxidation of iron. In addition, a black discolouration in reservoirs and distribution systems can result from the action of bacteria on dissolved manganese to produce insoluble oxides. Some of these compounds form colloidal suspensions, or are only partially dissolved, and so contribute to apparent rather than true colour.

The fact sheet in the ADWG for colour states that, based on aesthetic considerations, true colour in drinking water should not exceed 15 Hazen Units (HU). GWMWater has an internal performance benchmark that the mean true colour will be less than 15 Hazen Units.

4.2.1 Results

The sampling of true colour was scheduled for Lake Bolac, Quambatook and Willaura based on ADWG recommendations, risks and historical data (Table 4-2). There were no missed samples for true colour and all samples met the standard this reporting period.

Table 4-2 - True Colour Results for Drinking Water Supplied of 1 July 2019 – 30 June 2020. True colour in drinking water should not exceed 15 Hazen Units (HU).

Sampling Locality	Sampling Frequency	No. of Samples	Max (HU)	Average (HU)
Lake Bolac	Monthly	12	12	7
Quambatook	Monthly	12	6	3
Willaura	Monthly	12	12	7

4.3 Hardness

Hardness is caused primarily by the presence of calcium and magnesium ions.

The ADWG discuss ramifications of hardness and what constitutes hard and soft water. ADWG suggest that, to minimise build-up of scale in hot water systems, total hardness (as calcium carbonate) in drinking water should not exceed 200 mg/L.

High total hardness may be a problem for supplies reliant on groundwater. Surface waters can generally be expected to have acceptable values.

4.3.1 Results

Hardness sampling and analysis was either quarterly, biannual or annually for drinking water supplies (Table 4-3). There were no exceedances of hardness and no missed samples for this reporting period (a change in sampling frequency occurred from the commencement of the 2020 calendar year based on historic hardness levels having low variability and low negative consequence (Table 3-1)).

Table 4-3 - Hardness Results for Drinking Water Supplied of 1 July 2019 – 30 June 2020. GWMWater internal performance benchmark that the mean hardness should be less than 200 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)
Ararat*	Twice-biannually	6	48	33
Beulah#	Quarterly	4	20	16
Birchip	Biannually	3	19	18
Brim#	Quarterly	4	29	20
Charlton	Biannually	3	25	18
Dimboola	Biannually	3	19	15
Donald	Biannually	3	23	19
Edenhope	Quarterly	4	170	140
Great Western	Biannually	3	33	29
Halls Gap	Biannually	3	36	27
Hopetoun	Quarterly	4	18	16
Horsham*	Twice-quarterly	8	28	22
Jeparit	Biannually	3	18	15
Lake Bolac	Quarterly	3	25	22

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)
Manangatang	Biannually	3	18	15
Minyip	Quarterly	4	24	17
Murtoa	Biannually	3	20	17
Natimuk	Quarterly	4	36	25
Nhill	Quarterly	4	20	16
Ouyen	Biannually	3	46	26
Pomonal	Biannually	3	32	28
Quambatook	Annually	3	150	130
Rainbow	Biannually	3	16	12
Rupanyup	Biannually	3	18	16
Sea Lake	Quarterly	4	21	18
St Arnaud	Biannually	3	20	18
Stawell*	Twice- biannually	6	37	26
Underbool	Quarterly	4	55	33
Warracknabeal	Biannually	3	22	17
Willaura	Annually	2	24	18
Woomelang#	Quarterly	4	23	15
Wycheproof	Biannually	3	22	16

** Due to the population size of these towns two samples are taken.*

 # Declared drinking water 30/08/2019.

4.4 Electrical Conductivity

Electrical Conductivity (EC) is caused by inorganic salts and small amounts of organic matter that are dissolved in water. Electrical conductivity mostly comprises sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate (and nitrite) and phosphate.

High EC values may be associated with excessive scaling in pipes, fittings and household appliances.

The ADWG sets a guideline values for Total Dissolved Solids (TDS) of 600 mg/L and approximates that the TDS is 0.64 times the electrical conductivity value. As it is more cost effective to monitor electrical conductivity than total dissolved solids, the analysis for compliance is based on electrical conductivity. The ADWG value for TDS is equivalent to an electrical conductivity of 1000 µS/cm.

4.4.1 Results

Sampling and field analysis for electrical conductivity was undertaken on a weekly basis for all drinking water supplies other than Ararat, Stawell and Horsham where twice weekly samples were taken. There were no missed samples for and no exceedances for this reporting period (Table 4-4).

Table 4-4 - Electrical Conductivity (EC) Results for Drinking Water Supplied of 1 July 2019 – 30 June 2020. EC in drinking water should be less than 1000 µS/cm.

Sampling Locality	Sampling Frequency	No. of Samples	Max (µS/cm)	Average (µS/cm)
Ararat*	Twice-weekly	104	300	221
Beulah#	Weekly	43	212	120
Birchip	Weekly	52	296	115
Brim#	Weekly	43	195	126
Charlton	Weekly	52	200	122
Dimboola	Weekly	52	175	117
Donald	Weekly	52	255	138
Edenhope	Weekly	52	865	798
Great Western	Weekly	52	315	233
Halls Gap	Weekly	52	185	145
Hopetoun	Weekly	52	222	122
Horsham*	Twice-weekly	104	260	174
Jeparit	Weekly	52	145	117
Lake Bolac	Weekly	52	275	169
Manangatang	Weekly	52	353	97
Minyip	Weekly	52	170	125
Murtoa	Weekly	52	220	122
Natimuk	Weekly	52	300	177
Nhill	Weekly	52	190	116
Ouyen	Weekly	52	327	125
Pomonal	Weekly	52	205	143
Quambatook	Weekly	52	1068	657
Rainbow	Weekly	52	383	123
Rupanyup	Weekly	52	205	121
Sea Lake	Weekly	52	383	125
St Arnaud	Weekly	52	225	133
Stawell*	Twice-weekly	104	240	194
Underbool	Weekly	52	352	177
Warracknabeal	Weekly	52	220	119
Willaura	Weekly	52	225	153
Woomelang#	Weekly	43	180	121
Wycheproof	Weekly	52	257	118

** Due to the population size of these towns two samples are taken.*

 # Declared drinking water 30/08/2019.

4.5 Iron

At concentrations exceeding 0.3 mg/L, iron imparts an undesirable taste to water and stains plumbing fixtures and laundry. Some micro-organisms can concentrate iron and give rise to taste, odour and turbidity problems in distribution systems.

Based on aesthetic considerations the ADWG suggests that the concentration of iron in drinking water should not exceed 0.3 mg/L. A detailed description of iron and its implications in a water supply can be found by reference to the ADWG.

4.5.1 Results

The sampling of iron is based on ADWG recommendations, risks, and historical data. There were no missed samples and no exceedance of iron for this reporting period (Table 4-5).

Table 4-5 - Iron Results for Drinking Water Supplied of 1 July 2019 – 30 June 2020. Iron in drinking water should not exceed 0.3 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)
Nhill	Monthly	12	0.020	0.011
Quambatook	Monthly	12	0.030	0.016

4.6 Zinc

Based on aesthetic considerations the ADWG suggests that the concentration of zinc in drinking water should not exceed 3 mg/L as at higher concentrations zinc can impact the taste of water and cause visual impact at higher concentrations

4.6.1 Results

The sampling of zinc is based on ADWG recommendations, risks, and historical data.

There were one missed result for zinc during the reporting period at Jeparit under Regulation 13 of the Safe Drinking Water Regulations 2015. There was a sample for a metals suite (arsenic, lead, zinc and copper) not taken due to the sampler not being able to access the sampling point. This has now been rectified, and the sample was rescheduled to for July 2020.

Table 4-6 - Zinc Results for Drinking Water Supplied of 1 July 2019 – 30 June 2020. Zinc in drinking water should not exceed 3 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Ararat	Yearly	1	0.004	0.004	0
Beulah#	Yearly	1	0.020	0.020	0
Birchip	Yearly	1	0.019	0.019	0
Brim#	Yearly	1	0.012	0.012	0
Charlton	Yearly	1	0.006	0.006	0

Sampling Locality	Sampling Frequency	No. of Samples	Max (mg/L)	Average (mg/L)	No. of samples where standard was not met (S 18)
Dimboola	Yearly	1	0.003	0.003	0
Donald	Yearly	1	0.004	0.004	0
Edenhope	Yearly	1	0.003	0.003	0
Great Western	Yearly	1	0.003	0.003	0
Halls Gap	Yearly	1	0.007	0.007	0
Hopetoun	Yearly	1	0.027	0.027	0
Horsham	Yearly	1	0.004	0.004	0
Jeparit	Yearly	0	N/A	N/A	N/A
Lake Bolac	Yearly	1	0.003	0.003	0
Manangatang	Yearly	1	0.004	0.004	0
Minyip	Yearly	1	0.004	0.004	0
Murtoa	Yearly	1	0.011	0.011	0
Natimuk	Yearly	1	0.004	0.004	0
Nhill	Yearly	1	0.003	0.003	0
Ouyen	Yearly	1	0.004	0.004	0
Pomonal	Yearly	1	0.004	0.004	0
Quambatook	Yearly	1	0.024	0.024	0
Rainbow	Yearly	1	0.015	0.015	0
Rupanyup	Yearly	1	0.009	0.009	0
Sea Lake	Yearly	1	0.011	0.011	0
St. Arnaud	Yearly	1	0.003	0.003	0
Stawell	Yearly	1	0.003	0.003	0
Underbool	Yearly	1	0.007	0.007	0
Warracknabeal	Yearly	1	0.003	0.003	0
Willaura	Yearly	1	0.003	0.003	0
Woomelang#	Yearly	1	0.029	0.029	0
Wycheproof	Yearly	1	0.004	0.004	0

Declared drinking water 30/08/2019.

5 Analysis of Results

Regulation 16(h) requires a reporting of analysis of all water quality sample information, data and results of drinking water supplied for this reporting period, 2019/2020 with the last two reporting periods, 2018/2019 and 2017/2018 (Table 5-1).

The water quality performance has remained consistent compared with the previous reporting periods, with 6.4% of pH samples exceeding the 6.5-8.5 range recommended in the ADWG. Investigation demonstrated that WTPs were producing water within ADWG and the average pH in all reticulation meet the ADWG. These exceedances were skewed towards sampling locations in the reticulation that have less water throughput or are at the end of mains. This information is being used to implement an improved mains flushing program for the 2020/2021 year and inform GWMWater mains replacement program.

A missed sample was identified for free chlorine at Wycheproof. Historic chlorine levels in the reticulation, online analysers at the entry point to the town were within ADWG. In addition there were no microorganisms detected in the sample and the WTP was operating with all controls in place at the time, indicating there was low risk from this sample being missed. A missed sample was identified for the metals arsenic, lead, zinc and copper at Jeparit. Investigation of historic trends and water treatment controls showed that there was minimal risk from this annual sample being missed, and was rescheduled for July 2020. All supplies the standards for drinking water except for pH.

Table 5-1 - Comparison of analysis of water quality results of drinking water supplied from 2017/2018 to 2019/2020.

Parameters	2017/2018		2018/2019		2019/2020	
	Localities supplied drinking water that met standard (%)	Customers supplied drinking water that met standard (%)	Localities supplied drinking water that met standard (%)	Customers supplied drinking water that met standard (%)	Localities supplied drinking water that met standard (%)	Customers supplied drinking water that met standard (%)
Escherichia coli	96.6	99.3	100	100	100	100
Trihalomethanes	96.6	98.1	100	100	100	100
Turbidity	100	100	100	100	100	100
Aluminium acid-soluble	100	100	100	100	100	100
Monochloroacetic acid	100	100	100	100	100	100
Dichloroacetic acid	100	100	100	100	100	100
Trichloroacetic acid	100	100	100	100	100	100
Chlorine	100	100	100	100	100	100
Lead	100	100	100	100	100	100
Nitrite	100	100	100	100	100	100
Nitrate	100	100	100	100	100	100
Copper	100	100	100	100	100	100
Arsenic	100	100	100	100	100	100

Fluoride	100	100	100	100	100	100
pH*	44.8	45.7	31.0	45.1	37.5	41.4
Colour	93.1	98.8	100	100	100	100
Hardness	100	100	100	100	100	100
Electrical conductivity	96.6	98.1	100	100	100	100
Iron	100	100	100	100	100	100
Zinc#	N/A	N/A	N/A	N/A	100	100

* pH counted as not meeting targeted standard for the locality if multiple (≥2) exceedances occurred.
# Added to the sampling schedule at the beginning of 2020

6 Complaints

6.1 Complaints and Responses

GWMWater's Customer Complaints and Disputes Policy recognises the customer's rights, including the right to complain.

GWMWater systematically records all complaints in a register. Trends in water quality complaints are able to be tracked, monitored, and actioned appropriately.

All customer complaints are investigated to determine the cause and significance of the complaint. Operational changes or capital improvements which optimise treated water quality, may be implemented in response to significant customer complaints. In response to a complaint, customers are contacted directly followed by appropriate action, which will vary depending on the nature of the complaint.

Table 6-1 and Table 6-2 summarises the complaints received during the reporting period for both drinking water and regulated water supplies.

Table 6-3 and Table 6-4 provide a detailed breakdown of the total number of complaints received from customers supplied with drinking and regulated water respectively.

Table 6-1 – Drinking Water Quality Complaints comparison between 2017/2018 to 2019/2020.

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2017/2018	2018/2019	2019/2020	
Discoloured	66	53	58	No significant change.
Taste/Odour	13	12	6	50% decrease. Compared with previous years there were no taste or odour complaints related to the odour producing compound geosmin.
Air in water	3	10	18	Significant increase from previous years, resultant from several mains breaks and repairs that resulted in air in water in certain parts of town.
Other	4	0	7	Scattered concerns over harm to plants and related to chemicals in water.
Total	86	75	89	19% Increase

Table 6-2 – Regulated Water* Quality Complaints comparison between 2017/2018 to 2019/2020.

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2017/2018	2018/2019	2019/2020	
Discoloured	36	29	35	No significant change.
Odour	12	12	7	Decrease.
Air in water	0	1	0	No significant change.
Other	1	0	3	No significant change.
Total	49	42	45	GWMWater conducted flushing and implemented raw water storage cleaning program, air scouring and mains swabbing program.

** Regulated water is water that is not intended for drinking. Refer to Section 8 for more information.*

6.2 Analysis of Issues

Over the 2019/2020 reporting period the total number of customer complaints for drinking water and regulated supplies were within the expected range compared with the previous reporting periods.

The most significant change in complaint numbers was an increase in discoloured and air in water complaints for drinking water supplies. The majority of these complaints occurred in Ararat (23) and Horsham (15). Of the Ararat complaints, 21 were attributed to different mains breaks and subsequent repairs in February and June. Work on the water mains can lead to discoloured water and air in water in localised parts of Ararat and so the works can lead to sporadic complaints for a short period of time. All six of the air in water complaints in Horsham could be also attributed to a mains break in May. Increased flushing of the water mains was conducted to help provide clearer water soon after the repairs were completed.

Discoloured water complaints occurred in Nhill due to some small iron deposits in the mains, which had four complaints occurring during this reporting period. This is due to the town having historically being supplied untreated water from bores and old infrastructure. Historically, flushing, air scouring and ice pigging of the water lines have been completed to remove almost all the iron with some residual pocket remaining. GWMWater is monitoring this closely to assess if further cleaning works will be required.

Willaura can be subject to the occasional taste and odour complaint, and had two for this reporting period. This is due to variability in the supply (between bore and creek water) and use of chloramination at the water treatment plant for disinfection of the water. There was no other notable trend in taste odour complaints, and in each case of a complaint the water treatment plants were operating correctly to deliver water at ADWG standards.

Discolouration due to iron deposits in the mains pipeline also occurs for the reticulated town of Kaniva, which had four complaints for this reporting period. Regulated towns of Moyston (four complaints) and Wickliffe (nine) are subject to variable water quality from seasonal inflows. Moyston is planned for an upgrade to drinking water through a supply of water from Ararat. Wickliffe will be supplied water from Lake Fyans through the East Grampian Pipeline project, which is expected to increase the satisfaction of the community by the end of 2021. GWMWater is also improving the water quality of these regulated towns by increased swabbing, flushing and coagulant dosing raw of storages.

Table 6-3 - Water Quality Complaints for Drinking Water Towns for 2019/2020.

Locality	Population	Number of Complaints				
		Colour	T&O^	Air	Other	Total
Ararat	7200	15		8		23
Beulah	360					0
Birchip	760					0
Brim	190					0
Charlton	1140	1			1	2
Dimboola	1870					0
Donald	1620	4				4
Edenhope	1020					0
Great Western	430					0
Halls Gap	470	1				1
Hopetoun	590	1				1
Horsham	15730	9		6	3	18
Jeparit	370	3		1		4
Lake Bolac	360					0
Manangatang	260	2				2
Minyip	570	1				1
Murtoa	940	1				1
Natimuk	560	1				1
Nhill	2360	6				6
Ouyen	1290	1				1
Pomonal	350					0
Quambatook	270	1		1		2
Rainbow	740	1				1
Rupanyup	580				1	1
Sea Lake	690	1		2		3
St Arnaud	2200	2	2			4
Stawell	5970	5	1			6
Underbool	200					0
Warracknabeal	2510	2	1		2	5
Willaura	290		2			2
Woomelang	220					0
Wycheproof	640					0
Total	52750	58	6	18	7	89

^ *Taste and Odour (T & O).*

Table 6-4 - Water Quality Complaints for Regulated Supplies for 2019/2020.

Locality	Population	Number of Complaints				
		Colour	Odour	Air	Other	Total
Antwerp	70					0
Apsley	300					0
Berriwillock	200	3				3
Buangor	110	2				2
Chillingollah	10					0
Chinkapook	40					0
Cowangie	40					0
Culgoa	110	2				2
Dooen	260					0
Elmhurst	200	1	1			2
Glenorchy	140	1				1
Goroke	320					0
Harrow	220				1	1
Jung	260					0
Kaniva	680	4				4
Kiata	70					0
Lalbert	160		1			1
Lascelles	100					0
Lillimur	120					0
Marnoo	130					0
Miram	380	1				1
Moyston	300	4				4
Murrayville	40					0
Nandaly	90	1				1
Nullawil	100					0
Patchewollock	140		1			1
Pimpinio	200				1	1
Serviceton	130	1				1
Speed	80					0
Streatham	170		1			1
Tarranyurk	30					0
Tempy	60	1				1
Ultima	190	3	2			5
Waitchie	50					0
Walpeup	170		1			1
Watchem	120	2				2
Westmere	40				1	1
Wickliffe	120	9				9
Yaapeet	90					0
Total	6040	**35**	**7**		**3**	45

7 Risk Management Plan Audit

The regulatory audit covering the 2018-2020 reporting period is being completed in July 2020, and so will be reported on in the annual report in 2021.

All improvements identified in the previous audit in 2016-2018 were completed before the commencement of the 2019/2020 year.

8 Undertakings under Section 30 of the Act

There were no undertakings during the reporting period.

9 Regulated Water

Regulated water is water that is not intended for drinking, but which could reasonably be mistaken as drinking water. This could be the case when such water is, for example, delivered to households through a piped reticulation system.

Section 6 of the *Safe Drinking Water Act 2003* allows the Minister for Health to declare certain water as regulated. The Minister for Health declared all rural water pipelines, other than the WMP, as regulated supplies in the Victorian Government Gazette No. S 36 on Monday 23 February 2009.

GWMWater must manage risks in relation to water that is not intended for drinking, as part of its normal business practices. GWMWater is required to:

- Prepare a Risk Management Plan for the regulated water.
- Ensure the Risk Management Plan contains the matters specified in Regulation 8 of the Safe Drinking Water Regulations.
- Have the Plan audited by an approved auditor.
- Take all reasonable steps to minimise the likelihood of the water being mistaken as drinking water.
- Include a summary of the management activities for regulated water supply in the Annual Report.

GWMWater had a total of 39 towns supplied with water classified as 'regulated water' under Section 6 of the Act during the reporting period. The regulated water supplies are listed in Table 1-2.

Under Section 25 of the *Safe Drinking Water Act 2003*, water suppliers are required to report on the steps taken to make the public aware of regulated water (non-drinking water). GWMWater informs their customers in towns with a regulated water supply are advised of the water quality through:

a) 'Do not drink the water' symbol notices on their water bills, - four bills per annum.
b) Issue 'Untreated Water Supply' newsletters annually.
c) Provide 'Do not drink the water' signage/stickers to Local Government to place on publicly accessible taps in each town.
d) Provide information on GWMWater's website (https://www.gwmwater.org.au/connecting-services/urban-and-reclaimed-water/drinking-water-in-urban-areas).

Tanks were installed at the raw water storage of Harrow for regulated supply to that community. These tanks provided an improvement of water quality and reduced the risk of blue green algae growth compared with the existing open storages. The Mallee Towns Drinking Water Supply Project concluded the upgrade of three regulated supplies (Brim, Beulah and Woomelang) to a treated drinking water supply.

10 Emergency, Incident and Event Management

GWMWater has developed an Emergency Management Plan, and specific procedures for the management of water quality incidents.

Water quality incidents are notifiable to DHHS under Section 18s and 22s of the *Safe Drinking Water Act 2003*. Section 18s notifications give DHHS an early warning notification of any known or suspected problem, whereas section 22s reports are given when the water quality standard has not been met. For the 2019/2020 year, GWMWater:

- complied with the obligations imposed by section 18 of the *Safe Drinking Water Act 2003*, and
- provided DHHS with two notifications for section 22 of the *Safe Drinking Water Act 2003*.

10.1 Detection of E*scherichia. coli* – section 22 notification

A reading of 1 *E. coli*/100 mL was recorded in a sample at Willaura on the 15/07/2019 and one sample at St. Arnaud on the 17/07/2019. In response, the reticulation system was flushed, multiple sites were re-sampled (before and after flushing), and an investigation was carried out to determine if the *E. coli* result was a false positive in accordance with Schedule 2 of the Safe Drinking Water Regulations 2015.

The investigation concluded that the results of the analysis conducted in accordance with regulation 14 were not representative of the water in the relevant water sampling locality because:

- all other factors that would indicate the presence of *E. coli* were not present in the water in the water sampling locality at the time of the investigation; and
- the drinking water treatment process applied were such as would be reasonably expected to have eliminated the presence of *E. coli* in the water sampling locality at the time; and
- all plant and infrastructure associated with the water treatment process were operating to specification at all relevant times; and
- there were no issues arising from degradation of plant or infrastructure in or around the relevant water sampling locality that could reasonably be suspected to have contributed to the presence of *E. coli* in the drinking water in that water sampling locality.

Accordingly, the result was deemed to be a false positive, escalation via a Section 18 notification was not needed, and no further action was required.

10.2 Blue-Green Algae (BGA) in the Murray River

GWMWater experienced a BGA event in the Murray River beginning the end of December 2019 and ending early February 2020. The bloom was initially deemed to be toxic due to the presence of the potentially toxic species *Dolichospermum* coiled (≥ 8 µm), however further investigation found that this species could be correctly identified as the non-toxic *Dolichospermum crassum*, reducing the response required around the bloom. During the bloom the sampling frequency increased to daily at affected pump stations, customers in the affected areas were notified and GWMWater maintained an incident management team during the event.

The supply to the Manangatang WTP, which is directly fed off a pipeline from the Murray River, was switched off when the concentration of BGA was above the trigger threshold. Demand for Manangatang rarely exceeded supply so water carting was only needed for 18-20 January. No other major operational changes were required during the bloom.

As a consequence of the algal bloom, high levels of geosmin and 2-Methylisoborneol were reported in the Murray River. While they do not cause harm to human health, these compounds can cause taste and odour complaints. Geosmin and 2-Methylisoborneol can occur in high concentrations as a result of algal growth and subsequent die off in source waters. GWMWater's WTPs that are supplied raw water from the river are not currently equipped to remove these compounds. To manage the issue, the frequency of monitoring these compounds was increased, and filling of and consumption of raw water storages fed from the river was managed to minimise the impact of taste and odour for drinking water towns. No other operational changes were needed and there was not an increase in water quality complaints related to taste or odour during this event. GWMWater water is assessing all treatment options to help manage future blooms anticipated under climate change.

11 Water Storage Manager

In addition to being a water supplier for the purposes of the Act, GWMWater is also a water Storage Manager. GWMWater liaise with Wimmera CMA for all the reservoirs that are in the Wimmera catchment and Glenelg Hopkins CMA for Rocklands Reservoir and Moora Moora Reservoir. This situation arises when a water corporation owns reservoirs or major headworks assets which supply water to multiple users including other water corporations. Other water corporations may in turn use the water to supply drinking water to various localities.

GWMWater assumes this role for the two water corporations described below. Being both a water supplier and a water storage manager places some additional legislative responsibilities onto GWMWater. To address this, GWMWater has executed a Memorandum of Understanding (MoU) with Wannon Water and Coliban Water, stating how its obligations as a water storage manager will be met.

Monthly monitoring is undertaken for a suite of predetermined parameters, with all analysis being conducted by a NATA accredited laboratory. These results are made available to the other water corporations as needed, as is access to all monitoring data conducted by GWMWater in its role of Water Supply Manager.

GWMWater has developed a risk management framework for the headworks storages under its control. GWMWater's operational staff meet with personnel from Coliban Water and Wannon Water on an annual basis to discuss the agreement.

Table 11-1 – Summary of water supply systems.

Catchments	Source Water	Raw water storage area	Treatment*	Treatment Plant	Water Receivers
Lake Bellfield	Supply System 4, Wimmera Mallee Pipeline	N/A	N/A	N/A	Coliban Water
Waranga Western Channel	Waranga Basin	N/A	N/A	N/A	Coliban Water
Willaura Headwork – Mt William and Stoney Creek	Glenthompson Pipeline	N/A	N/A	N/A	Wannon Water
Rocklands Reservoir	Pipeline	N/A	N/A	N/A	Wannon Water

* The water storage manager does not apply any drinking water treatment processes before supplying its water.

11.1 Coliban Water

GWMWater provides raw water to Coliban Water, which subsequently treats the water and supplies it to the localities of Wedderburn, Borung, Korong Vale and Wychitella (Figure 2). In winter this water is sourced predominately from Supply System 4 of the WMP, which is fed from the Grampians Headworks, primarily Lake Bellfield. Taylors Lake provides an emergency back-up source of supply to the WMP should Lake Bellfield become unsuitable for any reason. In summer between November and April the raw water supply to Coliban Water is switched to the Waranga Basin, managed by GMWater via the Waranga Western Channel.

The catchment of Lake Bellfield is National Park, and is a moderately protected surface water (category 2). The catchment of Taylors Lake includes both streams originating in the National Park and land utilised for farming. Taylors Lake can also receive water transfers from other reservoirs within the Grampians Headworks. Taylors Lake and the Waranga Basin is considered to be a poorly protected catchment and such are category 4 under the health based targets assessment.

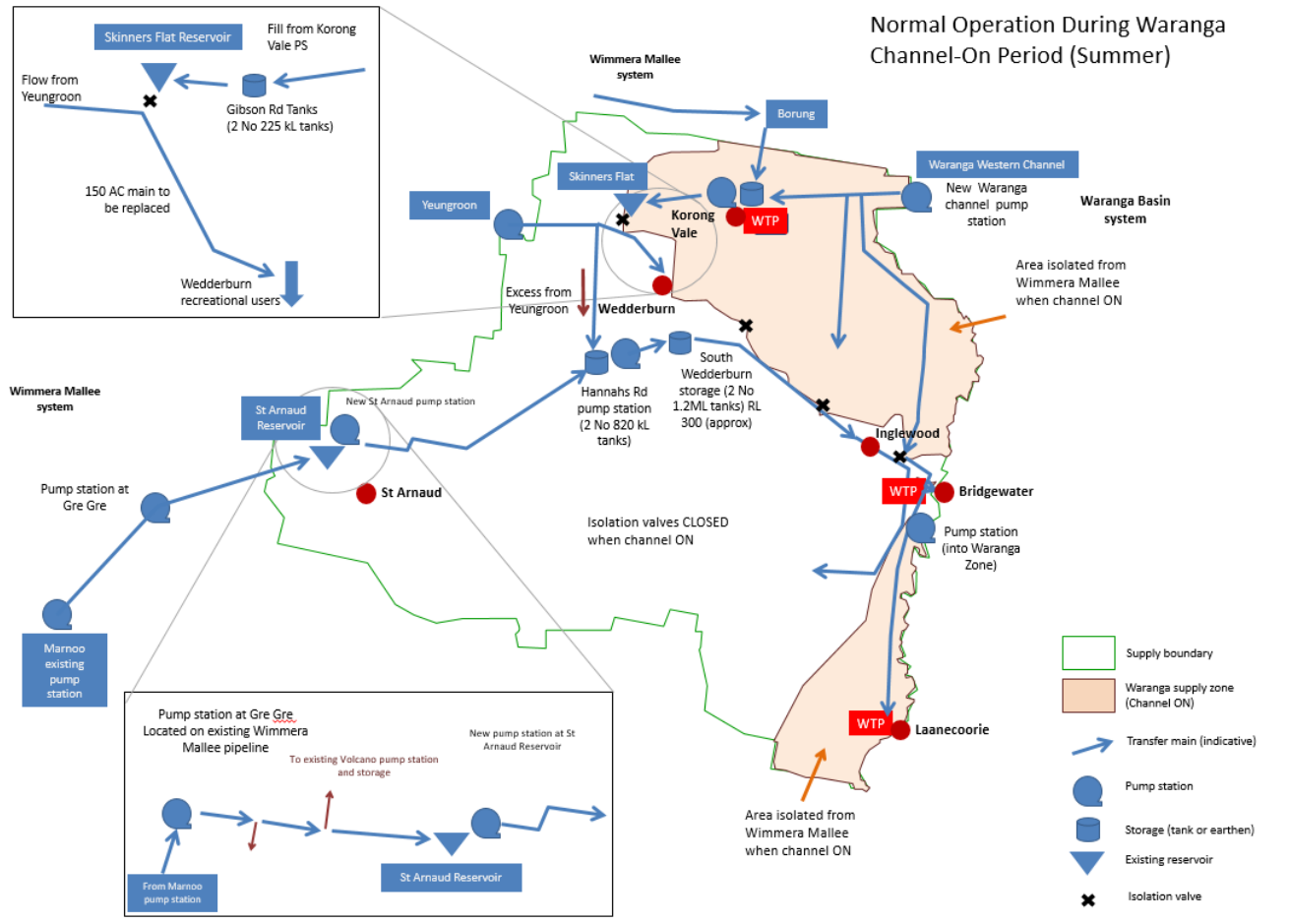

Figure 2: Schematic showing supplies to Coliban Water from Bellfield and Waranga Western Channel (during summer).

11.2 Wannon Water

GWMWater delivers untreated water from the Willaura Headworks (Mt William and Stoney Creek) to Wannon Water through the Glenthompson Pipeline (Figure 3A). Between the months of June and December, water supplied to Glenthompson is primarily from surface water diversion from unregulated waterways in the Grampians National Park. Groundwater bores supply water between January and May.

The bore water is considered a protected catchment (category 1), while the creeks deliver water from a moderately protected catchment (category 2). The overall catchment classification is category 2.

The water for Hamilton and Balmoral is taken directly from Rocklands Reservoir. Rocklands Reservoir is located between the Grampians National Park and Black Range State Park. The majority of the catchment is native forest, however the storage is poorly protected (category 3).

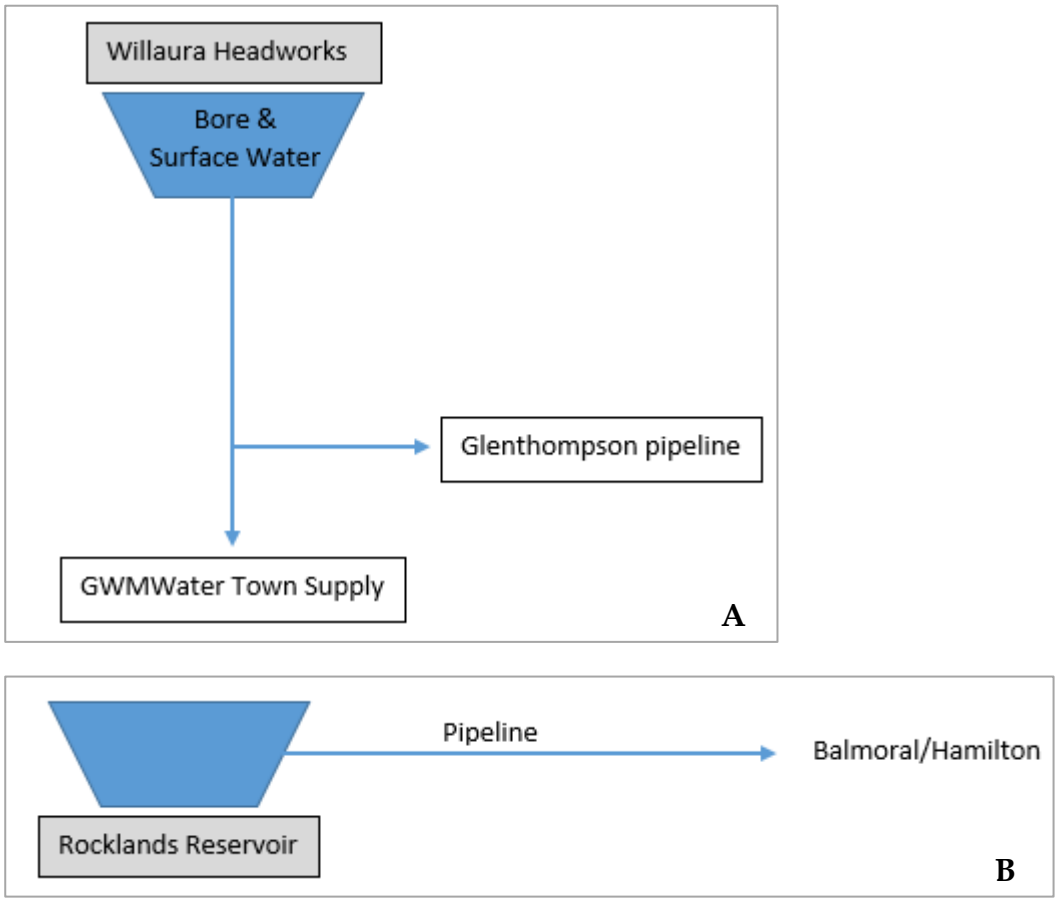

Figure 3: Simplified schematic diagram showing supplies to Wannon Water from Willaura Headworks (A), and Rocklands Reservoir (B).

12 Glossary of Terms

Terms and abbreviations used in this report have been collated into a Glossary to provide clarity.

Term/Abbreviation	Description
ADWG, 2011:	The Australian Drinking Water Guidelines provide a framework for the management of drinking water supplies designed to ensure safety at the point of use.
Alum:	Aluminium sulphate as used as a coagulant in the water treatment process.
BGA:	Blue Green Algae.
BOOT:	Build, Own, Operate and Transfer. A form of commercial contract associated with the provision of treated water at privately-owned water treatment plants.
Bore:	Conduit for extracting groundwater from an aquifer to the surface for use in a town water supply.
CCP:	Critical Control Point in the Risk Management Plan.
Chlorination:	Process of adding chlorine to water as a disinfectant.
Coagulation:	The clumping together of solids so they can more easily be settled out or filtered out of water. A chemical called aluminium sulphate (alum) or aluminium chlorohydrate (Megapac 23) is generally used to aid coagulation in water treatment.
Concentration:	A measure of how much of a given substance there is mixed with another substance (in this case water), usually expressed as a weight to volume, e.g. milligrams per litre (mg/L).
CWS:	Clear Water Storage.
DELWP:	Department of Environment, Land, Water and Planning
DHHS:	Department of Health and Human Services.
DBP:	Disinfection by-product – a reaction of natural organic material with the disinfectant medium producing by-products via reaction.
Disinfection-only	Water supplies that have disinfection as their only form of treatment.
Dissolution:	A form of chemical weathering in which water molecules, sometimes in combination with acid or another compound in the environment, attract and remove oppositely charged ions or ion groups from a mineral or rock.
Distribution system:	The system of pipes delivering water from the water treatment plant to the reticulation system.
DOC:	Dissolved organic carbon – a measure of the concentration of humic and fulvic acids in the water.
DOM:	Dissolved organic matter – this term can be interrelated with the amount of 'colour' in the water (is similar to DOC).
Drinking water:	Legislatively defined as water intended for human consumption or associated with purposes for human consumption. Also known as a potable supply.
EC:	Electrical conductivity as measured in micro Siemens per centimetre (µS/cm).
Entry point:	The point at which the water supply enters the reticulation system.

Flocculation:	The water treatment process after coagulation that uses gentle stirring to cause suspended particles to form larger, aggregated masses (floc). The aggregates are removed from the water by a separation process (e.g. sedimentation, flotation, or filtration).
Fluoridation:	The act of adding fluoride to a water supply in accordance with the *Health (Fluoridation) Act 1973*.
Fully-treated water Supplies:	Water supplies that have coagulation and filtration processes in addition to disinfection.
GWMWater:	Grampians Wimmera Mallee Water Corporation (trading as GWMWater).
Hardness:	Caused by the presence of calcium and magnesium ions in water and can contribute to scale build up in pipes and appliances.
HU:	Scientific units for true colour measurements – Hazen Units.
Jar Testing:	A bench top test designed to optimise chemical dose rates based on known quality of raw water.
kL:	Kilolitre (1,000 L).
L:	Litre
Megapac 23:	Aluminium chlorohydrate as used as a coagulant in the water treatment process.
mg/L:	Scientific units for the concentration of a parameter given as milligrams per litre. Also known as parts per million (ppm).
ML:	Megalitre (1,000,000 L).
NATA:	National Association of Testing Authorities, Australia. National Accredited Testing Authority.
NMP:	Northern Mallee Pipeline drawing its water from the Murray River.
Notifications:	Pursuant to Sections 18 and 22 of the *Safe Drinking Water Act,* 2003.
NTU:	Scientific units for turbidity measurements – Nephelometric Turbidity Units.
Orgs/100 mL:	Organisms per 100 mL. A measure of the number of *E. coli*.
pH:	The measure of the concentration of hydrogen ions in a sample related to a logarithmic scale between 1 (acidic) and 14 (basic).
Regulated water:	Water not intended for human consumption, but that could easily be mistaken as such. Also known as non-potable supply. This term is defined in the *Safe Drinking Water Act,* 2003.
Reticulation system:	The system of pipes delivering water to the customers tap from the entry point of the system.
RMP:	Risk Management Plan pursuant to the *Safe Drinking Water Act 2003*.
Safe Drinking Water Act, 2003:	Legislative framework for assuring drinking water quality in Victoria.
Safe Drinking Water Regulations, 2015:	Regulations made subsequent to the *Safe Drinking Water Act 2003* that give effect to key aspects of the Act.
Sampling:	The process of collecting a representative amount of water from a reticulation system to analyse and compare against the ADWG Standards and subsequently report to DHHS.

SCADA:	Supervisory Control and Data Acquisition. A computer interface to acquire data remotely through a telemetered communications exchange network.
T&O:	Taste and odour.
THMs:	Trihalomethanes – disinfection by-products formed when using chlorine as a disinfectant. Take the form of trichloromethane, bromodichloromethane, dibromochloromethane and tribromomethane.
Undertakings:	Legally binding commitment made pursuant to Section 30 of the *Safe Drinking Water Act*, 2003.
WMP:	Wimmera Mallee Pipeline.
WPS:	Water pump station.
WTP:	Water treatment plant.
95th Percentile:	The value for which 95 percent of the time the data is below.

13 References

a) **Australian Drinking Water Guidelines 2011**, National Health and Medical Research Council, Canberra, 2011

b) ***Safe Drinking Water Act 2003*** (Act No. 46/2003), 11 June 2003, Parliament of Victoria.

c) **Safe Drinking Water Regulations 2015** (S/R No. 88/2015), 18 July 2015, Parliament of Victoria.

d) ***Health (Fluoridation) Act 1973***, (Act No. 8506/1973), 1 July 1973, Parliament of Victoria.

e) **Code of Practice for fluoridation of drinking water supplies**, Second edition, Department of Health and Human Services, Victoria, 2018.

f) **Victoria Government Gazette No. S 344,** 30 August 2019, Victorian Government.