GWMWater

2018/19
Water Quality Annual Report

2018/19 Annual Report for Water Quality

Our vision for a healthy environment and thriving communities extends to improvements in water quality. Continued investment in works and improved operational oversight have been undertaken to improve the quality of water provided and in doing so enhance the productivity and liveability of the region.

This year saw the construction of the Mallee Towns Project to deliver drinking water to Brim, Beulah, and Woomelang from the Warracknabeal Water Treatment Plant (WTP). The pipeline extension also included the township of Sea Lake, improving the source water quality and aesthetics of the water.

As part of the GWMWater commitment to provide safe drinking water to small urban centres, water quality improvements are being planned for Moyston, Elmhurst, Ultima and Kaniva for the period 2018-2023.

GWMWater in partnership with Ararat Rural City Council, Pyrenees Shire Council and the Northern Grampians Shire Council are currently planning to construct a stock and domestic water pipeline in the East Grampians region. The East Grampians pipeline will provide a valuable resource to the area and provide an opportunity to improve the quality of water to towns such as Streatham, Westmere and Wickliffe. The South-West Loddon Project is well advanced and will provide a water supply from the Grampians and/or the Warana Channel to landowners in the southern part of Loddon Shire and the north east corner of the Northern Grampians Shire. The project will also provide an alternative water source of better quality to meet the towns in the footprint of the pipeline that are serviced by Coliban Water.

This year we experienced a low level blue-green algae (BGA) bloom in the Murray River early in the 2018/19 summer. The Murray River has occasional BGA and blackwater events, and GWMWater will be addressing some of these challenges of these risks. A study to determine the best way to mitigate the risk of poor source water to protect customers from water quality events in the Murray River is presently being undertaken.

We are committed to preventative risk management at Water Treatment Plants (WTPs). The production of safe drinking water is supported by a program of internal audit, verification of critical alarms on instrumentation, continuous online monitoring and daily checks.

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	26 July 2019	Draft for internal review	Emily Quek
2	31 July 2019	Water Regulation review	Mark Ferguson
3	13 September 2019	Department of Health and Human Services review	Renwick Chan
4	19 September 2019	Executive Manager Infrastructure review	Nalaka Vitharana
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6	9 October 2019	Managing Director review and sign off	Mark Williams
7	14 October 2019	Final copy to Department of Health and Human Services	Renwick Chan

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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 58,000 urban 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 198 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.

1.2 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:

1.3.1 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. Total catchment area is 400,000 hectares with a maximum reservoir operating capacity of 522,000 megalitres.

1.3.2 GWMWater provides water to the majority of towns through two extensive pipeline systems.

a) The Wimmera Mallee Pipeline (WMP) system, as follows:
- Supply Systems 1,2,3 4 and 6, which originate from the Grampians headworks and consists of approximately 7,300 kilometres of pipeline; and
- Supply System 5, which draws water from the Murray River and consists of approximately 1,800 kilometres of pipeline.

b) The Northern Mallee Pipeline (NMP) system consisting of 3,200 kilometres of pipeline which also draws water from the Murray River.

1.3.3 A total of 1,388 kilometres of reticulation pipeline servicing the 71 urban water supplies.

1.3.4 Twenty-nine 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 four 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.

1.3.5 In this reporting period, Sea Lake moved from a drinking water urban supply receiving water from the Murray River, and undergoing disinfection with chlorine only, to a fully treated supply receiving water from the Warracknabeal Water Treatment Plant (WTP). Upgrade works were completed on the 27th February 2019.

1.3.7 GWMWater also supplies regulated water to 42 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 or fit for 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 Environment, 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 (WSSAA). 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.

Water Supply	Source Water	Raw Storage	Treatment Plant	Population of water sampling locality
Ararat	Surface water (Lake Fyans, Mt Cole Reservoir, Langi Ghiran Reservoir)	Copes Hill and Olivers Gully earthen storages	Ararat WTP	7200
Birchip	Grampians Headworks (WMP)	1 x lined earthen storages	Birchip WTP	730
Charlton	Grampians Headworks (WMP)	1 x lined earthen storages	Charlton WTP	1090
Dimboola	Grampians Headworks (WMP)	2 x lined earthen storages	Dimboola WTP	1800
Donald	Grampians Headworks (WMP)	2 x lined steel tanks	St Arnaud WTP	1560
Edenhope	Groundwater (bores)	N/A – Feed directly fed from bores	Edenhope WTP	980
Great Western	Surface water (Lake Fyans)	Vearings Basin earthen storage	Great Western WTP	420
Halls Gap	Surface water (Lake Bellfield, Dairy Creek)	Lake Bellfield and Dairy Creek earthen storages	Halls Gap WTP	450
Hopetoun	Grampians Headworks (WMP)	1 x lined earthen storages	Hopetoun WTP	560
Horsham	Surface and bore water (Lake Wartook and Laharum Bores)	1 x lined earthen storages	Mt Zero WTP	15130
Jeparit	Grampians Headworks (WMP)	2 x lined steel tanks	Rainbow WTP	360
Lake Bolac	Surface water (Mt William Creek, Stony Creek, Masons Creek) & Groundwater (bores)	2 x lined earthen storages at Willaura and Mt Pleasant	Willaura WTP	340
Manangatang	Surface water (Murray River via NMP)	N/A – Feed directly via Piangil Pipeline from Murray River	Manangatang WTP	250
Minyip	Grampians Headworks (WMP)	2 x poly lined steel tanks	Murtoa WTP	550
Murtoa	Grampians Headworks (WMP)	1 x lined earthen storages	Murtoa WTP	900
Natimuk	Surface and bore water (Lake Wartook and Laharum bores)	1 x lined steel tank	Mt Zero WTP	540
Nhill	Surface water Grampians Headworks (WMP)	2 x lined steel storages elevated tank	Dimboola WTP	2270
Ouyen	Surface water (Murray River via NMP)	2 x earthen storages	Ouyen WTP	1240
Pomonal	Surface water (Lake Bellfield)	1 x concrete tank	Halls Gap WTP	340

Water Supply	Source Water	Raw Storage	Treatment Plant	Population of water sampling locality
Quambatook	Surface water (Goulburn & Loddon Rivers) via Normanville Pipeline	1 x earthen storage	Quambatook WTP	260
Rainbow	Grampians Headworks (WMP)	2 x lined earthen storages	Rainbow WTP	710
Rupanyup	Grampians Headworks (WMP)	2 x poly lined steel tanks	Murtoa WTP	560
Sea Lake	Surface water (Murray River via NMP)	2 x earthen storages	Sea Lake disinfection only (1 July 2018 to 26 February 2019)	670
	Grampians Headworks (WMP)	2 x lined steel tanks	Warracknabeal WTP (26 February 2019 to 30 June 2019)	
St Arnaud	Grampians Headworks (WMP)	Volcano storage, lined 720 ML capacity St Arnaud, earthen storage of 1,000 ML capacity	St. Arnaud WTP	2110
Stawell	Surface water (Lake Fyans, Lake Bellfield, Fyans Creek)	3 x earthen storages totalling 505.4 ML capacity	Stawell WTP	5740
Underbool	Surface water (Murray River via NMP)	2 x earthen storages	Underbool WTP	190
Warracknabeal	Grampians Headworks (WMP)	2 x lined earthen storages	Warracknabeal WTP	2410
Willaura	Surface water (Mt William Creek, Stony Creek, Masons Creek) and Groundwater (bores)	2 x earthen storages at Willaura and Mt Pleasant	Willaura WTP	280
Wycheproof	Grampians Headworks (WMP)	2 x poly lined steel tanks	Charlton WTP	610

N/A Not Available
Water Treatment Plant (WTP)
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 of water sampling locality
Antwerp	Grampians Headworks (WMP)	2 x poly lined steel tanks	70
Apsley	Groundwater (bores)	elevated steel tank	290
Berriwillock	Surface water (Murray River via NMP)	2 x earthen storages	190
Beulah	Grampians Headworks (WMP)	2 x poly lined steel tanks	340
Brim	Grampians Headworks (WMP)	2 x poly lined steel tanks	180
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)	concrete tank	30
Cowangie	Groundwater (bores)	elevated tank	40
Culgoa	Surface water (Murray River via NMP)	1 x earthen storage	110
Dooen	Grampians Headworks (WMP)	2 x poly tanks	250
Elmhurst	Surface water (Hickmans Creek)	1 x earthen storage	190
Glenorchy	Grampians Headworks (WMP)	2 x elevated steel tanks	130
Goroke	Groundwater (bores)	2 x elevated steel tanks	310
Harrow	Groundwater (bores) & surface water (Glenelg River)	1 x earthen storage, elevated steel tank	210
Jung	Grampians Headworks (WMP)	2 x poly lined steel tanks	250
Kaniva	Groundwater (bores)	elevated concrete tank	650
Kiata	Groundwater (bores)	2 x concrete tanks	60
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)	elevated steel tank	110
Marnoo	Grampians (bores)	1 x earthen storage	130
Miram	Groundwater (bores)	elevated steel tank	40
Moyston	Surface water (Mt William, Stony and Masons Creeks) and Groundwater (bores)	1 x earthen storage	360
Murrayville	Groundwater (bores)	elevated tank	290

Water Supply	Source Water	Raw Water Storage	Population of water sampling locality
Nandaly	Surface water (Murray River via NMP)	concrete tank	40
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 and 1 x elevated tank storage	190
Serviceton	Groundwater (bores)	elevated steel tank	130
Speed	Surface water (Murray River via NMP)	concrete tank	80
Streatham	Groundwater (bores)	1 x earthen storage	160
Tarranyurk	Grampians Headworks (WMP)	2 x lined steel tanks	30
Tempy	Surface water (Murray River via NMP)	1 x steel and 1 x concrete tanks	60
Ultima	Surface water (Murray River via NMP)	2 x poly lined steel tanks	180
Waitchie	Surface water (Murray River via NMP)	concrete tank	50
Walpeup	Surface water (Murray River via NMP)	2 x earthen storages	160
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
Woomelang	Grampians Headworks (WMP)	2 x poly lined steel tanks	210
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 **Error! Reference source not found.**.

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

Water Sampling Localities	Treatment Processes	Chemicals approved to be used in Treatment	Comments
Ararat*^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction, fluoridation	Lime, potassium permanganate, powder activated carbon, aluminium sulphate, polymer, chlorine, fluorosilicic acid	
Birchip*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, aluminium chlorohydrate, polymer, chlorine	
Charlton*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Sulphuric acid, aluminium chlorohydrate, polymer, chlorine	
Dimboola*	Coagulation, flocculation, dissolved air flotation, filtration disinfection, pH correction	Sodium hydroxide, aluminium chlorohydrate, 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, polymer, chlorine	
Great Western*^	Microfiltration, disinfection, pH correction	Sulphuric acid, polyaluminium chloride, polymer, sodium hydroxide, chlorine	
Halls Gap*^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, aluminium sulphate, polymer, chlorine	
Hopetoun*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Soda ash, aluminium chlorohydrate, polymer, chlorine	
Horsham*	Powdered activated carbon dosing, coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction, fluoridation	Lime, aluminium chlorohydrate, polymer, chlorine, carbon dioxide, fluorosilicic acid	

Water Sampling Localities	Treatment Processes	Chemicals approved to be used in Treatment	Comments
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	
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, 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, 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, hydrochloric acid, chlorine	
Rainbow*	Coagulation, flocculation, dissolved air flotation, filtration, disinfection	Aluminium chlorohydrate, chlorine	
Rupanyup	Receives water from Murtoa WTP, booster disinfection	Chlorine	Receives water from Murtoa WTP.

Water Sampling Localities	Treatment Processes	Chemicals approved to be used in Treatment	Comments
Sea Lake*	Disinfection Only. From the 26th February 2019, receives water from Warracknabeal WTP, booster disinfection	Chlorine	Changed from disinfection only from 26 February 2019 to booster disinfection and receives water from Warracknabeal WTP.
St Arnaud*	Coagulation, flocculation, dissolved air flotation, filtration, pH correction, disinfection	Aluminium chlorohydrate, polymer, sodium hydroxide, chlorine	
Stawell*^	Coagulation, flocculation, dissolved air flotation, filtration, disinfection, pH correction	Lime, aluminium sulphate, 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, chlorine	
Willaura*	Coagulation, flocculation, microfiltration, pH correction, disinfection	Soda ash, calcite, aluminium chlorohydrate, sodium hypochlorite, carbon dioxide, ammonia	
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
Beulah	Coagulation, disinfection	Polydadmac (off – no longer required), chlorine booster
Brim	Coagulation, disinfection	Polydadmac (off – no longer required), chlorine booster
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

Water Supply	Treatment Processes	Chemicals used in Treatment
Ultima	Coagulation, disinfection	Polydadmac, chlorine
Walpeup	Disinfection	Chlorine
Watchem	Coagulation, disinfection	Sodium hypochlorite, hydrochloric acid
Woomelang	Coagulation, disinfection	Polydadmac (off – no longer required), chlorine
Yaapeet	Coagulation	Polydadmac

2.2 Water Treatment Changes

As part of GWMWater's ongoing commitment to the provision of safe drinking water, a $14 million Mallee Towns Drinking Water Supply Project was initiated by GWMWater. The infrastructure components of the project are completed with Sea Lake (a disinfection only supply), and three regulated water supplies (Brim, Beulah and Woomelang) will now receiving fully treated drinking water. Towns have been receiving fully treated water since early 2019, however formal removal of the regulated status of the towns will occur in the next financial year. When the regulated status is removed these towns will once again be declared as drinking water towns via specifying as water sampling localities under the Regulations. 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.

Water quality improvements are also being planned for three regulated water supply, Moyston, Elmhurst, Ultima and Kaniva for the period 2018-2023.

2.3 Water Treatment Issues

The Underbool storage experienced a non-toxigenic algal bloom this year. Coagulation and filtration are employed at the water treatment plant to remove organic matter such as the algae, however, the filter did undergo some clogging due to the algae. Upon backwashing of the filters, it was assumed that some channelling occurred and was allowing some turbidity to escape the filters. It was noted by the WTP Operator that Critical control point (CCP) alarms were not triggered during high turbidity. An investigation found that the Global Reset in SCADA had latched on, which prevented CCP alarms from being able to activate.

The root cause of this issue was the incorrect operation of the global reset function. This issue was addressed by the SCADA technician unlatching the global reset. The raw water storage was placed in bypass mode (i.e. feeding directly from pipeline), and the raw water storage was treated to remove the algae. This issue was not considered to pose a health risk and it was GWMWater's assessment at the time that it did not require reporting under section 22 to the department despite the CCP breach.

In the reporting period, all routine WTP and compliance samples were within the ADWG values excepting two samples with lead exceedances due to sampling error only.

3. Drinking Water Quality Results

For the period 1 July 2018 to 30 June 2019, the sampling frequency of the drinking water quality standards for *Escherichia coli*¸ trihalomethanes and turbidity as specified in Schedule 2 under the Regulations, apply (Table 3-1). 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 is currently under review.

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 – Summary of Water Quality data for 1 July 2018 to 30 June 2019.

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 authority can demonstrate treatment and control systems were in place, and the result was not representative of the water in the sampling locality. With a false positive, the result is more than likely the result of an external factor such as sampling error.

3.1.1 Results

There were no missed samples for E.coli in this reporting period. All sites met the standard for the reporting period of 2018/2019 (Table 3-2).

Table 3-2 – Results for Escherichia coli in Drinking Water: 1 July 2018 – 30 June 2019. 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 sample.

Sampling Locality	Sampling Frequency	No. of Samples	Results (*Escherichia coli/100 mL*)	No. of samples where standard was not met (S 18)
			Max	
Ararat*	Twice-weekly	104	0	0
Birchip	Weekly	52	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
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

Sampling Locality	Sampling Frequency	No. of Samples	Results (*Escherichia coli/100 mL*)	No. of samples where standard was not met (S 18)
			Max	
Rupanyup	Weekly	52	0	0
Sea Lake	Weekly	52	0	0
St. Arnaud	Weekly	52	0	0
Stawell*	Twice-weekly	104	0	0
Underbool	Weekly	52	0	0
Warracknabeal	Weekly	52	0	0
Willaura	Weekly	52	0	0
Wycheproof	Weekly	52	0	0

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

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. All sites met the standard for the reporting period of 2018/2019 (Table 3-3).

There were no missed samples for THM in this reporting period.

Table 3-3 – Results for Trihalomethanes in Drinking Water: 1 July 2018 – 30 June 2019. The concentration of THM must not exceed 0.25 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results		No. of samples where standard was not met (S18)
			Maximum	Average	
Ararat*	Twice-monthly	24	0.09	0.07	0
Birchip	Monthly	12	0.06	0.04	0
Charlton	Monthly	12	0.08	0.07	0
Dimboola	Monthly	12	0.07	0.05	0
Donald	Monthly	12	0.10	0.09	0
Edenhope	Monthly	12	0.11	0.07	0
Great Western	Monthly	12	0.16	0.12	0
Halls Gap	Monthly	12	0.06	0.05	0
Hopetoun	Monthly	12	0.08	0.05	0

Sampling Locality	Sampling Frequency	No. of Samples	Results		No. of samples where standard was not met (S18)
Horsham*	Twice-monthly	24	0.12	0.09	0
Jeparit	Monthly	12	0.08	0.07	0
Lake Bolac	Monthly	12	0.02	0.01	0
Manangatang	Monthly	12	0.05	0.03	0
Minyip	Monthly	12	0.09	0.07	0
Murtoa	Monthly	12	0.07	0.06	0
Natimuk	Monthly	12	0.15	0.12	0
Nhill	Monthly	12	0.07	0.06	0
Ouyen	Monthly	12	0.09	0.07	0
Pomonal	Monthly	12	0.07	0.06	0
Quambatook	Monthly	12	0.20	0.16	0
Rainbow	Monthly	12	0.04	0.04	0
Rupanyup	Monthly	12	0.08	0.06	0
Sea Lake	Monthly	12	0.14	0.09	0
St Arnaud	Monthly	12	0.06	0.04	0
Stawell*	Twice-monthly	24	0.10	0.07	0
Underbool	Monthly	12	0.06	0.05	0
Warracknabeal	Monthly	12	0.07	0.07	0
Willaura	Monthly	12	0.03	0.01	0
Wycheproof	Monthly	12	0.08	0.07	0

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

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. All sites met the standard for the reporting period of 2018/2019 (Table 3-4).

There were no missed samples for turbidity in this reporting period.

Table 3-4 – Results for turbidity in Drinking Water: 1 July 2018 – 30 June 2019. 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	Results (NTU)		
			Max	Max 95th percentile in any 12 months	No. of 95th percentile of results in any 12 months above standard (S 18)
Ararat*	Twice-weekly	104	0.60	0.30	0
Birchip	Weekly	52	0.40	0.34	0
Charlton	Weekly	52	0.60	0.20	0
Dimboola	Weekly	52	0.30	0.20	0
Donald	Weekly	52	0.60	0.15	0
Edenhope	Weekly	52	0.20	0.20	0
Great Western	Weekly	52	0.40	0.20	0
Halls Gap	Weekly	52	2.10	0.20	0
Hopetoun	Weekly	52	0.40	0.30	0
Horsham*	Twice-weekly	104	3.00	0.30	0
Jeparit	Weekly	52	0.30	0.25	0
Lake Bolac	Weekly	52	0.50	0.30	0
Manangatang	Weekly	52	7.30	0.45	0
Minyip	Weekly	52	1.10	0.55	0
Murtoa	Weekly	52	0.60	0.35	0
Natimuk	Weekly	52	0.90	0.35	0
Nhill	Weekly	52	0.60	0.20	0
Ouyen	Weekly	52	1.80	0.15	0
Pomonal	Weekly	52	0.30	0.20	0
Quambatook	Weekly	52	0.40	0.30	0
Rainbow	Weekly	52	0.30	0.20	0
Rupanyup	Weekly	52	2.60	0.90	0
Sea Lake	Weekly	52	4.40	4.18	0
St Arnaud	Weekly	52	0.20	0.10	0
Stawell*	Twice-weekly	104	0.30	0.20	0
Underbool	Weekly	52	1.80	0.20	0
Warracknabeal	Weekly	52	0.20	0.10	0
Willaura	Weekly	52	0.50	0.30	0
Wycheproof	Weekly	52	1.40	0.44	0

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

3.4 Other Algae, Pathogen, Chemical or Substances

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 Algae, pesticides and radiological parameters

Pesticides, algae or radiological parameters were tested in raw water storages and reservoirs for drinking water supplies. All the test results obtained were below the limit of detection. The sampling of these parameters is risk-based.

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

All samples for chlorine met the standard for the reporting period (Table 3-5). Free chlorine was measured in localities with chlorination system, and total chlorine was measured in chloramination systems.

There were no missed samples for chlorine during the reporting period

Table 3-5 - Concentrations of chlorine in Drinking Water for 1 July 2018 – 30 June 2019. The concentrations of chlorine should not exceed 5.0 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met
			Max	Average	
Ararat*	Twice-weekly	104	1.10	0.56	0
Birchip	Weekly	52	1.28	0.55	0
Charlton	Weekly	52	2.03	0.72	0
Dimboola	Weekly	52	1.64	1.02	0
Donald	Weekly	52	1.56	1.12	0
Edenhope	Weekly	52	1.30	0.72	0
Great Western	Weekly	52	1.40	0.79	0
Halls Gap	Weekly	52	1.49	1.04	0
Hopetoun	Weekly	52	1.28	0.67	0
Horsham*	Twice-weekly	104	1.70	0.97	0
Jeparit	Weekly	52	1.83	0.84	0
Lake Bolac	Weekly	52	2.20	1.29	0
Manangatang	Weekly	52	1.38	1.12	0
Minyip	Weekly	52	1.30	0.87	0
Murtoa	Weekly	52	1.05	0.55	0
Natimuk	Weekly	52	1.58	0.99	0
Nhill	Weekly	52	1.10	0.76	0
Ouyen	Weekly	52	1.46	1.02	0
Pomonal	Weekly	52	1.13	0.67	0
Quambatook	Weekly	52	1.21	0.58	0

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met
			Max	Average	
Rainbow	Weekly	52	1.28	0.88	0
Rupanyup	Weekly	52	1.90	0.93	0
Sea Lake	Weekly	52	1.53	1.03	0
St Arnaud	Weekly	52	1.87	1.20	0
Stawell*	Twice-weekly	104	1.10	0.48	0
Underbool	Weekly	52	1.48	0.94	0
Warracknabeal	Weekly	52	1.43	0.78	0
Willaura	Weekly	52	2.20	1.58	0
Wycheproof	Weekly	52	1.42	0.90	0

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

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

All samples for chloroacetic acids met the standard for the reporting period (Table 3-6).

The sampling of these parameters is based on ADWG recommendations, risks, historical data and any operational changes. Based on historical data and risks assessment, the sampling of chloroacetic acids has been revised. Sampling was only scheduled for towns with higher risk of DBP formation (Great Western, Manangatang, Ouyen, Quambatook). Chloroactic acids have not been shown to be an issue at other locations in the region over the last 13 years.

There were no missing samples for chloroacetic acids during the reporting period.

Table 3-6 - Concentrations of Monochloroacetic Acid in Drinking Water for 1 July 2018 – 30 June 2019. The concentrations of chloroacetic 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	0.004	0
Ouyen	Monthly	12	< 0.005	0.004	0
Quambatook	Monthly	12	< 0.005	0.005	0

< *Less than limit of detection.*

Table 3-7 - Concentrations of Dichloroacetic Acids in Drinking Water of 1 July 2018 – 30 June 2019. 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	0.053	0.039	0
Manangatang	Monthly	12	0.018	0.011	0
Ouyen	Monthly	12	0.037	0.025	0
Quambatook	Monthly	12	0.025	0.016	0

Monthly from July 2017 – February 2018.

Table 3-8 - Concentrations of Trichloroacetic Acids in Drinking Water for 1 July 2018 – 30 June 2019. 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	0.100	0.056	0
Manangatang	Monthly	12	0.056	0.021	0
Ouyen	Monthly	12	0.060	0.032	0
Quambatook	Monthly	12	0.013	0.007	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 reporting period (
Table 3-9).

There were no missing samples for lead during the reporting period.

Two compliance samples result were received from the laboratory with lead concentration of 0.11 mg/L in Ararat and the other at Murtoa. Investigation identified the root cause of the non-compliance as 'sampling error, due to the use of disused taps at both locations that were not adequately flushed prior to sampling. Refer to Section 0 for further information.

Table 3-9 - Concentrations of Lead in Drinking Water for 1 July 2018 – 30 June 2019. The lead should not exceed 0.01 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)	No of samples where standard was not met (S 18)	Comments
Ararat*	Yearly	2	0.011	1	'1 Sampling error'. Refer to Section 3.4.4 and Section 0 for details.
Birchip	Yearly	1	< 0.001	0	
Charlton	Yearly	1	0.002	0	
Dimboola	Yearly	1	< 0.001	0	
Donald	Yearly	1	0.002	0	
Edenhope	Quarterly	4	< 0.001	0	All results were < 0.001
Great Western	Yearly	1	< 0.001	0	
Halls Gap	Yearly	1	< 0.001	0	
Hopetoun	Yearly	1	< 0.001	0	
Horsham*	Yearly	2	< 0.001	0	All results were < 0.001
Jeparit	Yearly	1	< 0.001	0	
Lake Bolac	Yearly	1	< 0.001	0	
Manangatang	Yearly	1	< 0.001	0	
Minyip	Yearly	1	0.002	0	
Murtoa	Yearly	1	0.012	1	'1 Sampling error'. Refer to Section 3.4.4 and Section 0 for details.
Natimuk	Yearly	1	< 0.001	0	
Nhill	Yearly	1	< 0.001	0	
Ouyen	Yearly	1	< 0.001	0	
Pomonal	Yearly	1	< 0.001	0	
Quambatook	Yearly	1	< 0.001	0	
Rainbow	Yearly	1	< 0.001	0	
Rupanyup	Yearly	1	< 0.001	0	
Sea Lake	Yearly	1	0.002	0	
St Arnaud	Yearly	1	< 0.001	0	
Stawell*	Yearly	2	< 0.001	0	All results were < 0.001
Underbool	Yearly	1	< 0.001	0	
Warracknabeal	Yearly	1	< 0.001	0	
Willaura	Yearly	1	< 0.001	0	
Wycheproof	Yearly	1	< 0.001	0	

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

3.5 Drinking water quality standard not met and actions undertaken

The initial compliance samples at Ararat and Murtoa did not meet the water quality standards, however, after an investigation was conducted, it was found that the sample was not representative of the water at that locality, and the exceedance was due to a sampling error from disused taps that had not been flushed correctly. There were no contributing factors to pose a risk to human health. Refer to Section 10 for further information on the actions undertaken.

3.5.1 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.

3.5.1.1 Results

Nitrite and Nitrate were only measured in chloramination systems, Willaura and Lake Bolac.

All the results for nitrite (Table 3-10) and nitrate (Table 3-11) met the standard for this reporting period.

There were no missing samples during the reporting period. The sampling frequency for nitrite and nitrate was increased this year from monthly to weekly. This was due to the greater risk of nitrification occurring at Lake Bolac due to the long distance for the water to travel from Willaura WTP. Nitrification occurs when the disinfectant breaks down through microbial action to form nitrate and nitrite.

Table 3-10 - Concentrations of Nitrite in Drinking Water for 1 July 2018 – 30 June 2019. Nitrite should not exceed 3 mg-NO_2/L (0.913 mg N/L).

Sampling Locality	Sampling Frequency	No. of Samples	Average results (mg N/L)	No of samples where standard was not met (S 18)
Lake Bolac	Weekly*	52	0.102	0
Willaura	Monthly	12	0.005	0

*Frequency changed from monthly to weekly for the reporting period.

Table 3-11 - Concentrations of Nitrate in Drinking Water for 1 July 2018 – 30 June 2019. Nitrate should not exceed 50 mg-NO_3/L (11.3 mg N/L).

Sampling Locality	Sampling Frequency	No. of Samples	Average results (mg N/L)	No of samples where standard was not met (S 18)
Lake Bolac	Weekly*	52	0.089	0
Willaura	Monthly	14	0.055	0

*Frequency changed from monthly to weekly for the reporting period.

3.5.2 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.

3.5.2.1 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 3-12).

There were no missing samples during the reporting period.

Table 3-12 - Concentrations of Copper in Drinking Water for 1 July 2018 – 30 June 2019. Copper should not exceed 1 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)	No of samples where standard was not met (S 18)
Ararat*	Yearly	2	0.012	0
Birchip	Yearly	1	0.001	0
Charlton	Yearly	1	0.010	0
Dimboola	Yearly	1	0.003	0
Donald	Yearly	1	0.070	0
Edenhope	Quarterly	4	0.080	0
Great Western	Yearly	1	0.032	0
Halls Gap	Yearly	1	0.009	0
Hopetoun	Yearly	1	0.001	0
Horsham*	Yearly	2	0.006	0
Jeparit	Yearly	1	0.003	0
Lake Bolac	Yearly	1	0.040	0
Manangatang	Yearly	1	0.018	0
Minyip	Yearly	1	0.003	0
Murtoa	Yearly	1	0.120	0
Natimuk	Yearly	1	0.007	0
Nhill	Yearly	1	0.004	0

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)	No of samples where standard was not met (S 18)
Ouyen	Yearly	1	0.002	0
Pomonal	Yearly	1	0.070	0
Quambatook	Yearly	1	0.001	0
Rainbow	Yearly	1	0.001	0
Rupanyup	Yearly	1	0.012	0
Sea Lake	Yearly	1	0.170	0
St Arnaud	Yearly	1	0.001	0
Stawell*	Yearly	2	0.009	0
Underbool	Yearly	1	0.003	0
Warracknabeal	Yearly	1	0.005	0
Willaura	Yearly	1	0.045	0
Wycheproof	Yearly	1	0.003	0

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

3.5.3 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.

3.5.3.1 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 3-13).

There were no missing samples during the reporting period.

Table 3-13 - Concentrations of Arsenic in Drinking Water for 1 July 2018 – 30 June 2019. Arsenic 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)
Ararat*	Yearly	2	< 0.001	0
Birchip	Yearly	1	< 0.001	0
Charlton	Yearly	1	< 0.001	0
Dimboola	Yearly	1	< 0.001	0
Donald	Yearly	1	< 0.001	0
Edenhope	Quarterly	4	0.002	0
Great Western	Yearly	1	< 0.001	0
Halls Gap	Yearly	1	< 0.001	0
Hopetoun	Yearly	1	< 0.001	0
Horsham*	Yearly	2	< 0.001	0
Jeparit	Yearly	1	< 0.001	0
Lake Bolac	Yearly	1	0.002	0
Manangatang	Yearly	1	< 0.001	0
Minyip	Yearly	1	< 0.001	0
Murtoa	Yearly	1	< 0.001	0
Natimuk	Yearly	1	< 0.001	0
Nhill	Yearly	1	< 0.001	0
Ouyen	Yearly	1	< 0.001	0
Pomonal	Yearly	1	< 0.001	0
Quambatook	Yearly	1	< 0.001	0
Rainbow	Yearly	1	< 0.001	0
Rupanyup	Yearly	1	< 0.001	0
Sea Lake	Yearly	1	< 0.001	0
St Arnaud	Yearly	1	< 0.001	0
Stawell*	Yearly	2	< 0.001	0
Underbool	Yearly	1	< 0.001	0
Warracknabeal	Yearly	1	< 0.001	0
Willaura	Yearly	1	0.002	0
Wycheproof	Yearly	1	< 0.001	0

* *Due to the population size of these towns two samples are taken every week.*
< *Less than limit of detection.*

3.5.4 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 must not result in an average optimum concentration in excess of one mg/L of water. A detailed description of fluoride and its implications in a water supply can 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. The Natimuk water supply is sourced from Horsham's WTP, and is also therefore a fluoridated supply. Fluoridation was installed at the Ararat WTP in August 2016. 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.

3.5.4.1 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. All water supplies complied with the ADWG health-based guideline value for fluoride and the requirements of the *Health (Fluoridation) Act* 1973 (Table 3-14).

There were no missing samples for fluoride during the reporting period.

Table 3-14 - Fluoride Results in Drinking Water for 1 July 2018 – 30 June 2019. The total concentration of fluoride should not exceed 1.5 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		Target Optimum operating concentration (mg/L)	No. of samples where standard was not met (S 18)
			Max	Average		
Ararat*	Twice-weekly	104	1.20	0.91	0.9	0
Horsham*	Twice-weekly	104	0.82	0.67	0.9	0
Natimuk	Weekly	52	0.77	0.67	-	0

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

3.5.5 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.

3.5.5.1 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 (Table 3-15). All samples for aluminium acid-soluble met the standard for the reporting period.

There were no missed samples for aluminium acid-soluble during the reporting period.

Table 3-15 – Aluminium acid-soluble in Drinking Water for 1 July 2018 – 30 June 2019. Aluminium acid-soluble should not exceed 0.2 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)	Comments
			Max	Average		
Ararat*	Twice-monthly	24	0.07	0.04	0	
Birchip	Monthly	12	0.04	0.02	0	
Charlton	Monthly	12	0.04	0.02	0	
Dimboola	Monthly	12	0.04	0.02	0	
Donald	Monthly	12	0.04	0.02	0	
Edenhope	Monthly	12	0.01	0.01	0	
Great Western	Monthly	12	0.04	0.02	0	
Halls Gap	Monthly	12	0.02	0.02	0	
Hopetoun	Monthly	12	0.08	0.03	0	
Horsham*	Twice-monthly	24	0.06	0.03	0	
Jeparit	Monthly	12	0.04	0.02	0	
Lake Bolac	Weekly	12	0.05	0.03	0	
Manangatang	Monthly	12	0.01	0.01	0	
Minyip	Monthly	12	0.04	0.02	0	
Murtoa	Monthly	12	0.06	0.02	0	
Natimuk	Monthly	12	0.05	0.04	0	
Nhill	Monthly	12	0.10	0.02	0	
Ouyen	Monthly	12	0.01	0.01	0	
Pomonal	Monthly	12	0.03	0.02	0	
Quambatook	Monthly	12	0.06	0.02	0	
Rainbow	Monthly	12	0.02	0.01	0	
Rupanyup	Monthly	12	0.04	0.02	0	
St Arnaud	Monthly	12	0.03	0.02	0	
Stawell*	Twice-monthly	22	0.04	0.03	0	
Underbool	Monthly	12	0.04	0.02	0	
Warracknabeal	Monthly	13	0.04	0.02	0	

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)	Comments
			Max	Average		
Willaura	Monthly	12	0.05	0.02	0	
Wycheproof	Monthly	12	0.04	0.02	0	

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

4. Aesthetic Parameters

Sampling is risk based, and individual monitoring results for 1 July 2018 to 30 June 2019 that exceed the aesthetic guideline value set out in ADWG are highlighted in the tables in this section. Manganese has not shown to be a problem in source waters, and was dropped from the sampling program this year.

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 a number of individual results, which did not satisfy the aesthetic guideline values set out in the ADWG 2011. Birchip, Charlton, Dimboola, Donald, Halls Gap, Hopetoun, Horsham, Jeparit, Lake Bolac, Manangatang, Minyip, Murtoa, Natimuk, Nhill, Pomonal, Rainbow, Rupanyup, Sea Lake, and Wycheproof experienced some values outside the pH guideline values.

There were no missed samples for pH during the reporting period.

4.1.2 Actions Undertaken in relation to values outside the guidelines.

pH exceedances (≥ 3 exceedances at each locality in the last 12 months) occurred at Birchip, Lake Bolac, Manangatang, Minyip, Rainbow, Rupanyup, Sea Lake and Wycheproof. Ad-hoc flushing was carried out in the end mains to maintain drinking water quality. Continuous monitoring at the WTPs and compliance sampling routine will occur.

Table 4-1 - pH Results for Drinking Water for 1 July 2018 – 30 June 2019. pH value should be between pH 6.5 and pH 8.5.

Sampling Locality	Sampling Frequency	No. of Samples	Results (pH)		
			Max	Min	Average
Ararat*	Twice-weekly	104	8.4	6.6	7.2
Birchip	Weekly	52	8.5	6.1	7.1
Charlton	Weekly	52	8.8	6.6	7.5
Dimboola	Weekly	52	9.0	5.4	7.2
Donald	Weekly	52	9.0	6.7	7.5
Edenhope	Weekly	52	7.8	6.7	7.4
Great Western	Weekly	52	7.7	6.6	7.2

Sampling Locality	Sampling Frequency	No. of Samples	Results (pH)		
			Max	Min	Average
Halls Gap	Weekly	52	8.0	6.3	7.2
Hopetoun	Weekly	52	8.6	6.4	7.2
Horsham*	Twice-weekly	104	7.6	6.4	7.1
Jeparit	Weekly	52	7.6	5.7	7.0
Lake Bolac	Weekly	52	9.7	6.9	7.8
Manangatang	Weekly	52	7.9	6.2	7.1
Minyip	Weekly	52	9.4	6.9	8.0
Murtoa	Weekly	52	7.8	4.8	7.2
Natimuk	Weekly	52	7.8	6.4	7.1
Nhill	Weekly	52	7.9	6.4	7.3
Ouyen	Weekly	52	8.5	6.8	7.6
Pomonal	Weekly	52	7.8	6.4	7.1
Quambatook	Weekly	52	8.0	6.5	7.4
Rainbow	Weekly	52	8.8	6.2	7.0
Rupanyup	Weekly	52	9.2	6.6	7.3
Sea Lake	Weekly	52	8.5	6.4	7.6
St Arnaud	Weekly	52	8.0	6.8	7.4
Stawell*	Twice-weekly	104	8.2	6.5	7.1
Underbool	Weekly	52	8.5	6.7	7.7
Warracknabeal	Weekly	52	7.8	6.6	7.2
Willaura	Weekly	52	8.2	6.8	7.4
Wycheproof	Weekly	52	7.9	6.0	7.1

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

4.2 Colour

In natural waters, colour is due mainly 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 is based on ADWG recommendations, risks, historical data and any operational changes. Based on historical data and risks assessment, sampling of true colour was only scheduled for localities with higher risk of coloured water (Table 4-2). All samples for true colour met the standard for the reporting period.

There were no missing samples for the reporting period.

Table 4-2 - True Colour Results for Drinking Water Supplied of 1 July 2018 – 30 June 2019. True colour in drinking water should not exceed 15 Hazen Units (HU).

Sampling Locality	Sampling Frequency	No. of Samples	Results (HU)
			Max
Lake Bolac	Monthly	12	14.0
Quambatook	Monthly	12	4.0
Willaura	Monthly	12	14.0

4.3 Hardness

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

The ADWG has a full discussion on the 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. GWMWater has an internal performance benchmark that the mean hardness should be less than 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 undertaken on a quarterly basis for drinking water supplies, and twice quarterly for the larger sized localities including Ararat, Horsham and Stawell (Table 4-3). There were no exceedance of hardness and no missing samples for the reporting period.

Table 4-3 - Hardness Results for Drinking Water Supplied of 1 July 2018 – 30 June 2019. GWMWater internal performance benchmark that the mean hardness should be less than 200 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)
			Max
Ararat*	Twice-quarterly	8	50
Birchip	Quarterly	4	17
Charlton	Quarterly	4	25
Dimboola	Quarterly	4	19
Donald	Quarterly	4	22

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)
			Max
Edenhope	Quarterly	4	170
Great Western	Quarterly	4	37
Halls Gap	Quarterly	4	33
Hopetoun	Quarterly	4	20
Horsham*	Twice-quarterly	8	29
Jeparit	Quarterly	4	24
Lake Bolac	Quarterly	4	26
Manangatang	Quarterly	4	17
Minyip	Quarterly	4	24
Murtoa	Quarterly	4	21
Natimuk	Quarterly	4	32
Nhill	Monthly	4	19
Ouyen	Quarterly	4	34
Pomonal	Quarterly	4	35
Quambatook	Quarterly	4	170
Rainbow	Quarterly	4	25
Rupanyup	Quarterly	4	19
Sea Lake	Quarterly	4	77
St Arnaud	Quarterly	4	22
Stawell*	Twice-quarterly	8	59
Underbool	Quarterly	4	67
Warracknabeal	Quarterly	4	21
Willaura	Quarterly	4	20
Wycheproof	Quarterly	4	20

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

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 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 advises that, based on taste, electrical conductivity in drinking water should not exceed 1000 µS/cm. GWMWater has an internal performance benchmark that the mean electrical conductivity should be less than 1000 µS/cm.

The ADWG also describe the guideline values for Total Dissolved Solids (TDS) and approximates that the electrical conductivity standard is approximately twice that of the total dissolved solids. As it is easier and more cost effective to monitor electrical conductivity than total dissolved solids, the analysis for compliance is based on electrical conductivity.

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 (

Table 4-4). All analyses were undertaken using a TPS hand-held meter.

During the reporting period, EC values in water supplied to customers were stable. There were no exceedance and no missing samples in Edenhope for the reporting period.

Table 4-4 - Electrical Conductivity (EC) Results for Drinking Water Supplied of 1 July 2018 – 30 June 2019. EC in drinking water should be less than 1000 µS/cm.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)
			Max
Ararat*	Twice-weekly	104	364
Birchip	Weekly	52	93
Charlton	Weekly	52	145
Dimboola	Weekly	52	126
Donald	Weekly	52	170
Edenhope	Weekly	52	875
Great Western	Weekly	52	280
Halls Gap	Weekly	52	208
Hopetoun	Weekly	52	162
Horsham*	Twice-weekly	104	190
Jeparit	Weekly	52	150
Lake Bolac	Weekly	52	235
Manangatang	Weekly	52	136
Minyip	Weekly	52	145
Murtoa	Weekly	52	191
Natimuk	Weekly	52	195
Nhill	Weekly	52	151
Ouyen	Weekly	52	187
Pomonal	Weekly	52	282
Quambatook	Weekly	52	707
Rainbow	Weekly	52	158
Rupanyup	Weekly	52	144
Sea Lake	Weekly	52	228
St Arnaud	Weekly	52	173

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)
			Max
Stawell*	Twice-weekly	104	320
Underbool	Weekly	52	296
Warracknabeal	Weekly	52	152
Willaura	Weekly	52	210
Wycheproof	Weekly	52	153

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

4.5 Iron

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

The ADWG suggests that, based on aesthetic considerations, 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 (Table 4-5Table 1-1). There were no exceedance of iron and no missing samples for the reporting period.

Table 4-5 - Iron Results for Drinking Water Supplied of 1 July 2018 – 30 June 2019. Iron in drinking water should not exceed 0.3 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)
			Max
Minyip	Quarterly	4	0.025
Nhill	Monthly	12	0.050
Quambatook	Monthly	12	0.040

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, 2018/2019 with the last two reporting periods, 2017/2018 and 2016/2017 (Table 5-1).

The water quality performance for most parameters have remained consistent over the reporting periods, or have improved slightly. Compliance with pH has decreased slightly over time. This is due to some reticulation systems equilibrating with upgraded drinking water supplies, and the inability to correct variable pH of incoming source water at some locations. GWMWater have long-term plans to address some of these issues.

Table 5-1 - Comparison of analysis of water quality results of drinking water supplied from 2016/2017 to 2018/2019.

Parameters	2016/2017		2017/2018		2018/2019	
	% of water sampling localities met standards	% of customers supplied with drinking water that met standard	% of water sampling localities met standards	% of customers supplied with drinking water that met standard	% of water sampling localities met standards	% of customers supplied with drinking water that met standard
Escherichia coli	100	100	96.55	99.32	100	100
Trihalomethanes	86.21	96.29	96.55	98.06	100	100
Turbidity	100	100	100	100	100	100
Aluminium acid-soluble	96.55	98.63	100	100	100	100
Monochloroacetic acid	100.00	100.00	100	100	100	100
Dichloroacetic acid	93.10	98.32	100	100	100	100
Trichloroacetic acid	82.76	94.61	100	100	100	100
Chlorine	100	100	100	100	100	100
Lead	100	100	100	100	93.10	84.25
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	51.72	68.00	44.83	45.68	34.48	42.04
Colour	93.10	100	93.10	98.78	100	100
Hardness	100	100	100	100	100	100
Electrical conductivity	100	100	96.55	98.06	100	100
Iron	100	100	100	100	100	100

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 below 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 2016/2017 to 2018/2019.

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2016/2017	2017/2018	2018/2019	
Discoloured	67	66	53	20 % reduction
Taste/Odour	4	13	12	No significant change. Geosmin found in drinking water in the Stawell water sampling locality. Stawell Water Treatment Plant does not have a treatment step to remove geosmin.
Air in water	2	3	10	Increase from previous years. Air in water is mainly due to water mains repair and replacement.
Other	0	4	0	No significant change.
Total	73	86	75	13% overall reduction

*Table 6-2 – *Regulated Water Quality Complaints comparison between 2016/2017 to 2018/2019.*

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2016/2017	2017/2018	2018/2019	
Discoloured	48	36	29	Trending down.
Odour	8	12	12	No significant change.
Air in water	0	0	1	No significant change.
Other	0	1	0	No significant change.
Total	56	49	42	Gradually trending down. 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 0 for more information.*

6.2 Analysis of Issues

Over this reporting period, the number of customer complaints for drinking water and regulated supplies is consistent with the previous reporting period. Discoloured water complaints were the highest number of complaints across the complaints categories for both drinking and regulated water supplies.

Horsham had the highest number of discoloured water complaints. GWMWater conducted flushing and checked the water quality to ensure that the water supplied was safe and fit for purpose. There were no particular incidents to cause the discoloured water complaints in Horsham. The complaints were likely due to a build-up of sediment at the end of the reticulation in some locations, and changes in flow during mains breaks in other locations. Complaints were spread out across the locality.

Ararat had the second highest number of discoloured water complaints and air in water complaints were the highest number of complaints, and mainly due to a number of mains repairs in the town. GWMWater conducted flushing to ensure the water supplied is fit for purpose.

Most of the taste and odour complaints were due to customers detecting the disinfectant (chlorine) in the Ouyen water supply. The chlorine concentration was checked to ensure that they were within normal operation limits, and the WTP was operating correctly. All chlorine residuals in the complaints locations were below ADWG limits.

A number of taste and odour complaints also came from Stawell. The cause of the taste and odour complaints was due to a naturally occurring taste and odour compound, geosmin. Geosmin gives an earthy/musty taste. Geosmin was present in the raw water storage at the Stawell WTP this year during summer. The raw water storage was low, and could not be filled for a short time due to repairs being conducted on the upstream pipe. A combination of warm water and exposed banks led to the production of geosmin.

The Stawell WTP is unable to remove geosmin, however this issue may be temporary as the raw water storage level was low which may have caused the geosmin spike. It has been identified that a better management of the level of the raw water storage is required and cleaning of the storage may be required. Ad hoc sampling for geosmin in the raw water storage will be conducted in summer.

GWMWater is always reviewing ways to affordably improve the water quality in regulated towns with such measures that include increased swabbing, coagulant dosing raw storages or addition of other water treatment processes. These options will be worked through to take in broader considerations of affordability, climate change, customer satisfaction and liveability, to deliver a solution that matches the need.

Table 6-3 - Water Quality Complaints for Drinking Water Towns of 1 July 2018 – 30 June 2019.

Water Supply	Pop'n served	ESC Customers†	Number of Complaints				
			Colour	T&O^	Air	Other	Total
Ararat	7202	4082	7		3		10
Birchip	730	458	1				1
Charlton	1092	698					0
Dimboola	1799	881	1				1
Donald	1558	890	1				1
Edenhope	984	546	2				2
Great Western	416	134					0
Halls Gap	447	528	4		1		5
Hopetoun	563	383					0
Horsham	15125	8548	10		3		13
Jeparit	356	303	3		1		4
Lake Bolac	343	173					0
Manangatang	248	164					0
Minyip	545	277	1				1
Murtoa	900	485					0
Natimuk	535	269					0
Nhill	2271	1150	5				5
Ouyen	1239	687	1	4			5
Pomonal	335	130					0
Quambatook	259	167	1	1			2
Rainbow	710	368					0
Rupanyup	557	248					0
Sea Lake	666	424	2	1	1		4
St Arnaud	2114	1429	2				2
Stawell	5741	3305	7	4			11
Underbool	192	134	3				3
Warracknabeal	2409	1443	1	1			2
Willaura	275	263	1		1		2
Wycheproof	612	427		1			1
Total	50221	28994	53	12	10	0	75

† *ESC defines a customer as a property which, is connected to the water business' water system; and receives a fixed and/or usage account.*

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

Table 6-4 - Water Quality Complaints for Regulated Supplies of 1 July 2018 – 30 June 2019.

Water Supply	Pop'n served	ESC Customers†	Number of Complaints				
			Colour	Odour	Air	Other	Total
Antwerp	66	12					0
Apsley	288	121					0
Berriwillock	191	89					0
Beulah	342	174					0
Brim	178	55					0
Buangor	107	39		3			3
Chillingollah	5	6					0
Chinkapook	33	15					0
Cowangie	37	12					0
Culgoa	105	76	4				4
Dooen	250	18	2		1		3
Elmhurst	190	121	1				1
Glenorchy	130	61					0
Goroke	311	176					0
Harrow	208	94					0
Jung	251	42					0
Kaniva	651	524	3	1			4
Kiata	64	21	1				1
Lalbert	157	56		1			1
Lascelles	97	30	1				1
Lillimur	114	19					0
Marnoo	127	69					0
Miram	42	10	3				3
Moyston	362	93	1				1
Murrayville	291	196		1			1
Nandaly	41	32	1				1
Nullawil	97	47					0
Patchewollock	138	52	1	5			6
Pimpinio	191	37		1			1
Serviceton	125	30					0
Speed	81	38	1				1
Streatham	162	48					0
Tarranyurk	31	7					0
Tempy	59	30					0
Ultima	181	101	1				1
Waitchie	50	6					0
Walpeup	164	75					0
Watchem	119	84					0
Westmere	42	16	4				4
Wickliffe	118	45	5				5

Water Supply	Pop'n served	ESC Customers†	Number of Complaints				
			Colour	Odour	Air	Other	Total
Woomelang	209	143					0
Yaapeet	87	33					0
Total	6493	2953	29	12	1	0	42

† *ESC defines a customer as a property which, is connected to the water business' water system; and receives a fixed and/or usage account.*

7. Risk Management Plan Audit

No regulatory audits were required during 2018/2019.

GWMWater underwent a drinking water risk management plan audit in the last reporting period 2017/2018 that highlighted the need for verifying the time delays for critical control points (CCPs). In response, GWMWater completed a program this year to verify that all CCP limits and time delays at WTPs and pump stations were set in accordance with the risk management plans.

GWMWater also addressed the opportunity for improvements set out in the 2017/2018 audit to:

- review process flow diagrams of supply systems to confirm accuracy,
- review the CCP procedure,
- ensure that a process is in place for regular review of time delays of CCPs,
- establish a review process to justify and document changes made to the monitoring program, and
- establish a regular review process to confirm that monitoring locations continue to be appropriate.

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:

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

GWMWater had a total of 42 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 and **Error! Reference source not found.**.

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).

As part of GWMWater's ongoing commitment to providing drinking water to townships across the region, work is currently in progress under the Mallee Towns Drinking Water Supply Project to upgrade three regulated supplies (Brim, Beulah and Woomelang) and one disinfection only town (Sea Lake) to a treated drinking water supply.

The water supply will be sourced from Lake Bellfield and treated at the Warracknabeal WTP. Four more towns (Elmhurst, Kaniva, Moyston and Ultima) have been identified

under GWMWater's Water Pricing Submission to be upgraded to a fully treated drinking water supply by 2023.

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 18 and 22 of the Act. Section 22 reports give DHHS an early warning notification of any known or suspected problem, whereas S18 notifications are given when the water quality standard has not been met.

10.1 Lead Incident – Ararat and Murtoa (sampling error)

Some sampling locations at clearwater storages were re-introduced as part of GWMWater's revised sampling program. Sampling occurred on the 18/02/2019 at the Clearwater storage at Ararat, and 19/02/2019 at the Clearwater storage at Murtoa.

Results were received from the laboratory on the 21/02/2019 (0.011 Ararat) and 22/02/2019 (Murtoa), having a lead concentration of 0.011 mg/L and 0.012 mg/L respectively. In response, DHHS were notified via a S18, flushing occurred at the location, and an investigation was conducted. The investigation included re-sampling from the taps, checking their condition, and sampling from other locations in the reticulation.

The investigation identified the root cause of the non-compliance as a 'sampling error', due to the use of disused taps at both locations that were not adequately flushed prior to sampling. The suitability of the sampling location was assessed and revised, and samplers were reminded about communicating any issues at sampling sites and to ensure that the required flushing is conducted as per procedures.

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

GWMWater experienced a BGA event in the Murray River which lasted from the 21st January 2019 to 18th March 2019. The bloom was non-toxic, with the dominant species being the non-toxic Dolichospermum – straight (≥ 8 μm) and potentially toxic Dolichospermum coiled (≥ 8 μm). The bloom affected the Pental Island, Nyah and Piangil pump stations intermittently.

BGA levels were only moderate, however, the supply to the Manangatang WTP was switched off when the concentration of BGA were above the trigger threshold, and water carting was conducted for Manangatang. No other operational changes were required during the bloom. Some coagulant dosing of the Ouyen raw water storages occurred to treat the water prior to the WTP.

Customers in the affected areas were notified, and GWMWater maintained an incident management team during the event. Sampling frequency increased to daily at affected pump stations. All toxicity testing came back as zero.

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 Suppliers
Lake Bellfield	Supply System 4, Wimmera Mallee Pipeline	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

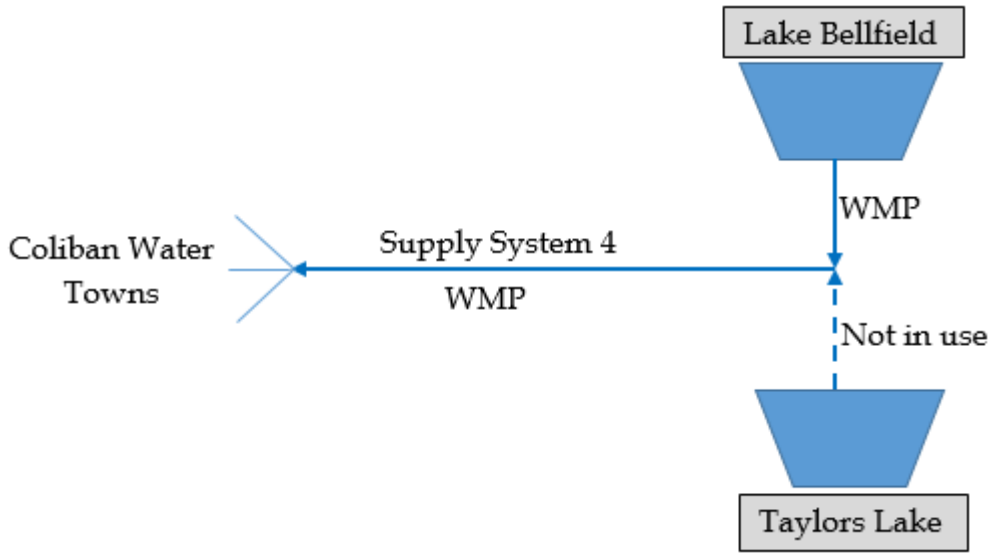
* The water storage manager does not apply any drinking water treatment processes before supplying its water.

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). This water is sourced from Supply System 4 of WMP, which is fed from the Grampians Headworks, primarily Lake Bellfield. Taylors Lake provides a back-up source of supply to the WMP, should Lake Bellfield become unsuitable for any reason.

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 is considered to be a poorly protected catchment (category 4).

Figure 2: Simplified schematic diagram showing supplies to Coliban Water.



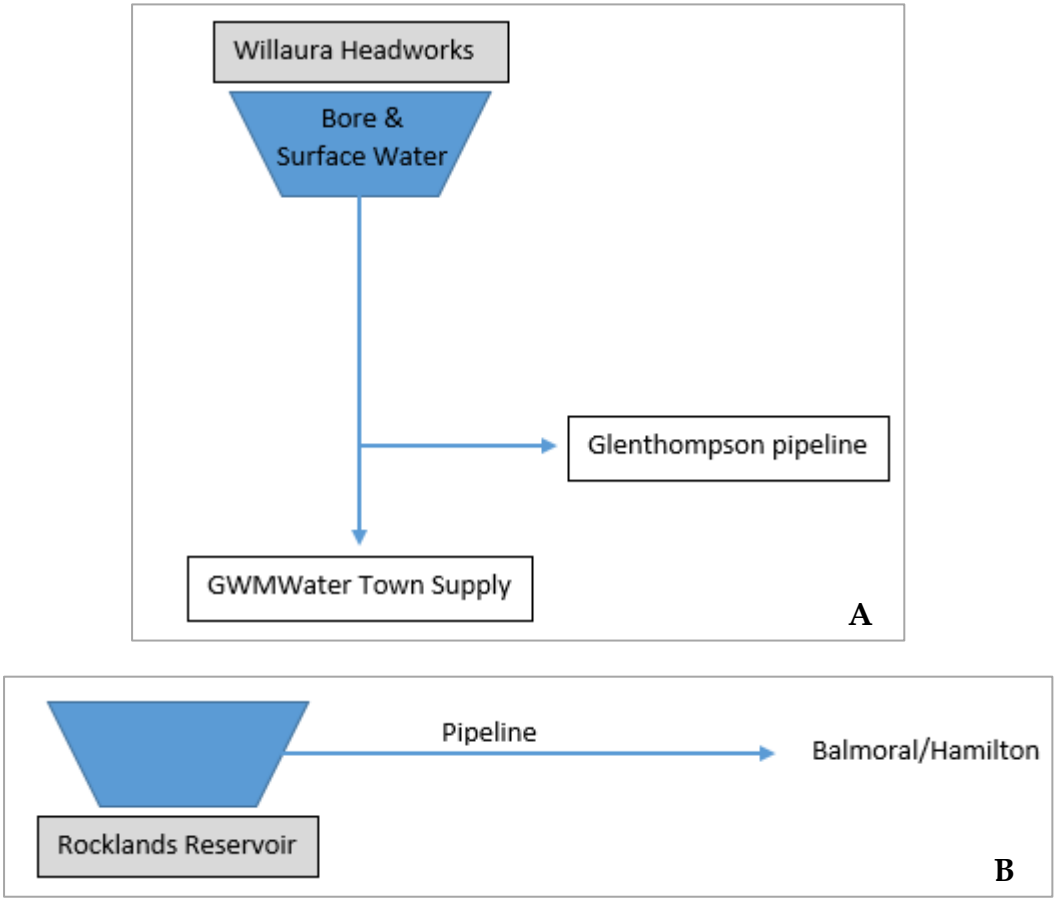
11.2 Wannon Water

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 gas 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.
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:	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.

ESC:	Essential Services Commission.
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 (1,000L).
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/100mL:	Organisms per 100 mL. A measure of the number of *E.coli*.
95th Percentile:	A statistical measure used to indicate when a value is below 95% of a group of observations.
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* 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.
TWS:	Treated Water Storage (applicable to disinfection only supplies).
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.

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.