2017/2018 Water Quality Annual Report

2017/18 Annual Report for Water Quality

With over 90 percent of the urban population serviced by GWMWater now receiving a potable water supply, we continually look for ways to improve access to safe drinking water for small urban communities.

In 2017/18, GWMWater commenced work on the Mallee Towns Water Quality Project. This project will bring drinking water to the towns of Brim, Beulah, and Woomelang, and will improve the water quality of Sea Lake.

The Mallee towns' project involves the construction of 137 km of pipeline to supply water sourced from the Grampians and treated utilising excess capacity of the Warracknabeal Water Treatment Plant. The piping decision was reflective of the long term risk of more frequent water quality events such as black water and blue green algae on the Murray Riveras a consequence of climate change. Sea Lake, Brim, Beulah and Woomelang will receive fully treated drinking water supply in 2018/19.

As part of GWMWater's ongoing 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. These service upgrades were considered through the engagement processes of the 2018-2023 Water Price Submission. The definitive technical solutions for these projects will be finalised during 2018/19.

GWMWater maintains a risk based operations and maintenance strategy that is informed by the history of water quality issues. This year, GWMWater engaged contractors to 'ice pig' the Nhill reticulation network. The network had a mineral build-up that had resulted from over 50 years of bore water supply prior to receiving drinking water supply. The

change to drinking water 'softened' the mineral and led to frequent dirty water events. The ice pigging was effective in cleaning reticulation network and more successful than traditional cleaning methods, resulting in a reduction in customer complaints. A technical case study on Nhill ice pigging was presented at the Australian Water Association's International Water Conference, OzWater in May 2018.

A drinking water quality regulatory audit was conducted in March 2018 to assess compliance of our risk management plans with the Safe Drinking Water Regulations 2015 and the *Safe Drinking Water Act* 2003. The audit highlighted the need for works to be conducted on the computer programming at water treatment plants for critical alarms, which is currently being addressed in a programmable logic controllers (PLC) upgrade project.

GWMWater has commenced the PLC upgrades and renewal project in October 2017. These upgrade and renewal works will assist in improving operational requirements, ensure the production of safe drinking water, and comply with the obligations imposed in the *Safe Drinking Water Act* 2003. The PLC work at Warracknabeal Water Treatment Plant has been completed and works are currently being conducted at the Dimboola Water Treatment Plant.

The South West Loddon project commenced construction in April 2016. By virtue of the collaborative engagement in the development of the project the capacity of the network has been increased to meet the requirements of towns serviced by Coliban Water that have variable source water quality.

GWMWater will continue to supply safe, affordable, drinking water whilst meeting the challenges of climate change and endeavouring to improve access to drinking water for communities presently receiving a regulated water supply.

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.

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2	31 July 2018	Water Regulation review	Mark Ferguson
3	10 August 2018	Department of Health and Human Services review	Cameron Laidlaw
4	29 August 2018	Executive Manager Infrastructure review	Robert Atkin
5	9 October 2018	Review by Senior Leadership Team	Senior Leadership Team
6	19 October 2018	Managing Director review and sign off	Mark Williams
7	19 October 2018	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 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 178 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) (updated November 2016) 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 7300 km of pipeline; and

- Supply System 5, which draws water from the Murray River and consists of approximately 1,800 km of pipeline.

b) The Northern Mallee Pipeline (NMP) system consisting of 3200 km of pipeline which also draws water from the Murray River.

1.3.3 A total of 1221 km 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). Of these 29 towns, 28 receive fully treated water, and one receives disinfection only. The one disinfection only urban water supply that is classified as drinking water is Sea Lake.

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.

1.3.6 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. The water is not put through any form of treatment and consequently is not intended for human consumption and is not 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 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 requires 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 is 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
Ararat	Surface water (Lake Fyans, Mt Cole Reservoir, Langi Ghiran Reservoir)	Copes Hill and Olivers Gully earthen storages	Ararat WTP	6925
Birchip	Grampians Headworks (WMP)	1 x lined earthen storages	Birchip WTP	700
Charlton	Grampians Headworks (WMP)	1 x lined earthen storages	Charlton WTP	1055
Dimboola	Grampians Headworks (WMP)	2 x lined earthen storages	Dimboola WTP	1723
Donald	Grampians Headworks (WMP)	2 x lined steel tanks	St Arnaud WTP	1507
Edenhope	Groundwater (bores)	N/A – Feed directly fed from bores	Edenhope WTP	936
Great Western	Surface water (Lake Fyans)	Verrings Basin earthen storage	Great Western WTP	395
Halls Gap	Surface water (Lake Bellfield, Dairy Creek)	Lake Bellfield and Dairy Creek earthen storages	Halls Gap WTP	415
Hopetoun	Grampians Headworks (WMP)	1 x lined earthen storages	Hopetoun WTP	534
Horsham	Surface and bore water (Lake Wartook and Laharum Bores)	1 x lined earthen storages	Mt Zero WTP	14625
Jeparit	Grampians Headworks (WMP)	2 x lined steel tanks	Rainbow WTP	337
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	326
Manangatang	Surface water (Murray River via NMPP)	N/A – Feed directly via Piangil Pipeline from Murray River	Manangatang WTP	242
Minyip	Grampians Headworks (WMP)	2 x poly lined steel tanks	Murtoa WTP	524
Murtoa	Grampians Headworks (WMP)	1 x lined earthen storages	Murtoa WTP	859
Natimuk	Surface and bore water (Lake Wartook and Laharum bores)	1 x lined steel tank	Mt Zero WTP	515
Nhill	Surface water Grampians Headworks (WMP)	2 x lined steel storages elevated tank	Dimboola WTP	2162
Ouyen	Surface water (Murray River via NMPP)	2 x earthen storages	Ouyen WTP	1173
Pomonal	Surface water (Lake Bellfield, Dairy Creek)	1 x concrete tank	Halls Gap WTP	349

Water Supply	Source Water	Raw Storage	Treatment Plant	Population
Quambatook	Surface water (Goulburn & Loddon Rivers) via Normanville Pipeline	1 x earthen storage	Quambatook WTP	247
Rainbow	Grampians Headworks (WMP)	2 x lined earthen storages	Rainbow WTP	671
Rupanyup	Grampians Headworks (WMP)	2 x poly lined steel tanks	Murtoa WTP	528
Sea Lake	Surface water (Murray River via NMPP)	2 x earthen storages	Sea Lake chlorinator	635
St Arnaud	Grampians Headworks (WMP)	Volcano storage, lined 720 ML capacity St Arnaud, earthen storage of 1,000 ML capacity	St. Arnaud WTP	2000
Stawell	Surface water (Lake Fyans, Lake Bellfield, Fyans Creek)	3 x earthen storages totalling 505.4 ML capacity	Stawell WTP	5454
Underbool	Surface water (Murray River via NMPP)	2 x earthen storages	Underbool WTP	182
Warracknabeal	Grampians Headworks (WMP)	2 x lined earthen storages	Warracknabeal WTP	2303
Willaura	Surface water (Mt William Creek, Stony Creek, Masons Creek) and Groundwater (bores)	2 x earthen storages at Willaura and Mt Pleasant	Willaura WTP	262
Wycheproof	Grampians Headworks (WMP)	2 x poly lined steel tanks	Charlton WTP	586

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
Antwerp	Grampians Headworks (WMP)	2 x poly lined steel tanks	22
Apsley	Groundwater (bores)	elevated steel tank	275
Berriwillock	Surface water (Murray River via NMPP)	2 x earthen storages	183
Beulah	Grampians Headworks (WMP)	2 x poly lined steel tanks	328
Brim	Grampians Headworks (WMP)	2 x poly lined steel tanks	119
Buangor	Surface water (McLeods Creek)	1 x earthen storage	88
Chillingollah	Surface water (Murray River via NMPP)	1 x earthen storage	14
Chinkapook	Surface water (Murray River via NMPP)	concrete tank	38
Cowangie	Groundwater (bores)	elevated tank	19
Culgoa	Surface water (Murray River via NMPP)	1 x earthen storage	100
Dooen	Grampians Headworks (WMP)	2 x poly tanks	44
Elmhurst	Surface water (Hickmans Creek)	1 x earthen storage	183
Glenorchy	Grampians Headworks (WMP)	2 x elevated steel tanks	150
Goroke	Groundwater (bores)	2 x elevated steel tanks	295
Harrow	Groundwater (bores) & surface water (Glenelg River)	1 x earthen storage, elevated steel tank	194
Jung	Grampians Headworks (WMP)	2 x poly lined steel tanks	105
Kaniva	Groundwater (bores)	Elevated concrete tank	627
Kiata	Groundwater (bores)	2 x concrete tanks	47
Lalbert	Surface water (Murray River via NMPP)	2 x poly lined steel tanks	108
Lascelles	Grampians Headworks (WMP)	2 x lined steel tanks	57
Lillimur	Groundwater (bores)	elevated steel tank	48

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Water Supply	Source Water	Raw Water Storage	Population
Marnoo	Grampians (bores)	1 x earthen storage	124
Miram	Groundwater (bores)	elevated steel tank	19
Moyston	Surface water (Mt William, Stony and Masons Creeks) and Groundwater (bores)	1 x earthen storage	234
Murrayville	Groundwater (bores)	elevated tank	276
Nandaly	Surface water (Murray River via NMPP)	concrete tank	48
Nullawil	Surface water (Murray River via NMPP)	2 x lined steel tanks	81
Patchewollock	Surface water (Murray River via NMPP)	2 x earthen storages	92
Pimpinio	Grampians Headworks (WMP)	2 x lined earthen storages and 1 x elevated tank storage	91
Serviceton	Groundwater (bores)	elevated steel tank	62
Speed	Surface water (Murray River via NMPP)	concrete tank	77
Streatham	Groundwater (bores)	1 x earthen storage	101
Tarranyurk	Grampians Headworks (WMP)	2 x lined steel tanks	10
Tempy	Surface water (Murray River via NMPP)	1 x steel and 1 x concrete tanks	42
Ultima	Surface water (Murray River via NMPP)	2 x poly lined steel tanks	180
Waitchie	Surface water (Murray River via NMPP)	concrete tank	8
Walpeup	Surface water (Murray River via NMPP)	2 x earthen storages	154
Watchem	Grampians Headworks (WMP)	2 x poly lined steel tanks	182
Westmere	Groundwater (bores)	1 x earthen storage	29
Wickliffe	Surface water (Mt William, Stony and Masons Creeks) and Groundwater (bores)	1 x earthen storage	88
Woomelang	Grampians Headworks (WMP)	2 x poly lined steel tanks	198
Yaapeet	Grampians Headworks (WMP)	2 x poly lined steel tanks	70

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.

2.2 Water Treatment Changes

There were no changes in the water treatment processes during this period.

As part of GWMWater's ongoing commitment to provide safe drinking water to localities in the region, a $ 14 million Mallee Towns Drinking Water Supply Project has been initiated by GWMWater, and is currently underway. As part of this project, Sea Lake, currently a disinfection only supply, and three regulated water supply (Brim, Beulah and Woomelang) will receive fully treated drinking water supply in the next reporting period. The water supply will be sourced from Lake Bellfield and fully treated water from the Warracknabeal Water Treatment Plant (WTP).

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

Water Sampling Localities	Treatment Processes	Chemicals 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	
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	
Jeparit	Booster disinfection	Chlorine	Receives water from Rainbow WTP

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Water Sampling Localities	Treatment Processes	Chemicals used in Treatment	Comments
Lake Bolac	Receives water from Willaura	-	
Manangatang*	Coagulation, flocculation, multimedia filtration, microfiber filtration (2 µm), disinfection	Ultrion 44560 coagulant, chlorine	
Minyip	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	Booster disinfection	Chlorine	Receives water from Horsham
Nhill	Booster disinfection	Chlorine	Receives water from Dimboola
Ouyen*	Microfiltration, disinfection	Aluminium chlorohydrate, chlorine	
Pomonal	Booster disinfection	Chlorine	Receives water from Halls Gap
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	Booster disinfection	Chlorine	Receives water from Murtoa WTP
Sea Lake*	Disinfection Only	Chlorine	
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	

Continued over page …

Water Sampling Localities	Treatment Processes	Chemicals used in Treatment	Comments
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	

^ *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, chlorine
Brim	Coagulation, disinfection	Polydadmac, chlorine, ammonia
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	Sodium hypochlorite, hydrochloric acid
Woomelang	Coagulation, disinfection	Polydadmac, chlorine
Yaapeet	Coagulation	Polydadmac

3 Drinking Water Quality Results

For the period 1 July 2017 to 30 June 2018, the sampling frequency of the drinking water quality standards, *Escherichia coli*¸ Trihalomethanes and turbidity is specified in Schedule 2 under the Regulations applied (Table 3-1). The water quality standards are discussed further below.

The Water Sampling Program for the entire region is based on ADWG recommendations, specific risks, historical data and operation 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 National Association of Testing Authorities (NATA) accredited laboratory for analysis. The sampling program was reviewed and new schedule was implemented in February 2017. A number of changes were made and are discussed below.

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 2017 to 30 June 2018.

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.	No	One locality was not compliant for the period. Refer to Section 3.1 for details.
Trihalomethanes (THM)	Monthly	Must not exceed 0.25 mg/L.	No	One locality was not 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 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 false positive is more than likely the result of an external factor such as sampling error.

3.1.1 Results

There was *E.coli* one exceedance in this reporting period (Table 3-2) in Lake Bolac.

There was one missed sample for *E. coli* in Stawell during the reporting period due to laboratory scheduling error.

3.1.1 Actions Undertaken in relation to values outside the guidelines.

Lake Bolac is a chloraminated supply, and receives fully treated drinking water from the Willaura WTP. The root cause of the *E.coli* incident was determined to be due to a low chloramine residual at the end of the main. The low chloramine residual was due to nitrification in the reticulation. Flushing and resampling in multiple locations was conducted. The chloramine residual at the Willaura WTP has since been increased, and management of the turnover of water in storage tanks has been improved to restore sufficient chloramine residual. Monitoring of chloramine residual and nitrification continues.

Table 3-2 – Results for Escherichia coli in Drinking Water: 1 July 2017 – 30 June 2018. 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	2	1
Manangatang	Weekly	52	0	0
Minyip	Weekly	52	0	0
Murtoa	Weekly	52	0	0
Natimuk	Weekly	52	0	0
Nhill	Weekly	63	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	0	0
Stawell*	Twice-weekly	103^	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.*

^ *One missing sample due to laboratory scheduling error.*

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 (Table 3-3).

There was one exceedance in this reporting period in Edenhope.

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

3.2.2 Actions Undertaken in relation to values outside the guidelines.

There is a wet well at Edenhope WTP that holds the bore water supply to the plant. Infiltration of surface water from the adjacent Lake Wallace into the wet well caused the raw water quality to change constantly, and increase in colour. It was difficult to optimise the coagulant dose rate at the WTP due to the rapidly changing water quality. As such, THM formation occurred briefly in the treated water. The leak into the wet well was repaired to prevent any further infiltration, and operations were returned to normal.

Table 3-3 – Results for Trihalomethanes in Drinking Water: 1 July 2017 – 30 June 2018. The concentration of THM should not exceed 0.25 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S18)	Comments
			Max	Average		
Ararat*	Twice-monthly	24	0.09	0.07	0	
Birchip	Monthly	12	0.06	0.05	0	
Charlton	Monthly	12	0.08	0.07	0	
Dimboola	Monthly	12	0.08	0.07	0	
Donald	Monthly	12	0.14	0.09	0	
Edenhope	Monthly	12	0.29	0.09	1	Infiltration of surface water into the wet well at the WTP, caused rapid change in raw water quality, and increased colour, leading to THM formation.
Great Western	Monthly	12	0.21	0.15	0	
Halls Gap	Monthly	12	0.08	0.06	0	
Hopetoun	Monthly	12	0.07	0.05	0	
Horsham*	Twice-monthly	24	0.13	0.10	0	
Jeparit	Monthly	12	0.08	0.07	0	

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Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met	Comments
			Max	Average		
Lake Bolac	Monthly	12	0.02	0.01	0	
Manangatang	Monthly	12	0.11	0.05	0	
Minyip	Monthly	12	0.11	0.08	0	
Murtoa	Monthly	12	0.09	0.07	0	
Natimuk	Monthly	12	0.15	0.13	0	
Nhill	Monthly	12	0.08	0.07	0	
Ouyen	Monthly	12	0.14	0.09	0	
Pomonal	Monthly	13	0.09	0.07	0	
Quambatook	Monthly	12	0.20	0.15	0	
Rainbow	Monthly	12	0.05	0.04	0	
Rupanyup	Monthly	12	0.10	0.07	0	
Sea Lake	Monthly	12	0.15	0.10	0	
St Arnaud	Monthly	12	0.10	0.06	0	
Stawell*	Twice-monthly	24	0.10	0.07	0	
Underbool	Monthly	12	0.10	0.07	0	
Warracknabeal	Monthly	12	0.09	0.08	0	
Willaura	Monthly	12	0.02	0.01	0	
Wycheproof	Monthly	12	0.10	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 undertaken on a minimum weekly basis for all drinking water supplies (Table 3-4).

There was one missed sample for turbidity in Stawell during the reporting period due to laboratory scheduling error.

Table 3-4 – Results for turbidity in Drinking Water: 1 July 2017 – 30 June 2018. The turbidity must not exceed 5.0 NTU in any 12-month period.

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	0.30	0.30	0
Birchip	Weekly	52	0.80	0.35	0
Charlton	Weekly	52	0.40	0.35	0
Dimboola	Weekly	52	0.30	0.20	0
Donald	Weekly	52	0.30	0.20	0
Edenhope	Weekly	52	1.00	0.55	0
Great Western	Weekly	52	0.30	0.30	0
Halls Gap	Weekly	52	0.40	0.30	0
Hopetoun	Weekly	52	0.70	0.38	0
Horsham*	Twice-weekly	104	1.10	0.52	0
Jeparit	Weekly	52	0.70	0.30	0
Lake Bolac	Weekly	52	3.90	0.40	0
Manangatang	Weekly	52	3.00	0.35	0
Minyip	Weekly	52	0.40	0.30	0

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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)
Murtoa	Weekly	52	0.70	0.55	0
Natimuk	Weekly	52	0.50	0.25	0
Nhill	Weekly	52	0.30	0.20	0
Ouyen	Weekly	52	0.20	0.15	0
Pomonal	Weekly	52	4.20	0.45	0
Quambatook	Weekly	52	0.40	0.35	0
Rainbow	Weekly	52	0.50	0.35	0
Rupanyup	Weekly	52	3.00	1.71	0
Sea Lake	Weekly	52	4.20	4.00	0
St Arnaud	Weekly	52	0.30	0.20	0
Stawell*	Twice-weekly	103^	0.70	0.30	0
Underbool	Weekly	52	0.20	0.20	0
Warracknabeal	Weekly	52	1.60	0.38	0
Willaura	Weekly	52	4.30	0.40	0
Wycheproof	Weekly	52	0.70	0.30	0

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

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 storage and reservoir 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 was one missed sample for turbidity in Stawell during the reporting period due to laboratory scheduling error.

Table 3-5 - Concentrations of chlorine in Drinking Water for 1 July 2017 – 30 June 2018. The concentrations of chlorine should not exceed 5.0 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		Comments
			Max	Average	
Ararat*	Twice-weekly	104	0.99	0.53	
Birchip	Weekly	52	1.14	0.55	
Charlton	Weekly	52	1.00	0.53	
Dimboola	Weekly	52	1.40	0.87	
Donald	Weekly	52	1.50	0.91	
Edenhope	Weekly	52	1.60	0.67	
Great Western	Weekly	52	1.09	0.54	
Halls Gap	Weekly	52	1.26	0.90	
Hopetoun	Weekly	52	1.47	0.83	
Horsham*	Twice-weekly	104	1.46	0.86	
Jeparit	Weekly	52	1.20	0.71	
Lake Bolac	Weekly	52	1.40	0.47	
Manangatang	Weekly	52	1.80	1.11	
Minyip	Weekly	52	1.10	0.78	
Murtoa	Weekly	52	1.00	0.62	
Natimuk	Weekly	53	1.46	0.87	

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Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		Comments
			Max	Average	
Nhill	Weekly	52	1.03	0.75	
Ouyen	Weekly	52	1.42	0.96	
Pomonal	Weekly	52	1.90	0.52	
Quambatook	Weekly	52	1.16	0.63	
Rainbow	Weekly	52	1.46	0.95	
Rupanyup	Weekly	52	1.20	0.81	
Sea Lake	Weekly	52	1.80	1.08	
St Arnaud	Weekly	52	1.70	1.00	
Stawell*	Twice-weekly	103^	1.03	0.48	One missing sample due to laboratory scheduling error.
Underbool	Weekly	52	1.60	0.90	
Warracknabeal	Weekly	52	1.02	0.70	
Willaura	Weekly	52	1.78	0.92	
Wycheproof	Weekly	52	1.53	1.01	

* *Due to the population size of these towns two samples are taken every week.*
^ *One missing sample due to laboratory scheduling error.*

3.4.3 Chloroacetic acids

Chloroacetic acids (monochloroacetic acid, dichloroacetic acid and trichloroacetic acid) 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, sampling of chloroacetic acids has been revised. From 1 July 2017 to February 2018, sampling of chloroacetic acids were done at least monthly in all the localities however from March 2018, sampling was only scheduled for localities (Great Western, Manangatang, Ouyen, Quambatook) with higher risk of DBP formation. 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 2017 – 30 June 2018. 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	
Ararat*	Monthly#	14	< 0.002	0.002	0
Birchip	Monthly#	7	< 0.002	0.002	0
Charlton	Monthly#	7	< 0.002	0.002	0
Dimboola	Monthly#	7	< 0.002	0.002	0
Donald	Monthly#	7	0.003	0.002	0
Edenhope	Monthly#	7	0.006	0.003	0
Great Western	Monthly	12	0.007	0.005	0
Halls Gap	Monthly#	7	< 0.002	0.002	0
Hopetoun	Monthly#	7	0.004	0.003	0
Horsham*	Monthly#	14	< 0.002	0.002	0
Jeparit	Monthly#	7	0.004	0.003	0
Lake Bolac	Monthly#	7	0.005	0.003	0
Manangatang	Monthly	12	0.003	0.002	0

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Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Minyip	Monthly#	7	< 0.002	0.002	0
Murtoa	Monthly#	7	< 0.002	0.002	0
Natimuk	Monthly#	7	0.003	0.003	0
Nhill	Monthly#	7	< 0.002	0.002	0
Ouyen	Monthly	12	0.003	0.002	0
Pomonal	Monthly#	7	0.003	0.002	0
Quambatook	Monthly	12	0.004	0.003	0
Rainbow	Monthly#	7	< 0.002	0.002	0
Rupanyup	Monthly#	7	< 0.002	0.002	0
Sea Lake	Monthly#	7	0.005	0.003	0
St Arnaud	Monthly#	7	< 0.002	0.002	0
Stawell*	Monthly#	14	< 0.002	0.002	0
Underbool	Monthly#	7	0.003	0.002	0
Warracknabeal	Monthly#	7	0.003	0.002	0
Willaura	Monthly#	7	0.010	0.005	0
Wycheproof	Monthly#	7	0.003	0.002	0

* *Due to the population size of these towns two samples are taken every week.*
< *Less than limit of detection.*
\# *Monthly from July 2017 – February 2018.*

Table 3-7 - Concentrations of Dichloroacetic Acids in Drinking Water of 1 July 2017 – 30 June 2018. 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)	Comments
			Max	Average		
Ararat*	Monthly#	14	0.020	0.012	0	
Birchip	Monthly#	7	0.013	0.011	0	
Charlton	Monthly#	7	0.020	0.015	0	
Dimboola	Monthly#	7	0.016	0.014	0	
Donald	Monthly#	7	0.023	0.018	0	
Edenhope	Monthly#	7	0.050	0.009	0	
Great Western	Monthly	12	0.077	0.040	0	
Halls Gap	Monthly#	7	0.020	0.014	0	

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Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)	Comments
			Max	Average		
Hopetoun	Monthly#	7	0.035	0.022	0	
Horsham*	Monthly#	14	0.013	0.011	0	
Jeparit	Monthly#	7	0.040	0.026	0	
Lake Bolac	Monthly#	7	0.023	0.010	0	
Manangatang	Monthly	12	0.043	0.018	0	
Minyip	Monthly#	7	0.014	0.008	0	
Murtoa	Monthly#	7	0.018	0.015	0	
Natimuk	Monthly#	7	0.030	0.024	0	
Nhill	Monthly#	7	0.022	0.019	0	
Ouyen	Monthly	12	0.042	0.024	0	
Pomonal	Monthly#	7	0.030	0.022	0	
Quambatook	Monthly	12	0.016	0.012	0	
Rainbow	Monthly#	7	0.014	0.009	0	
Rupanyup	Monthly#	7	0.006	0.005	0	
Sea Lake	Monthly#	7	0.039	0.029	0	
St Arnaud	Monthly#	7	0.014	0.011	0	
Stawell*	Monthly#	14	0.016	0.009	0	
Underbool	Monthly#	7	0.024	0.016	0	
Warracknabeal	Monthly#	7	0.024	0.018	0	
Willaura	Monthly#	7	0.043	0.021	0	
Wycheproof	Monthly#	7	0.026	0.015	0	

* *Due to the population size of these towns two samples are taken every week.*
\# *Monthly from July 2017 – February 2018.*

Table 3-8 - Concentrations of Trichloroacetic Acids in Drinking Water for 1 July 2017 – 30 June 2018. 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)	Comments
			Max	Average		
Ararat*	Monthly#	14	0.022	0.016	0	
Birchip	Monthly#	7	0.015	0.013	0	
Charlton	Monthly#	7	0.018	0.014	0	
Dimboola	Monthly#	7	0.015	0.013	0	
Donald	Monthly#	7	0.018	0.015	0	
Edenhope	Monthly#	7	0.078	0.013	0	
Great Western	Monthly	12	0.100	0.056	0	
Halls Gap	Monthly#	7	0.025	0.017	0	
Hopetoun	Monthly#	7	0.038	0.023	0	
Horsham*	Monthly#	14	0.012	0.009	0	
Jeparit	Monthly#	7	0.042	0.027	0	
Lake Bolac	Monthly#	7	0.003	0.002	0	
Manangatang	Monthly	12	0.056	0.021	0	
Minyip	Monthly#	7	0.019	0.015	0	
Murtoa	Monthly#	7	0.021	0.016	0	
Natimuk	Monthly#	7	0.058	0.041	0	
Nhill	Monthly#	7	0.027	0.020	0	
Ouyen	Monthly	12	0.060	0.032	0	
Pomonal	Monthly#	7	0.033	0.027	0	
Quambatook	Monthly	12	0.013	0.007	0	
Rainbow	Monthly#	7	0.018	0.011	0	
Rupanyup	Monthly#	7	0.027	0.015	0	
Sea Lake	Monthly#	7	0.100	0.063	0	
St Arnaud	Monthly#	7	0.011	0.008	0	
Stawell*	Monthly#	14	0.016	0.013	0	
Underbool	Monthly#	7	0.029	0.019	0	
Warracknabeal	Monthly#	7	0.042	0.027	0	
Willaura	Monthly#	7	0.250	0.042	2	.
Wycheproof	Monthly#	7	0.020	0.013	0	

* *Due to the population size of these towns two samples are taken every week.*
\# *Monthly from July 2017 – February 2018.*

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

All samples for lead met the standard for the reporting period (

Table 3-9).

The sampling of lead is based on ADWG recommendations, risks, historical data and any operational changes. Based on historical data and risks assessment, sampling of lead has been revised. From 1 July 2017 to February 2018, sampling of lead in Edenhope decreased to quarterly as it have not been shown to be an issue over the last 13 years.

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

Table 3-9 - Concentrations of Lead in Drinking Water for 1 July 2017 – 30 June 2018. 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	< 0.001	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	Monthly#	8	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	< 0.001	0	

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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	< 0.001	0	
Wycheproof	Yearly	1	< 0.001	0	

* *Due to the population size of these towns two samples are taken.*
\# *Monthly from July 2017 – February 2018.*

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 (as nitrite).

Nitrate: Based on health considerations, the guideline value of 50 mg-NO_3/L (as nitrate) has been set to protect bottle-fed infants under three months of age and up to 100 mg-NO_3/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 3-10) and nitrate (Table 3-11) met the standard for this reporting period.

There were no missing samples during the reporting period.

Table 3-10 - Concentrations of Nitrite in Drinking Water for 1 July 2017 – 30 June 2018. Nitrite should not exceed 3 mg-NO_2/L (a nitrite).

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)	No of samples where standard was not met (S 18)
Lake Bolac	Monthly	12	0.29	0
Willaura	Monthly	12	0.34	0

Table 3-11 - Concentrations of Nitrate in Drinking Water for 1 July 2017 – 30 June 2018. Nitrate should not exceed 50 mg-NO_3/L (as nitrate).

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)	No of samples where standard was not met (S 18)
Lake Bolac	Monthly	12	0.12	0
Willaura	Monthly	12	0.21	0

3.4.6 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

All samples for copper met the standard for the reporting period (Table 3-12).

The sampling of copper is based on ADWG recommendations, risks, historical data and any operational changes. Based on historical data and risks assessment, sampling of lead has been revised. From 1 July 2017 to February 2018, sampling of copper in Edenhope decreased to quarterly as it have not been shown to be an issue over the last 13 years.

There were no missing samples during the reporting period.

Table 3-12 - Concentrations of Copper in Drinking Water for 1 July 2017 – 30 June 2018. 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	0.006	0
Birchip	Yearly	1	0.128	0
Charlton	Yearly	1	0.006	0
Dimboola	Yearly	1	0.006	0
Donald	Yearly	1	0.006	0
Edenhope	Monthly#	8	0.064	0
Great Western	Yearly	1	0.029	0
Halls Gap	Yearly	1	0.006	0
Hopetoun	Yearly	1	0.006	0
Horsham*	Yearly	2	0.006	0
Jeparit	Yearly	1	0.066	0
Lake Bolac	Yearly	1	0.006	0
Manangatang	Yearly	1	0.039	0
Minyip	Yearly	1	0.006	0
Murtoa	Yearly	1	0.032	0
Natimuk	Yearly	1	0.006	0
Nhill	Yearly	1	0.006	0
Ouyen	Yearly	1	0.006	0
Pomonal	Yearly	1	0.016	0
Quambatook	Yearly	1	0.036	0
Rainbow	Yearly	1	0.026	0
Rupanyup	Yearly	1	0.006	0
Sea Lake	Yearly	1	0.006	0
St Arnaud	Yearly	1	0.006	0
Stawell*	Yearly	2	0.006	0
Underbool	Yearly	1	0.070	0
Warracknabeal	Yearly	1	0.006	0
Willaura	Yearly	1	0.060	0
Wycheproof	Yearly	1	0.040	0

* *Due to the population size of these towns two samples are taken.*
\# *Monthly from July 2017 – February 2018.*

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

All samples for arsenic met the standard for the reporting period (Table 3-13).

The sampling of arsenic is based on ADWG recommendations, risks, historical data and any operational changes. Based on historical data and risks assessment, sampling of arsenic has been revised. From 1 July 2017 to February 2018, sampling of arsenic in Edenhope decreased to quarterly sampling of copper in Edenhope decreased to quarterly as it have not been shown to be an issue over the last 13 years.

There were no missing samples during the reporting period.

Table 3-13 - Concentrations of Arsenic in Drinking Water for 1 July 2017 – 30 June 2018. 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	Monthly#	8	0.005	0
Great Western	Yearly	1	< 0.001	0
Halls Gap	Yearly	1	< 0.001	0
Haven^	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	< 0.001	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	< 0.001	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.*
\# *Monthly from July 2017 – February 2018.*

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 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. In November 2006, the Horsham water supply became fluoridated. The Natimuk water supply is sourced from Horsham's WTP, and is also therefore a fluoridated supply. In August 2016, Ararat's water supply became fluoridated.

3.4.8.1 Results

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).

The sampling of fluoride is based on ADWG recommendations, Code of practice for fluoridation of drinking water supplies, risks, historical data and any operational changes. Based on historical data and risks assessment, sampling of fluoride has been revised. From 1 July 2017 to February 2018, sampling of fluoride at non-fluoridated localities were done yearly however from March 2018, sampling for those localities have been reduced as fluoride in source water were low.

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

3.4.8.2 Actions Undertaken in relation to values outside the guidelines.

Under the *Code of Practice for Fluoridation of Drinking Water Supplies*, water utility must notify DHHS within 24 hours when fluoride concentration in drinking water measured at the fluoridation plant is less than 0.6 mg/L for a continuous period longer than 72 hours. The fluoridation at Horsham WTP was switched off for more than 72 hours from 12 to 14 March 2018 due to a PLC analogue input card fault. The analogue input card was replaced and the system was thoroughly tested prior to restoration of the fluoridation dosing. DHHS was notified within 24 hours of the issue occurring and was notified when fluoridation has been restored.

Table 3-14 - Fluoride Results in Drinking Water for 1 July 2016 – 30 June 2017. 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.*

3.4.9 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. 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.

3.4.10 Results

Aluminium acid-soluble sampling and analysis was undertaken on a minimum monthly basis (Table 3-15).

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 2017 – 30 June 2018. 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	0.05	0	
Birchip	Monthly	12	0.04	0.02	0	
Charlton	Monthly	12	0.09	0.02	0	
Dimboola	Monthly	12	0.06	0.03	0	
Donald	Monthly	12	0.03	0.02	0	
Edenhope	Monthly	12	0.11	0.02	0	
Great Western	Monthly	12	0.03	0.02	0	
Halls Gap	Monthly	12	0.03	0.02	0	
Hopetoun	Monthly	12	0.06	0.02	0	
Horsham*	Twice-monthly	24	0.06	0.03	0	
Jeparit	Monthly	12	0.07	0.03	0	
Lake Bolac	Weekly	12	0.08	0.03	0	
Manangatang	Monthly	12	0.01	0.01	0	
Minyip	Monthly	12	0.03	0.02	0	
Murtoa	Monthly	12	0.04	0.02	0	
Natimuk	Monthly	12	0.03	0.03	0	
Nhill	Monthly	12	0.05	0.02	0	
Ouyen	Monthly	12	0.03	0.01	0	
Pomonal	Monthly	12	0.04	0.03	0	
Quambatook	Monthly	12	0.01	0.01	0	
Rainbow	Monthly	12	0.04	0.02	0	
Rupanyup	Monthly	12	0.03	0.02	0	
Sea Lake	-	0	-	-	-	No analysis conducted as coagulation is not part of a treatment at Sea Lake WTP.
St Arnaud	Monthly	12	0.04	0.02	0	
Stawell*	Twice-monthly	22	0.05	0.03	0	
Underbool	Monthly	12	0.02	0.01	0	
Warracknabeal	Monthly	13	0.07	0.03	0	
Willaura	Monthly	12	0.15	0.02	0	
Wycheproof	Monthly	12	0.04	0.01	0	

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

4 Aesthetic Parameters

Individual monitoring results for 1 July 2017 to 30 June 2018 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 a number of individual results, which did not satisfy the aesthetic guideline values set out in the ADWG 2011. Birchip, Charlton, Dimboola, Donald, Hopetoun, Manangatang, Minyip, Natimuk, Ouyen, Quambatook, Rainbow, Stawell, Willaura and Wycheproof experienced some values outside the pH guideline values.

There was one missed sample for turbidity in Stawell during the reporting period.

4.1.2 Actions Undertaken in relation to values outside the guidelines.

A number of pH exceedances (≤ 3 exceedances at each locality in the last 12 months) at Dimboola, Donald, Hopetoun, Horsham, Lake Bolac, Natimuk, Quambatook, Rupanyup, Sea Lake and Willaura. 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.

Minyip experiences seasonally high pH due to the reaction of water with cement-lined reticulation pipes. Trends indicate that the high pH is reducing, and it is anticipated that the issue will resolve itself over time. If the issue is persistent pH correction may be implemented to counter the effects of the cement lined pipes.

Table 4-1 - pH Results for Drinking Water for 1 July 2017 – 30 June 2018. 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	7.9	6.6	7.2
Birchip	Weekly	52	8.4	6.3	7.0
Charlton	Weekly	52	9.4	6.7	7.5
Dimboola	Weekly	52	8.6	6.8	7.2
Donald	Weekly	52	8.7	6.7	7.4
Edenhope	Weekly	52	7.6	6.7	7.3
Great Western	Weekly	52	7.9	6.8	7.2
Halls Gap	Weekly	52	8.3	6.7	7.1
Hopetoun	Weekly	52	8.0	6.2	7.2
Horsham*	Twice-weekly	104	7.6	6.5	7.0
Jeparit	Weekly	52	7.7	6.5	6.9
Lake Bolac	Weekly	52	9.1	6.9	7.4
Manangatang	Weekly	52	7.9	6.1	7.0
Minyip	Weekly	52	9.8	6.9	8.0
Murtoa	Weekly	52	7.8	6.7	7.2
Natimuk	Weekly	52	7.6	6.6	7.1
Nhill	Weekly	52	7.9	6.5	7.2
Ouyen	Weekly	52	8.3	6.6	7.5
Pomonal	Weekly	52	7.8	6.5	7.0
Quambatook	Weekly	52	8.1	6.3	7.2
Rainbow	Weekly	52	7.6	6.2	6.7
Rupanyup	Weekly	52	8.3	6.5	7.1
Sea Lake	Weekly	52	8.4	6.2	7.6
St Arnaud	Weekly	52	8.6	6.9	7.3
Stawell*	Twice-weekly	103^	8.2	6.6	7.1
Underbool	Weekly	52	8.3	6.6	7.7
Warracknabeal	Weekly	52	8.0	6.6	7.2
Willaura	Weekly	52	7.8	5.9	7.2
Wycheproof	Weekly	52	8.3	6.2	7.0

* *Due to the population size of these towns two samples are taken every week.*
^ *One missing sample due to laboratory scheduling error.*

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 has been revised. From 1 July 2017 to February 2018, sampling of true colour were done at least monthly in all the localities however from March 2018, sampling was only scheduled for localities with higher risk of coloured water (

Table 4-2).

There were two results, one in Lake Bolac and one in Willaura, which did not satisfy the aesthetic guideline values set out in the ADWG 2011.

There were no missing samples for the reporting period.

4.2.2 Actions Undertaken in relation to values outside the guidelines.

Lake Bolac and Willaura had one occurrence of colour exceeding the ADWG aesthetic guideline value in July 2017. This exceedance was due to high colour after some seasonal rainfall. The membrane filtration at Willaura WTP is not capable of removing colour from the raw water. The need to upgrade the existing membrane filtration system at Willaura WTP has been recognised by GWMWater and the options to upgrade the WTP is currently under review.

Table 4-2 - True Colour Results for Drinking Water Supplied of 1 July 2017 – 30 June 2018. True colour in drinking water should not exceed 15 Hazen Units (HU).

Sampling Locality	Sampling Frequency	No. of Samples	Results (HU)
			Max
Ararat*	Monthly#	14	4.0
Birchip	Monthly#	7	2.0
Charlton	Monthly#	7	4.0
Dimboola	Monthly#	7	2.0
Donald	Monthly#	7	4.0
Edenhope	Monthly#	7	4.0
Great Western	Monthly#	7	4.0
Halls Gap	Monthly#	7	4.0
Hopetoun	Monthly#	7	2.0
Horsham*	Monthly#	14	2.0
Jeparit	Monthly#	7	4.0
Lake Bolac	Monthly	12	25.0
Manangatang	Monthly#	7	4.0
Minyip	Monthly#	7	2.0
Murtoa	Monthly#	7	4.0
Natimuk	Monthly#	7	2.0
Nhill	Monthly#	7	2.0
Ouyen	Monthly#	7	4.0
Pomonal	Monthly#	7	4.0
Quambatook	Monthly	12	4.0
Rainbow	Monthly#	7	4.0
Rupanyup	Monthly#	7	2.0
Sea Lake	Monthly#	7	6.0
St Arnaud	Monthly#	7	4.0
Stawell*	Monthly#	14	4.0
Underbool	Monthly#	7	2.0
Warracknabeal	Monthly#	7	2.0
Willaura	Monthly	12	18.0
Wycheproof	Monthly#	7	2.0

* *Due to the population size of these towns two samples are taken.*
\# *Monthly from July 2017 – February 2018.*

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 2016 – 30 June 2017. 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	44
Birchip	Quarterly	4	18
Charlton	Quarterly	4	29
Dimboola	Quarterly	4	19
Donald	Quarterly	4	26
Edenhope	Quarterly	4	180
Great Western	Quarterly	4	37
Halls Gap	Quarterly	4	32
Hopetoun	Quarterly	4	23
Horsham*	Twice-quarterly	8	33
Jeparit	Quarterly	4	21
Lake Bolac	Quarterly	4	34
Manangatang	Quarterly	4	27
Minyip	Quarterly	4	30
Murtoa	Quarterly	4	22
Natimuk	Quarterly	4	30
Nhill	Monthly	12	22
Ouyen	Quarterly	4	64
Pomonal	Quarterly	4	33
Quambatook	Quarterly	4	160
Rainbow	Quarterly	4	19
Rupanyup	Quarterly	4	21
Sea Lake	Quarterly	4	73
St Arnaud	Quarterly	4	24
Stawell*	Twice-quarterly	8	44
Underbool	Quarterly	4	80
Warracknabeal	Quarterly	4	24
Willaura	Quarterly	4	24
Wycheproof	Quarterly	4	24

* *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 provides 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 was one exceedance in Edenhope for the reporting period.

4.4.2 Actions Undertaken in relation to values outside the guidelines.

Edenhope had one occurrence of EC exceeding the ADWG aesthetic guideline value. There are four bores, three low salinity bores and a high salinity bore (that is used during peak demand) at the Edenhope borefield. The low salinity bores are treated through the DAFF plant and in a peak demand periods, the high salinity bore is switched on and water is treated through the Reverse Osmosis (RO) plant. The EC exceedance occurred when the RO plant at the Edenhope WTP was turned on during a high demand period in January 2018. The RO plant was only able to removed 50 percent of the EC in the high salinity bore, and due to communication issues with the low saline bores, the town supply relied mainly on the RO product which causes the EC in the clear water storage to increase. The issue was rectified by replacing the transmitters for the low saline bores.

Table 4-4 - Electrical Conductivity (EC) Results for Drinking Water Supplied of 1 July 2017 – 30 June 2018. 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	267
Birchip	Weekly	52	166
Charlton	Weekly	52	130
Dimboola	Weekly	52	135
Donald	Weekly	52	150
Edenhope	Weekly	52	1270
Great Western	Weekly	52	311
Halls Gap	Weekly	52	177
Haven^	Weekly	52	176
Hopetoun	Weekly	52	164
Horsham*	Twice-weekly	104	175
Jeparit	Weekly	52	130
Lake Bolac	Weekly	52	242
Manangatang	Weekly	52	218
Minyip	Weekly	52	145
Murtoa	Weekly	52	145
Natimuk	Weekly	52	177
Nhill	Weekly	52	148
Ouyen	Weekly	52	224
Pomonal	Weekly	52	152
Quambatook	Weekly	52	720
Rainbow	Weekly	52	295
Rupanyup	Weekly	52	135
Sea Lake	Weekly	52	288
St Arnaud	Weekly	52	145
Stawell*	Twice-weekly	103^	254
Underbool	Weekly	52	316
Warracknabeal	Weekly	52	127
Willaura	Weekly	52	220
Wycheproof	Weekly	52	168

* *Due to the population size of these towns two samples are taken.*
^ *One missing sample due to laboratory scheduling error.*

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

Iron sampling and analysis was undertaken on a quarterly basis for drinking water supplies. The sampling of iron is based on ADWG recommendations, risks, historical data and any operational changes. Based on historical data and risks assessment, sampling was reduced from March 2018.

During the reporting period iron values in water supplied to customers were stable. There were no missing samples for the reporting period.

Table 4-5- Iron Results for Drinking Water Supplied of 1 July 2017 – 30 June 2018. Iron in drinking water should not exceed 0.3 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)
			Max
Ararat*	Quarterly#	4	0.030
Birchip	Quarterly#	2	0.020
Charlton	Quarterly#	2	0.060
Dimboola	Quarterly#	2	0.030
Donald	Quarterly#	2	0.050
Edenhope	Quarterly#	2	0.030
Great Western	Quarterly#	2	0.020
Halls Gap	Quarterly#	2	0.010
Hopetoun	Quarterly#	2	0.010
Horsham*	Quarterly#	4	0.010
Jeparit	Quarterly#	2	0.070
Lake Bolac	Quarterly#	2	0.020
Manangatang	Quarterly#	2	0.020
Minyip	Quarterly#	2	0.020
Murtoa	Quarterly#	2	0.250
Natimuk	Quarterly#	2	0.020
Nhill	Monthly	12	0.030
Ouyen	Quarterly#	2	0.010
Pomonal	Quarterly#	2	0.030
Quambatook	Monthly	12	0.060
Rainbow	Quarterly#	2	0.040
Rupanyup	Quarterly#	2	0.040
Sea Lake	Quarterly#	2	0.200
St Arnaud	Quarterly#	2	0.010
Stawell*	Quarterly#	2	0.060
Underbool	Quarterly#	2	0.010
Warracknabeal	Quarterly#	2	0.020
Willaura	Quarterly#	2	0.020
Wycheproof	Quarterly#	2	0.070

* *Due to the population size of these towns two samples are taken.*
\# *Quarterly from July 2017 – February 2018.*

4.5 Manganese

The concentration of manganese should not exceed 0.1 mg/L based on aesthetic considerations but would not be a health consideration unless the concentration exceeds 0.5 mg/L. At concentrations exceeding 0.1 mg/L, manganese imparts an undesirable taste to water and stains plumbing fixtures and laundry. Even at concentrations of 0.02 mg/L, manganese will form a coating on pipes, which can slough off as black ooze. Some nuisance micro-organisms can concentrate manganese and give rise to taste, odour and turbidity problems in distribution systems. A detailed description of manganese and its implications in a water supply can be found by reference to the ADWG 2011.

4.5.1 Results

The sampling of manganese is based on ADWG recommendations, risks, historical data and any operational changes. Based on historical data and risks assessment, frequency of sampling reduced from March 2018.

All samples for manganese met the standard for the reporting period (Table 4-6).

There were no missing samples during the reporting period.

Table 4-6 - Concentrations of Manganese in Drinking Water for 1 July 2017 – 30 June 2018. Manganese should not exceed 0.5 mg/L.

Sampling Locality	Sampling Frequency	No. of Samples	Results (mg/L)		No. of samples where standard was not met (S 18)
			Max	Average	
Ararat*	Quarterly	4	0.001	0.001	0
Birchip	Quarterly	3	0.001	0.001	0
Charlton	Quarterly	3	0.001	0.001	0
Dimboola	Quarterly	3	0.001	0.001	0
Donald	Quarterly	3	0.003	0.002	0
Edenhope	Quarterly	2	0.002	0.002	0
Great Western	Quarterly	2	0.001	0.001	0
Halls Gap	Quarterly	2	0.001	0.001	0
Hopetoun	Quarterly	3	0.006	0.003	0
Horsham*	Quarterly	2	0.010	0.006	0
Jeparit	Quarterly	6	0.001	0.001	0
Lake Bolac	Quarterly	2	0.001	0.001	0
Manangatang	Quarterly	3	0.001	0.001	0
Minyip	Quarterly	3	0.005	0.002	0
Murtoa	Quarterly	2	0.001	0.001	0
Natimuk	Quarterly	2	0.004	0.003	0
Nhill	Monthly	2	0.003	0.003	0
Ouyen	Quarterly	9	0.001	0.001	0
Pomonal	Quarterly	3	0.001	0.001	0
Quambatook	Quarterly	4	0.001	0.001	0
Rainbow	Quarterly	7	0.002	0.002	0
Rupanyup	Quarterly	2	0.001	0.001	0
Sea Lake	Quarterly	2	0.001	0.001	0
St Arnaud	Quarterly	2	0.006	0.001	0
Stawell*	Quarterly	3	0.006	0.003	0
Underbool	Quarterly	4	0.001	0.001	0
Warracknabeal	Quarterly	3	0.001	0.001	0
Willaura	Quarterly	3	0.001	0.001	0
Wycheproof	Quarterly	3	0.005	0.004	0

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

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, 2017/18 with the last two reporting periods, 2016/17 and 2015/2016 (Table 5-1).

The water quality performance for turbidity, chloroacetic acids, chlorine, lead, nitrite, nitrate, copper, arsenic and fluoride has remained consistent over the reporting periods with no exceedances.

Table 5-1 - Comparison of analysis of water quality results of drinking water supplied from 2015/16 to 2017/18.

Parameters	2015/16		2016/17		2017/18	
	% 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	100	100	96.55	99.32
Trihalomethanes	100	100	86.21	96.29	96.55	98.06
Turbidity	100	100	100	100	100	100
Aluminium acid-soluble	93.10	61.85	96.55	98.63	100	100
Monochloroacetic acid	100	100	100.00	100.00	100	100
Dichloroacetic acid	100	100	93.10	98.32	100	100
Trichloroacetic acid	100	100	82.76	94.61	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	89.66	96.73	51.72	68.00	44.83	45.68
Colour	93.10	99.15	93.10	100	93.10	98.78
Hardness	96.55	99.59	100	100	100	100
Electrical conductivity	100	100	100	100	96.55	98.06
Iron	100	100	100	100	100	100
Manganese	100	100	100	100	100	100

6 Complaints

6.1 Complaints and Responses

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

GWMWater systematically records all complaints in a complaint register. Trends in water quality complaints are able to be tracked and 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 2015/2016 to 2017/2018.

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2015/16	2016/17	2017/18	
Discoloured	63	67	66	No significant change.
Taste/Odour	20	4	13	Significant increase due to customers detecting the disinfectant (chlorine) in Ararat and earthy/musty taste in St Arnaud.
Air in water	1	2	3	No significant change.
Other	5	0	4	Slight increase, not specific to an event/incident.
Total	89	73	86	No significant change

*Table 6-2 – *Regulated Water Quality Complaints comparison between 2015/2016 to 2017/2018.*

Type of Complaint	Number of complaints			Comparison with previous reporting periods
	2015/16	2016/17	2017/18	
Discoloured	58	48	36	Trending down.
Odour	36	8	12	No significant change.
Air in water	0	0	0	No significant change.
Other	8	0	1	No significant change.
Total	102	56	49	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 8 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.

Discoloured water complaints were the highest number of complaints at Nhill. These complaints were due to iron accumulation in the reticulation system, resulting in orange coloured water. GWMWater addressed the issue by conducting an ice pigging with a flushing and air-scouring program in September 2017. This was a successful program, resulting in a clean reticulation, and reduced number of complaints.

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

There was a significant increase of taste and odour complaints, by three-fold in this reporting period in drinking water supplies. Most of the taste and odour complaints were due to customers detecting the disinfectant (chlorine) in the Ararat 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 St. Arnaud. The naturally occurring taste and odour compound, geosmin, giving an earthy/musty taste was also present during summer in the St. Arnaud water supply. The St Arnaud WTP is unable to remove geosmin, however this issue may be temporary as GWMWater cleaned out a raw water storage recently and this may have caused the geosmin spike. If the issue arises again, GWMWater may need to consider activated carbon dosing in St Arnaud.

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Table 6-3 - Water Quality Complaints for Drinking Water Towns of 1 July 2017 – 30 June 2018.

Water Supply	Pop'n served	ESC Customers†	Number of Complaints				
			Colour	T&O^	Air	Other	Total
Ararat	6925	4054	9	3			12
Birchip	700	457					0
Charlton	1055	698	2				2
Dimboola	1723	884	4	1			5
Donald	1507	887	1				1
Edenhope	936	547	1				1
Great Western	395	134					0
Halls Gap	415	517	1		1		2
Hopetoun	534	381	1	1	1		3
Horsham	14625	8482	8	1	1	2	12
Jeparit	337	303	1				1
Lake Bolac	326	172					0
Manangatang	242	164					0
Minyip	524	276					0
Murtoa	859	484		1			1
Natimuk	515	269	1				1
Nhill	2162	1152	24				24
Ouyen	1173	688		1			1
Pomonal	349	129	4	1			5
Quambatook	247	168					0
Rainbow	671	368					0
Rupanyup	528	248					0
Sea Lake	635	422	1	1			2
St Arnaud	2000	1429	2	2			4
Stawell	5454	3296	5				5
Underbool	182	133				1	1
Warracknabeal	2303	1442				1	1
Willaura	262	263		1			1
Wycheproof	586	427	1				1
Total	48171	28874	66	13	0	7	86

† *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 2017 – 30 June 2018

Water Supply	Pop'n served	ESC Customers†	Number of Complaints				
			Colour	Odour	Air	Other	Total
Antwerp	22	12					0
Apsley	275	122					0
Berriwillock	183	89	1	2			3
Beulah	328	174					0
Brim	119	55	1				1
Buangor	88	39		1			1
Chillingollah	14	6					0
Chinkapook	38	15					0
Cowangie	19	12					0
Culgoa	100	77	3	1			4
Dooen	44	18					0
Elmhurst	183	120	2				2
Glenorchy	150	61					0
Goroke	295	176					0
Harrow	194	93	2	1			3
Jung	105	40					0
Kaniva	627	524	1	3		1	5
Kiata	47	21					0
Lalbert	108	57	1				1
Lascelles	57	30					0
Lillimur	48	19					0
Marnoo	124	69	2				2
Miram	19	10	1				1
Moyston	234	93					0
Murrayville	276	196	1	1			2
Nandaly	48	32					0
Nullawil	81	47					0
Patchewollock	92	52					0
Pimpinio	91	37	1				1
Serviceton	62	30					0
Speed	77	38	2				2
Streatham	101	48	2	2			4
Tarranyurk	10	7					0
Tempy	42	30					0
Ultima	180	100	2	1			3
Waitchie	8	6					0
Walpeup	154	75					0

Continued over page …

Water Supply	Pop'n served	ESC Customers†	Number of Complaints				
			Colour	Odour	Air	Other	Total
Watchem	182	84	2				2
Westmere	29	16	7				7
Wickliffe	88	45	5				5
Woomelang	198	144					0
Yaapeet	70	33					0
Total	5210	2952	36	12	0	1	49

† *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

7.1 Summary of Risk Management Plan Audit

The Department of Health and Human Services advised GWMWater that a risk management plan (RMP) be audited by 31 May 2018. The specified audit period is from 2 June 2016 to 27 March 2018. The areas assessed included RMP, development and implementation of preventative strategies (including appropriate control and monitoring measures), detailed description of supply, details of emergency management arrangements and procedures for dealing with an incident and event or emergency that may adversely affect the quality or safety of drinking water

GWMWater underwent a drinking water RMP audit in March 2018. During the audit period, GWMWater has:

- not complied with the obligations imposed by section 7 (1) of the *Safe Drinking Water Act* 2003, and
- complied with the obligations imposed by section 8 (1) of the *Safe Drinking Water Act* 2003 during the audit period.

A minor non-compliance was noted as the auditor could not verify the implementation of the time delays for critical control points (CCPs) at the majority of the sites, or view evidence that the water utility had confirmed the implementation of the time delays at all sites. For a selection of sites that evidence was available, the time delays that were implemented were not consistent with the risk management plan. It was recommended by the auditor to review all critical limits in Supervisory Control and Data Acquisition (SCADA) to confirm that the action limits and time delays are set in accordance with the RMP.

Some excellent feedback was provided from the audit and additional identified improvement opportunities and observations made by the auditor as listed below.

a) Overall, GWMWater has allocated significant resources to the establishment and implementation of its risk management plan and associated risk management activities in its role as a water supplier and water storage manager. The RMP follows the framework outlined in the *Safe Drinking Water Act* 2003 and Regulations and is effective in managing water quality risk.
b) GWMWater staff demonstrated a high level of knowledge and experience in managing risk and had a good awareness of their obligations under the RMP and understood how they contributed to its implementation.
c) Consider documenting the data analysis used to inform the risk assessment to justify risk assessment outcomes and assist in future risk reviews.
d) Ensure the uncertainty assessment takes into the account the data used to inform the risk assessment.

e) Consider reviewing procedures relating to CCP exceedances to consolidate and simplify the process for managing critical limit exceedances.
f) Develop a process for regular review of time delays to confirm that they are set in accordance with the risk management plan.
g) Review process flow diagrams of system supply to confirm accuracy.
h) Establish processes to review Trility procedures for implementing preventive measures at BOOT sites.
i) Establish a review process to justify and document and changes made to the m monitoring program
j) Establish a regular review process to confirm that monitoring locations continue to be appropriate.

The minor non-compliance and opportunity for improvement (OFI) identified are added into GWMWater Corporate risk register to ensure effective tracking and actioned accordingly. The critical limits in SCADA has been reviewed and the action limits and time delays are set in accordance with the RMP and other documentations will be actioned appropriately.

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, for example.

Section 6 of the *Safe Drinking Water Act* 2003 allows the Minister for Health to declare certain water as regulated.

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, and
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 Table 2-2 and were audited for the period with feedback to elevate the highest risks into the corporate framework, which has been complete. The Minister for Health also 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.

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) Untreated Water Supply newsletter issued annually,
c) 'Do not drink the water' signage/stickers on publicly accessible taps in each town in cooperation with Local Government,
d) Letters to new tenants (when this advice is received by GWMWater from real estate agents or property owners),
e) Delivery of a 'Living with an Untreated Water Supply' pamphlet to new customers, and
f) Information on GWMWater website.

As part of GWMWater ongoing commitment to provide drinking water to townships across the region, works are in progress under the Mallee Towns Drinking Water Supply Project. As part of the works, three regulated supplies (Brim, Beulah and Woomelang) and one

disinfection only town (Sea Lake) will received a fully treated drinking water supply in the next reporting period. Water supply will be sourced from Lake Bellfield and treated in accordance with the ADWG at Warracknabeal WTP. Four more towns (Elmhurst, Kaniva, Moyston and Ultima) have been identified under GWMWater Water Pricing Submission to be upgraded to a fully treated drinking water supply by 2023.

10 Emergency / Incident Management

10.1 Emergencies

GWMWater reviewed its Emergency Management Plan during 2017/2018. The Emergency Management Plan includes specific procedures for the management of water quality incidents.

Water quality incidents are notifiable to DHHS under Section 22 of the Act. The Emergency Management Plan reflects this requirement.

10.2 *Escherichia coli* incident – Lake Bolac (Section 22 notification)

A routine compliance sample collected on 27 December 2017 came back from the laboratory with 2 orgs/100 mL of *Escherichia coli* with total chlorine residual of 0.20 mg/L. In response, an investigation was conducted, flushing and sampling was conducted in multiple locations in the reticulation. The process at Willaura WTP was checked and the clear water storages were inspected. During the incident, DHHS was notified immediately followed by a Section 22 submission. A re-sampled result returned with 1 orgs/100mL of *E.coli* with total chlorine residual of 0.06 mg/L at the same location. DHHS was immediately notified followed by a second S22 submitted and subsequently with a S18 notification. Additional flushing was conducted, and resampling at multiple locations was done. Subsequent resampling result received shows no *E.coli* at any locations and total chlorine between 0.37 – 0.66 mg/L. The root cause from the incident was determined to be a low chloramine residual at the end of the main that had arisen due to nitrification.

Following the positive *E.coli* detection, clearwater storage tank levels were managed to ensure rapid turnover, and the chloramine concentration was increased at the Willaura WTP. This ensured sufficient total chlorine residual at Lake Bolac. Monitoring of chloramine residual and nitrifications continues in the reticulation system.

10.3 *Escherichia coli* incident – Halls Gap (Section 22 notification – False positive)

A compliance sample came back from the laboratory with an *E.coli* result of 6 orgs/100 mL on 17 January 2018. Chlorine residuals at the time that this sample was taken was 0.85 mg/L. A number of actions were undertaken including flushing and re-sampling, checking if there were any issues at the Halls Gap WTP, and checking if there were any issues at the sampling location. During the incident, DHHS was notified immediately followed by a Section 22 submission.

Investigations showed that the sample tap was contaminated with bird droppings, and that this was the likely cause of the contaminated sample. Chlorine residuals around Halls Gap were good, with the lowest being 0.82 mg/L, and no re-samples came back with a positive *E.coli*. The investigation found that there were no contributing factors in accordance with (c)(i)(ii) or (iv) in Schedule 2 to cause the *E.coli* results. It was therefore concluded that the

E.coli detect was from a contaminated sample, rather than in the reticulation water itself, thus being a 'false positive'.

Following the event, GWMWater undertook the following actions:

- Replaced the sampling tap at this location.
- Review the sample tap infrastructure across the region.
- Reviewed the sampling procedure to incorporate actions around contamination and dirty taps.
- Reinforced the importance of clean sample taps to samplers.

10.4 *Escherichia coli* incident – Ararat (Section 22 notification – False positive)

Two routine compliance samples collected on the 12th February 2018 from the Ararat reticulation came back from the laboratory with *E.coli* on the 14th February 2018, one with 1 *E.coli* Orgs/100 mL and a second sample with 3 *E.coli* Orgs/100mL, with a free chlorine residual of 0.15 and 0.65 mg/L respectively. Directly after the call was received by the laboratory, a number of actions were undertaken including flushing and re-sampling, checking if there were any issues at the Ararat WTP, and checking if there were any issues at the sampling locations. During the incident, DHHS was notified immediately followed by a Section 22 submission.

The investigation found that there were no contributing factors in accordance with (c)(i)(ii) or (iv) in Schedule 2 to cause the *E.coli* results. The WTP was working effectively, chlorine residuals were adequate to ensure disinfection of the water, and there were no points of ingress for contamination into the reticulation system. A low residual zone was noted in Ararat, however, this zone was isolated from the rest of the reticulation, and did not impact on where the compliance samples (having the *E.coli* results) were located.

The likely cause of the *E.coli* results were from sampling error, and thus, the *E.coli* event was a false positive.

10.5 Chlorine incident – Natimuk (Section 22 notification)

The water treatment plant operator on duty received a call for a High High chlorine alarm at Natimuk pump station on the 4th May 2018. High chlorine water (8.8 mg/L measured in the reticulation) had been generated in the bypass pipe and made its way to the analyser downstream from the dosing station. The operator step-flushed extensively, and another operator assisted in identifying the problem, and returned the two valves to their original position. Residuals were measured at various locations around Natimuk. The high chlorine event was over by approximately 8:30 am, and the incident considered over by 10:20 am on the same day.

The root cause of the incident was found to be the lack of labelling of pipes on-site, unclear piping diagrams on SCADA and inadequate detail in the risk management plan. During the incident, DHHS was notified immediately followed by a Section 22 submission.

Actions arising from this event included the tagging out of the bypass valve, works to be carried out to physically isolate the bypass, review the risk management plan and SCADA schematic, and employing a contractor to develop a new piping and instrument drawing.

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 Catchment Management Authority (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, which in turn use the supplied water for the supply of drinking water to a water sampling locality. 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 of 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

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. 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.

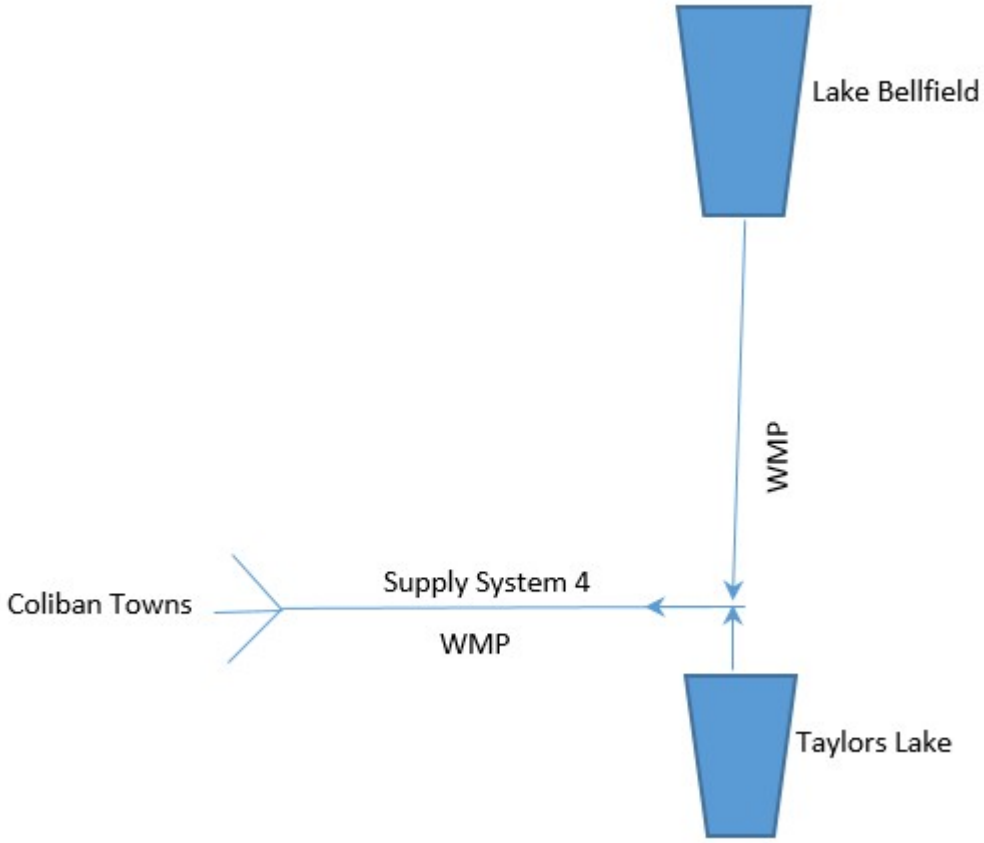

Figure 2: Simplified schematic diagram showing supplies to Coliban Water.

11.2 Wannon Water

GWMWater provides raw water to Wannon Water, which subsequently treats the water and supplies it to the localities of Balmoral and Glenthompson. The water for the latter is sourced from the Willaura Headwork (Mt William and Stoney Creek) and is delivered to Wannon Water through the Glenthompson Pipeline. 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 water for Hamilton and Balmoral is taken directly from Rocklands Reservoir.

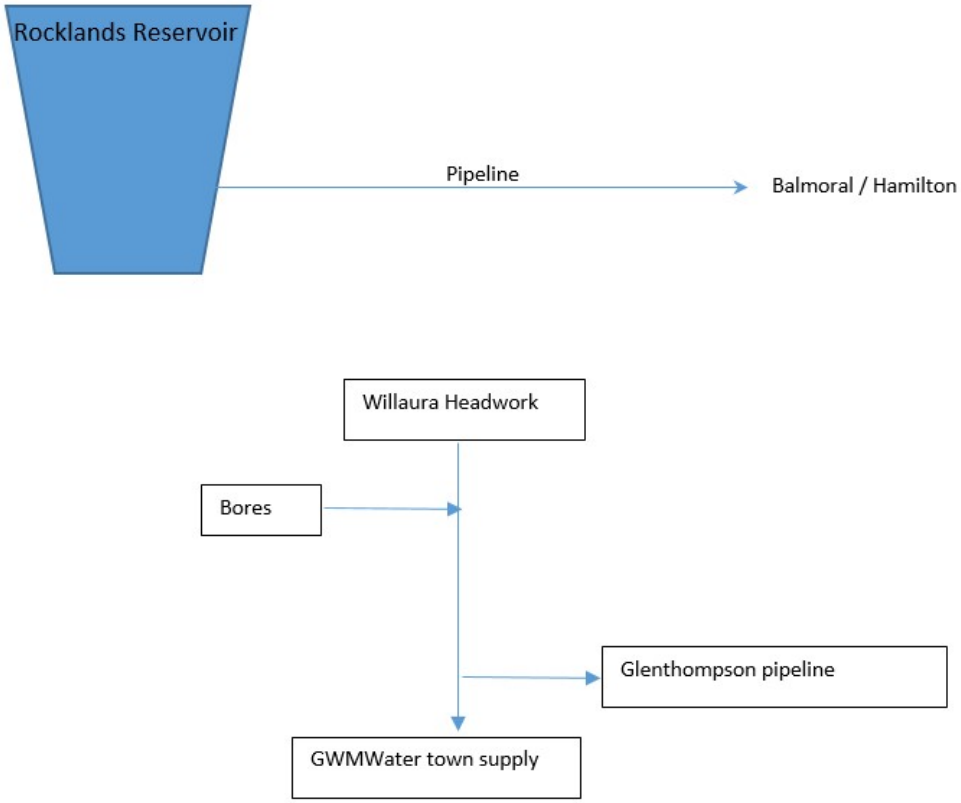

Figure 3: Simplified schematic diagram showing supplies to Wannon Water.

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*.
OFI:	Opportunity for improvement.
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).
UCL:	Upper Confidence Limit: A statistical method of evaluating a sample set.
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.