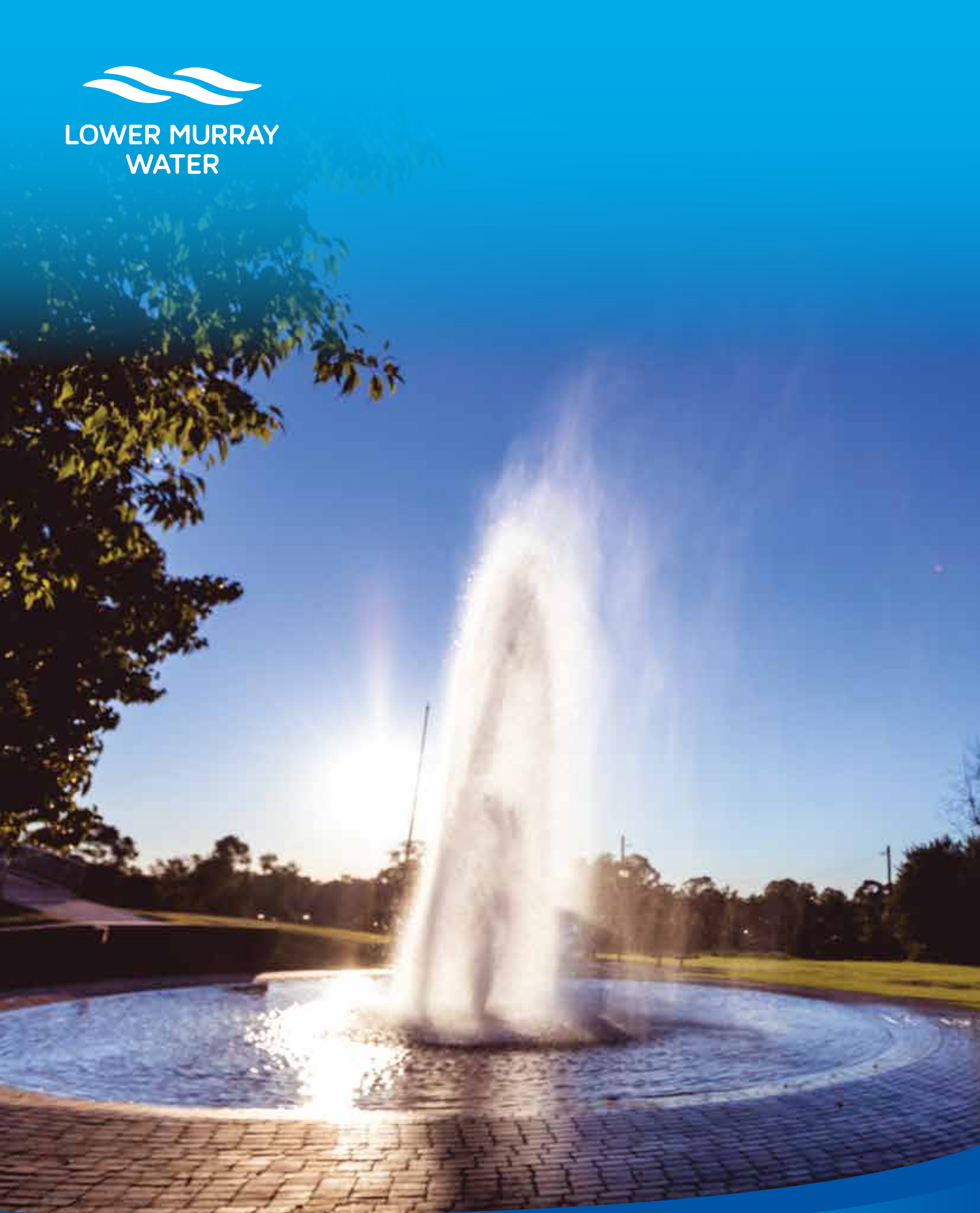




LOWER MURRAY  
WATER



Annual Drinking  
Water Quality Report

2018/19

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# Foreword from our Managing Director

I am pleased to present Lower Murray Water's (LMW) 2018/19 Annual Drinking Water Quality Report, which reports the quality of drinking water and regulated water. The report includes the bacteriological, chemical and physical characteristics of the drinking water supplied by LMW across its potable drinking water and non-potable water supply systems.

The report has been prepared in accordance with the requirements of the Safe Drinking Water Act 2003 and the Safe Drinking Water Regulations 2015. The information presented in this report explains the sources of our drinking water, how it is treated to ensure it meets the regulatory requirements and the Australian Drinking Water Guidelines (ADWG) 2011.

We verify the quality of the drinking water via a comprehensive monitoring program that also allows us to identify potential improvements to benefit our customers and the community. We also rely upon feedback from customers to advise of local issues that may arise, which are treated as water quality complaints.

This report demonstrates in detail how water quality consistently meets and surpasses the drinking water quality standards and targets, and highlights water quality challenges experienced and achievements during 2018/2019.

We have adopted a multiple barrier, catchment-to-tap approach to ensure high quality, safe drinking water

Under the Safe Drinking Water Act (SDWA) 2003, we are required to prepare and implement a Drinking Water Quality Management Plan (DWQMP) to ensure the safety of the drinking water supply systems. Our DWQMP is based on Hazard Analysis and Critical Control Point (HACCP) principles and the Australian Drinking Water Guidelines.

We have completed a number of major water quality improvement projects, which involve Programmable Logic Controller (PLC) automation, replacement of treated water pump station, water treatment plant capacity upgrade, refurbishment of water reservoirs, installation of water treatment control systems, etc. just to name a few.

Further details on these projects are provided under the water quality projects section on page 13.

LMW is committed to continuing its record of reliably providing high quality, safe drinking water to our customers. For the 2018/19 year, I'm pleased to advise that we achieved full compliance with the water quality standards and requirements of the SDWA 2003 and Safe Drinking Water Regulations (SDWR) 2015.



Anthony Couroupis  
**Managing Director**

## Acknowledgment of Traditional Owners

Lower Murray Water proudly acknowledge the Traditional Owners within Northwest Victoria. We strongly respect their rich culture and connections the Traditional Owners have to their land and waterways.

# Our Profile - Region



PROVIDE WATER SERVICES TO OVER  
**73,000**  
CUSTOMERS

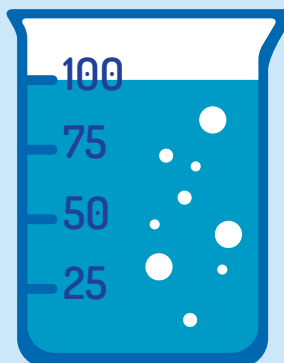


**92%**  
OF CUSTOMERS  
SATISFIED WITH  
**WATER**  
QUALITY



**13** PROJECTS AND  
UPGRADES

TO IMPROVE  
**WATER**  
QUALITY



WATER SAMPLE  
ANALYSIS  
**100%**  
COMPLIANCE  
WITH THE SAFE DRINKING  
WATER REGULATIONS 2015

# Area of Operations



# Nature of Services Provided

## We provide:

- urban water services to 14 towns via nine treatment plants to approximately 74,000 customers along the Murray River in Victoria from Koondrook to Merbein;
- wastewater collection, treatment and effluent re-use and disposal services to 11 towns via nine treatment plants;
- river quality water services to 2,616 irrigation and 1,856 stock and domestic customers in the four pumped irrigation districts of Merbein, Mildura, Red Cliffs, and Robinvale, to 290 Millewa rural district customers and some areas of the Yelta waterworks district;
- the collection and disposal of subsurface drainage water from the four pumped irrigation districts, as well as from private diverters in and around Boundary Bend, Nangiloc and Robinvale;
- oversight of irrigation and drainage design in new agricultural developments ensuring conformity with Irrigation Development Guidelines;
- management of the private diversion licenses of 1,165 water users along the Murray River in Victoria between Nyah and the South Australian border;
- the assessment and approval of licencing, water share and allocation trade applications;
- reclaimed water for third party use;
- water supply delivery services to important environmental and recreational sites; and
- management of the region's urban and bulk water entitlements

In addition to security of supply, public health, water quality and environmental responsibilities, we recognise the crucial economic role of water from a regional and state context.



# Water Supply Systems

LMW provides drinking water to 14 townships via Nine water treatment plants to a population of approximately 74,000 along the Murray River in Victoria from Koondrook to Mildura. We also have two regulated water supplies. The Minister for Health may declare a water supply system to be regulated water.

Regulated water is water that is not drinking water but could be mistaken for drinking water and is discussed in more detail on page 21.

LMW's drinking water and regulated water supply systems, including the sampling localities, population supplied, source water and the water treatment plants are provided in Table 1.

The population figures have been calculated based on the number of water connections as of 30 June 2019 and multiplied by the 2016 census average household population for each region. Non-residential connections are not included.

LMW's drinking water supply systems are shown on the map page 3.

This report, in accordance with the SDWA 2003, provides an overview of LMW's drinking water supply systems, the quality systems in place for the provision of safe drinking water and the drinking water test results for 2018/19 financial year..

## Source of Water

The Murray River catchment (part of the Murray-Darling Basin) covers a large area that spans Victoria, New South Wales and Queensland (Note, water from Queensland catchment enters the Murray River downstream of Mildura so does not impact on our drinking water). We are responsible for supplying drinking water from Kerang through to Mildura as shown in Table 1. There are also other water agencies located upstream of our offtakes that manage water treatment and provide drinking water to major towns along the Murray River including Albury, Wodonga, Cobram, Echuca and other smaller localities.

In 2015, LMW carried out a sanitary survey of the catchment within our area of operation. The results of the sanitary survey indicate the Murray River catchment is subject to various activities which impact on water quality.

The Murray River is an open and unprotected catchment, where various activities such as cattle grazing, human habitation, agriculture and industry, take place. Dominant agricultural activities include extensive horticultural areas, the production of rice, dairy, wool, wheat, beef, lamb and forestry. An abundance of recreational activities is undertaken along the Murray River and its tributaries including camping, swimming, fishing, water skiing, canoeing, sightseeing and picnicking.

As a result, the Murray River water is subject to a high microbial risk from humans, stock and industry. To assess these risks, we have a water quality verification monitoring program, which involves collecting and testing of source water samples for a range of parameters. In addition, the raw water turbidity is monitored online at all water treatment plants, which provides for initial alert to treatment plant operators of potential changes to the raw water quality, thus enabling them to undertake control measures to ensure adequate treatment is applied to the raw water and reduce the potential for process deviation.

To quantify the microbial risks in the catchment and realising the similarities in each catchment and the microbial hazards, LMW conducted a detailed microbial hazard quantification assessment on its drinking water supply systems.

The assessment involved the methodology outlined in the Water Services Association Australia (WSAA) Manual for the Application of Health Based Targets (WSAA 2015).

LMW has been intermittently monitoring *Cryptosporidium* and *Giardia* since January 1998. The monitoring frequency has changed to fortnightly and includes *E.coli*, to enable ongoing quantification and assessment of the source water risks. In addition, Phosphorus and Nitrogen are also monitored to provide alert for potential Blue Green Algae (BGA) Blooms.

Seasonal BGA monitoring is undertaken by our water quality team including water treatment plant operators, to identify potential BGA presence in the source water, implement appropriate control measures when blooms are detected and ensure that produced water is safe to drink. BGA monitoring is undertaken on a weekly basis and the frequency can increase subject to the volume of BGA detected in the source water, which may trigger additional Algae toxins identification.

## Table 1 - LMW drinking water localities

DRINKING WATER SAMPLING LOCALITY	SOURCE OF WATER	POPULATION	WATER TREATMENT PLANT
Irymple	Murray River	8,216	Mildura 7th street Mildura West
Kerang	Murray River Loddon River 14/2 Irrigation Channel	4,179	Kerang
Koondrook	Murray River	956	Koondrook
Lake Boga	Murray River	1,090	Swan Hill
Merbein	Murray River	3,637	Mildura 7th street Mildura West
Mildura	Murray River	35,614	Mildura 7th street Mildura West
Murrabit	Murray River Storage Dam	97	Murrabit
Nyah	Murray River	704	Swan Hill
Nyah West	Murray River	568	Swan Hill
Piangil	Murray River	224	Piangil
Red Cliffs	Murray River	3,878	Red Cliffs
Robinvale	Murray River	2,149	Robinvale
Swan Hill	Murray River	11,410	Swan Hill
Woorinen South	Murray River	437	Swan Hill
Millewa *	Lake Cullulleraine	169	Millewa Water Quality Improvement Plant
Mystic Park *	Kangaroo Lake	29	N/A
<b>* Regulated Supplies</b>		<b>Total: 73,356</b>	





# Drinking Water Treatment Processes

During the 2018/19 financial year, LMW treated over 21,600 Megalitres of drinking water across Nine WTP's. Most of LMW's WTP's use conventional treatment systems, and only one treatment plant utilises Dissolved Air Flootation treatment system. The water treatment systems involve the following process steps:

- Coagulation
- Flocculation
- Sedimentation / Dissolved Air Flootation
- Filtration
- Disinfection
- Fluoridation

LMW disinfects the drinking water using Chlorine, which is the most widely used drinking water disinfectant in the water industry. Chlorine dose rates are adjusted to provide adequate free Chlorine residual throughout the distribution system. This helps provide some protection against potential contamination within the reticulation system and can limit biological regrowth problems.

Water treatment processes may slightly differ from one water treatment plant to another due to plant capacity, technology type or raw water quality characteristics being sourced.

Table 2 on page 11, shows the water sampling localities, the water treatment plants that supply water to those localities, treatment processes used to treat the water per locality, and the chemicals used for water treatment.

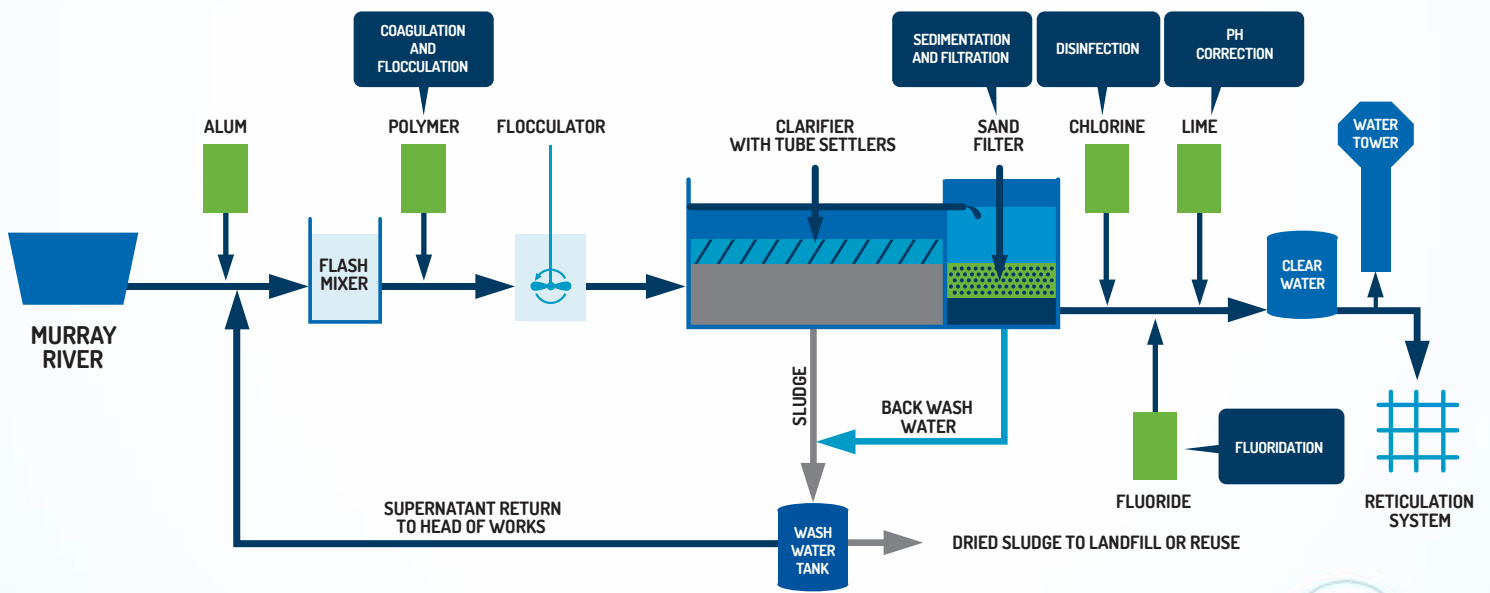


Table 2 - LMW Water Treatment Processes

WATER TREATMENT PLANT	WATER SUPPLY LOCALITY	TREATMENT PROCESS	ADDED SUBSTANCES
Kerang	Kerang	Coagulation Flocculation Sedimentation; Granular Media Filtration Disinfection Fluoridation	Aluminium Sulphate Hydrated Lime Sodium Hydroxide Chlorine Gas Powdered Activated Carbon Fluorosilicic Acid
Koondrook	Koondrook	Coagulation Flocculation Sedimentation Granular Media Filtration Disinfection	Aluminium sulphate Sodium hydroxide Chlorine gas Powdered activated carbon
Mildura 7 <sup>th</sup> Street West Mildura	Mildura Merbein Irymple	Coagulation Flocculation Sedimentation Clarification* Slow Sand Filtration Disinfection Fluoridation	Aluminium sulphate Hydrated lime* Polymer Chlorine gas Powdered activated carbon Fluorosilicic Acid Sodium Metabisulfite** Sodium hydroxide**
Murrabit	Murrabit	Coagulation Flocculation Sedimentation Granular Media Filtration Disinfection	Aluminium Chlorohydrate Sodium hydroxide Chlorine gas Powdered activated carbon
Piangil	Piangil	Coagulation Flocculation Sedimentation Granular Media Filtration Disinfection	Aluminium Sulphate Sodium Hydroxide Chlorine gas Powdered activated carbon
Red Cliffs	Red Cliffs	Coagulation Flocculation Pre-sedimentation Dissolved Air Floatation Granular Media Filtration Disinfection Fluoridation	Aluminium sulphate Sodium hydroxide Chlorine gas Powdered activated carbon Fluorosilicic Acid
Robinvale	Robinvale	Coagulation Flocculation Clarification Granular Media Filtration Disinfection Fluoridation	Aluminium Sulphate Soda Ash Chlorine Gas Powdered Activated Carbon Sodium Fluoride
Swan Hill	Lake Boga Nyah Nyah West Swan Hill Woorinen South	Coagulation Flocculation Clarification Slow Sand Filtration Disinfection Fluoridation	Aluminium Chlorohydrate Sodium hydroxide Chlorine gas Powdered activated carbon Fluorosilicic Acid

\*Applies to Mildura 7th Street WTP

\*\*Applies to Mildura West WTP

## Coagulation and Flocculation

The first step of the conventional treatment process involves dosing a chemical coagulant to help gather suspended solids and organic material in the raw water. We use Aluminium Sulphate and Aluminium Chlorohydrate to bring about the coagulation process, which helps to form larger particles called 'flocs' which can be removed more readily by subsequent treatment steps. During flocculation the floc particles develop to a larger size. The larger size and weight of the floc then assists in the sedimentation process. Flocculant aids including polyelectrolytes are also commonly used to enhance the flocculation phase which further assists in the sedimentation process.

## Sedimentation

The purpose of sedimentation is to enhance the filtration process by removing particulates. Sedimentation is the process by which suspended particles are removed from the water by means of gravity or separation. In the sedimentation process, the water passes through a relatively quiet and still basin. In these conditions, the floc particles settle to the bottom of the basin while "clear" water passes out of the basin over an effluent baffle or weir. The solids collect on the basin bottom and are removed by a mechanical "sludge collection" device which scrapes the solids (sludge) to a collection point within the basin from which it is pumped to disposal or to a sludge treatment process.

## Solid Contact Clarification

The purpose of the solid contact clarification is the same as for the sedimentation process i.e. to enhance the filtration process by removing particulates. It involves mixing the influent flow with previously settled solids within a cylinder located in the centre of the clarifier. Gentle mixing within the reaction well promotes agglomeration of floc particles and/or chemical precipitates.

The aggregated solids settle out more rapidly in the clarification area. Even better clarity is achieved when particles become enmeshed in a sludge blanket layer. Rotating sludge scrapers transport settled solids to the centre of the basin for removal. Clarified overflow is removed through a circular launder system that draws water from the entire surface area to prevent solids carryover caused by uneven velocity currents.

## Diffused Air Floatation (DAF)

The process of floatation consists of three steps:

- Bubble formation
- Attachment of bubbles to the solids
- Solids separation from the fluid

In DAF systems, air is pressurised under several atmospheres and then introduced into water, where it's mixed with pre-coagulated water just before it enters the floatation tank.

Upon attachment of air bubbles to the solid particles, the density of the solid becomes less than that of the surrounding fluid. In the process, the buoyant force lifts the solids to the surface to form a scum blanket, which is continuously swept to the periphery, automatically discharged into a scum trough by the skimming device.



## Filtration

Filtration occurs as the water passes through filters that help remove particles that have not settled in the sedimentation process. Sand filters are commonly used in the water treatment process and may contain layers of gravels, sands and filter coal. The sand filtration process removes fine suspended solid matter as well as some other particles including larger micro-organisms, resulting in clear water passing through.

## Disinfection

Water is disinfected to kill any pathogens (disease causing organisms) that remain in the treated water after filtration and provide protection within the distribution system. Without disinfection, the risk from waterborne disease is greatly increased. Disinfection is carried out by chlorination at all our water treatment plants in the form of Chlorine gas.

## Fluoridation

Water fluoridation is the adjustment of Fluoride in drinking water to a level that helps protect teeth against dental decay. We fluoridate 11 of our drinking water supplies. Fluoridation of the drinking water supplies is undertaken as per requirements of the Health (Fluoridation) Act 1973.

Late 2018, the DHHS released a new Code of Practice for Fluoridation of Public Water Supplies, and therefore, required Water Authorities to complete a gap analysis of the design, operation and performance of each of LMW's fluoridation plants against the revised requirements.

LMW engaged a third party to undertake the gap analysis, and submitted a report to the DHHS highlighting main issues that need to be addressed to achieve compliance with the requirements of the new code. LMW is currently looking into options to address the gaps.

## pH Correction

Due to the addition of some coagulants and Chlorine, the pH of the water decreases, becoming more acidic. To inhibit corrosion and make the water suitable to use, the pH is adjusted to a neutral pH of around 7.0, by adding Lime or other alkaline chemicals such as Soda Ash or Sodium Hydroxide.

## Powdered Activated Carbon (PAC)

PAC is derived from a variety of sources such as coal, wood and coconut. Due to its high adsorption capacity, i.e. ability to attract contaminants and bind them to its surface, PAC is used to assist in removing taste, odour compounds, Blue-green algae toxins and other impurities from water.

## Potassium Permanganate

Potassium Permanganate is used in cases where high concentrations of soluble Iron or Manganese is present in the source water. While dosing Potassium Permanganate is rarely required at our water treatment plants, this prevents potential nuisance stains and dirty water for customers.



# Drinking Water Quality Management

## Quality Management Systems

LMW has a drinking water quality risk management plan based on the twelve elements of the 'Framework for Management of Drinking Water Quality', as described in the Australian Drinking Water Guideline (ADWG) 2011, and the requirements set out in the Safe Drinking Water Act 2003 (the Act). The plan identifies key water quality risks in the water supply system using a catchment to tap approach. Each key risk is assessed, and process put in place to manage those risks to provide safe drinking water to our customers.

## Verification Water Quality Monitoring

Water quality monitoring constitutes a significant part of our water supply activities. We have a water quality monitoring program that was designed based on the requirements of the Safe Drinking Water Regulations 2015, the Australian Drinking Water Guidelines 2011 (ADGW), including consideration of locality population numbers for bacterial monitoring.

LMW used the outcome of the sanitary survey to assist in identifying the source water quality hazards and risks and reviewed the irrigation practices within the catchment area to identify the raw water quality parameters that potentially constitute health risks, and therefore require ongoing monitoring.

The ADWG 2011 provides a basis for assessing the quality of drinking water. The Microbiological assessment is based on *Escherichia coli* (*E. coli*), which is considered a definitive indicator for the presence of fecal contamination, and therefore, a health risk.

In terms of the physical and chemical monitoring, it's based on a combination of parameters that indicate the physical and aesthetic characteristics of water such as pH, colour and turbidity, as well as the chemical quality of the water, which include but not limited to free Chlorine levels, Iron and Manganese, Fluoride, Dissolved Salts, Aluminium, Copper, Lead, Chromium, Nickel, etc.

To comply with the water quality monitoring requirements set out in the Safe Drinking Water Act 2003 and Safe Drinking Water Regulations 2015, we use an external National Association of Testing Authorities (NATA) registered laboratory to perform all regulatory drinking water testing. Drinking water quality results are available in Appendix A (Attached).

During 2018/19 we collected over 1700 samples from our 16-water supply localities and analysed for more than 40 parameters to assess water quality for health risks.

## Sampling Points

The water quality sampling points have been carefully chosen based on the Department of Health and Human Services "Specification of Water Sampling Localities and Water Sampling Points guidelines", and risk assessment approach, with the objective of identifying effective strategies for prevention and control of hazards within the distribution system.

This involved understanding the characteristics of the drinking water system, what hazards may arise, how these hazards create risks, and the processes and practices that affect drinking water quality.

While the sampling points are representative of the water quality within their subsequent supply systems, a regular review of the sampling point is undertaken to verify the locations of the current sampling points, ensure that they reflect the associated water quality risks within their distribution systems, and assess the need to add in additional sampling points to reflect the expansion of the water supply localities that results from population growth, i.e. new subdivisions.



## Issues

LMW was found to be non-compliant with regulation 14, which is the requirement for samples collected as part of the sampling program to be analysed.

The following issues related to the monitoring schedule have occurred during the 2018/2019 financial year:

- The regulatory water quality tests were not performed on the weekly reticulation samples collected on 8th November 2018. The missing parameters are shown in the following table.

Date Sampled	Source of Sample	Testing Frequency	Water Quality Test Parameters	Locality
8 Nov 2018	Reticulation	Weekly	Microbiology (E.coli, Coliforms GPC)	Red Cliffs
8 Nov 2018	Reticulation	Weekly	Microbiology (E.coli, Coliforms GPC)	Irymple

The water quality tests for Microbiology (E.coli and Coliforms MPN Colilert) were not performed on the weekly reticulation samples collected from Red Cliffs and Irymple on 8th November 2018. The investigation into this issue revealed that the samples were not delivered to the laboratory within the required 24-hour holding period for microbiology testing due to a courier error.

Regulation 14 of the Safe Drinking Water Regulations 2015 requires that water samples are analysed by an approved laboratory, that is, a laboratory that holds NATA accreditation in relation to testing drinking water for the specified parameters. The NATA accredited method for analysis of drinking water for E.coli requires that samples be processed within 24hrs of being collected. In order to meet this requirement, LMW takes in account potential delays related to transit time, and regularly review and amend its sample collection procedure to ensure that all water quality samples are collected, delivered and processed at the Laboratory within the specified 24hrs time frame.

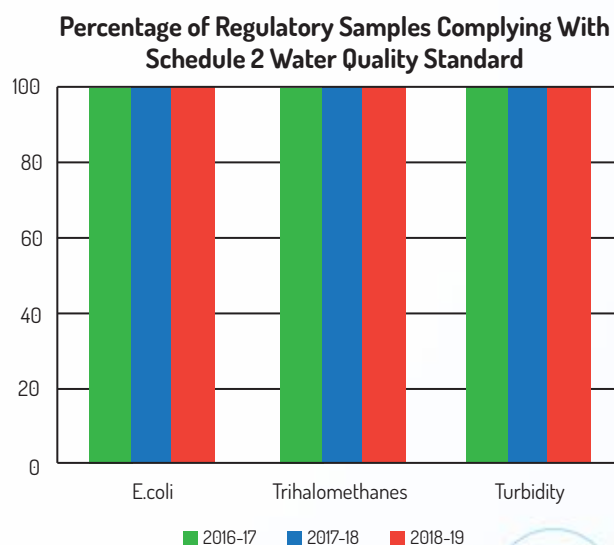
The NATA accredited laboratory has recently reassessed this requirement based on the outcome of several trials involving the collection of samples, and testing them for E.coli after up to 30hrs holding period, taking in account the Australian Standards AS 2031-2012 Water Quality – Sampling for Microbiological Analysis, the United States EPA Quick Guide to Drinking Water Sample Collection, other sources and studies, and amended the holding period to 26hrs.

Extension of the holding period from 24 to 26hrs gives more flexibility to LMW's staff and the service laboratory to collect, dispatch, receive and process the samples within the specified time frame, and reduces potential non-compliances.

A comparison of test results of water samples collected in accordance with the sampling program set out in our Drinking Water Quality Management Plan (DWQMP) and percentage of complying samples over the last three financial years, based on the 2015 Drinking Water Regulations requirements, is shown in the below chart.

The high quality of the drinking water supplied by LMW continued for 2018/2019 reporting period, complying fully with all water quality standards detailed in Schedule 2 of the Safe Drinking Water Regulations, and the health guideline values specified in the Australian Drinking Water Guidelines (ADWG) 2011.

## Percentage of Regulatory Samples Complying with Schedule 2 Water Quality Standard



This chart shows that LMW continued its outstanding performance and achieved full compliance with the water quality standards for three consecutive years. In addition, the water quality test results of samples collected as part of LMW's drinking water quality monitoring program have also been compared to the previous two years results and found compliant with the water quality standards detailed in Schedule 2 of the Safe Drinking Water Regulations 2015.

## Water Quality Projects

Table 3 below shows the water quality improvement projects that were initiated in 2018/19 financial year.

**Table 3 – Water Quality Improvement Projects**

Water Treatment Plant	Improvement Projects 2018/2019
All	ALL SITES Instrument Replacement
Mildura 7th Street	Coagulation Control System
Mildura West	Upgrade the cathodic Protection system
Mildura West	Install Backwash de-chlorination system
Mildura West	Replace UPS at the WTP
Red Cliffs	WTP Capacity Upgrade 9.5 ML/d to 12 ML/d
Robinvale	Installation of Filter to Waste System
Swan Hill	Installation of Filter to Waste System
Koondrook	WTP PLC Automation
Koondrook	Koondrook Standpipe Storage Paint Internals
Murrabit	WTP PLC Automation
Kerang	WTP PLC Automation
Kerang	Replace Treated Water Pump Station

LMW achieved 100% compliance for all samples analysed in 2018/19 in accordance with the Safe Drinking Water Regulations requirements. During the financial year, there were no issues that could have affected the treated water quality, in spite of the upgrade projects that were completed. It was noted that the raw water quality has significantly improved, hence achieving high quality standards.

Water treatment issues however may occasionally still occur due to a variety of factors, such as a change in raw water quality or asset breakdown. When these treatment issues occur, it may result in a change to the treatment process or a corrective action to ensure safe drinking water is maintained.

## Manganese Treatment

Historically, seasonal moderate Manganese levels have been detected in the source water at Red Cliffs WTP, which over time, become more concentrated due sludge handling and water recycling processes, where Potassium Permanganate was used as an oxidizing agent to remove soluble Manganese from drinking water and maintain its levels below the limits stipulated in the ADWG 2011.

LMW has also used Calgon-T for Manganese treatment, which is a sequestering agent that prevents the oxidation of Manganese in the treated water and eliminates the water discolouration.

Due to the recurrent nature of this problem, LMW liaised with the Environment Protection Authority (EPA) and obtained a permanent approval to discharge the recycled water with elevated Manganese levels back into the Murray River.

## Improvements

There have been a number of projects that were completed in the 2018/2019 financial year, and have contributed to improving water quality. Further detail on these projects is outlined below:

**Installation of a Coagulation Control System at Mildura 7th Street WTP:** An online spectrophotometer was installed to provide live and instant measurement of the UV absorption, Turbidity, True Colour and other water quality parameters. The primary utilisation of the spectrophotometer is to enable better control of the coagulant dosing system by continuously calculating and fine-tuning the dose rate, in line with changes in the raw water quality entering the treatment plant.

**PLC Automation at Kerang, Koondrook and Murrabit WTPs:** The PLC automation provides for greater control of the treatment process. It improves the treatment process efficiency, reliability and enables remote monitoring, fault diagnosis and timely addressing process faults.

**Replacement of the treated water pump station at Kerang:** The new pump station reduces risks related to groundwater infiltration and improves reliability of delivering water into the Kerang distribution system.

**Installation of filter to waste at Robinvale WTP:** The filter to waste system is crucial to managing suspected or non-compliant water, as it enables the Treatment Plant Operator to dispose of non-compliant water while allowing the ability to restore the water treatment process

**Upgrading the Capacity of Red Cliffs WTP from 9.5 to 12 ML/d:** The increased capacity of the plant allows LMW to cater for water demand for urban and industrial needs, and improves the efficiency and quality of the treated water.

The 2019-2020 financial year will see the first stage of the UV disinfection project, which involves retrofitting of four WTPs with UV disinfection systems to further improve water safety and robustness of the water supply system.

## Tank Cleaning

LMw has a scheduled inspection and maintenance program for clear water storage tanks and service reservoirs cleaning, which were carried out in 2018/19 financial year. This involved general inspections of the interior and exterior of the storages for sediment build-up, asset condition, and the roof area to ensure that access hatches are properly sealed and prevent contamination that could result from rain water ingress, and desludging of water storages as required.

## Taste and Odour Treatment

Intermittent PAC dosing took place at some water treatment plants during times where elevated Blue Green Algae count were detected, or biovolume was above the trigger for PAC dosing for the control of potential Algal toxins that may be present in water. PAC was also dosed occasionally to remove taste and odour compounds.

## Fluoride Treatment

During the reporting period, the average optimal Fluoride concentration for dental decay recommended within the Code of practice for fluoridation of drinking water supplies - Health (Fluoridation) Act 1973, was achieved within the Mildura, Red Cliffs and Robinvale water supply systems. However, the fluoride systems were taken offline due to reactive and scheduled repairs at Swan Hill WTP and a capital project at Kerang WTP to address potential OHS risks associated with undertaking a PLC upgrade project. This resulted in the average optimum fluoride levels not being achieved at Swan Hill and Kerang systems.

**Table 3A – Summary of Fluoride Interruption**

Notification	Fluoride	Fluoride System Taken Offline	Summary
Fluoride outage	Mildura West WTP	30/11/2018	Inline flow meter issue
Fluoride outage	Swan Hill WTP	26/10/2018	Blocked flow meter
Fluoride outage	Red Cliffs WTP	27/07/2018	Faulty analyser probe
Fluoride outage	Kerang WTP	14/11/2018	WTP PLC upgrade
Fluoride outage	Red Cliff WTP	15/05/2018	Maintenance
Fluoride outage	Swan Hill WTP	30/05/2019	Pump replacement







# Emergency Management

## Section 18 & 22 Reporting

The Department of Health and Human Services (DHHS) must be notified under section 22 of the Act where drinking water is supplied such that it may pose a risk to human health or cause widespread public complaint.

Drinking water that does not meet a water quality standard is required to be notified to the Department of Health and Human Services (DHHS) under Section 18 and have ten days to do after becoming aware of the fact.

During the reporting period, LMW met all water quality standards and didn't need to report under s18 of the act.

## Reportable Incidents 2018-19

We are pleased to report that during the reporting period, there were no incidents that required reporting under section 18 or 22 of the Safe Drinking Water Act 2003.

## Undertakings under Section 30

During 2018/2019 we did not have any undertakings with the Department of Health and Human Services.

## Staff Training

All our water treatment plant operators have achieved Certificate III qualifications in water industry operations, apart from newly appointed operators. These operators are currently undertaking this training. In addition, our water treatment plant operators attend the Water Industry

Operators Association conference in Bendigo on annual basis, visit other water authorities WTPs, attended Steve Hrudehy training workshop or watched the workshop DVD and other workshops and seminar events when available. We also engage instruments suppliers to conduct training on the operation and maintenance of the analyzers.

## Emergency Management Training

During 2018/19 we carried out refresher training of our emergency management procedures, which involved representatives from DELWP and external observers. The formation of our Emergency Management Planning Committee (EMPC) was completed, which comprised a cross section of management representatives who have each been delegated specific emergency management responsibilities.

The exercise included a simulated cyber security event that posed threat to control and operation of our water treatment plant and provision of quality water to customers. It considered the operational safeguards necessary to prevent the attack, as well as implications for business as usual activities. The exercise was well coordinated and covered a number of scenarios. Following this activity, the Emergency Management Plan was updated to incorporate learnings and then socialised amongst staff.

LMW endeavour to engage staff to annually undertake emergency management training to be better equipped to deal with real situations.

# Drinking Water Quality Standards

During 2018/19 financial year, LMW remained 100% compliant with the water quality standards specified for drinking water in Schedule 2 of the Regulations, and the ADWG 2011, for all samples collected as part of LMW's drinking water quality monitoring program.

All drinking water quality results can be found in Appendix A of this report.

We do not use Ozonation as part of water treatment processes and therefore does not test for its disinfection by-products.

**Table 4 - Schedule 2 SDWR**

**Drinking Water Quality Standards**

Parameter	Sampling frequency	Quality standards 2015
Escherichia coli	one sample per week *	All samples of drinking water collected are found to contain No Escherichia coli per 100 millilitres of drinking water, with the exception of any false positive sample.
Total Trihalomethanes	One sample per month	Less than or equal to 0.25 milligrams per litre of drinking water.
Turbidity	One sample per week	The 95th percentile of results for samples in any 12 month period must be less than or equal to 5.0 Nephelometric Turbidity Units.

## Water Quality Complaints

### Water Quality Complaint Management

LMW is committed to providing high quality, safe drinking water and continuously improving our services and communications to all customers. To ensure water quality complaints are resolved in appropriate timeframes, complaints are captured in the Corporation's customer management system 'Merit', which provides for workflow tracking of each complaint from registration to completion and produce reports as required. Merit directs the complaint to the relevant action officer to follow up with the complainants.

Complaints received after hours via our 1800 phone number are also directed to the relevant officer the next working day for follow up with the complainants if necessary.

If the issue cannot be resolved over the phone, an officer attends the property of concern to discuss the complaint with the complainant and take samples of water for testing/ tasting. If necessary, water mains in the area of concern will be flushed.

Monthly complaint summary reports for Board meetings and quarterly reports for Essential Services Commission reporting are prepared from the Merit database



## Water Quality Complaints

Over the reporting period, the main water quality complaint was for discoloured water (32 complaints). Discoloured water can be attributed to one or a combination of several factors which could include a burst water main within the area, change in the direction of water flow that could result in disturbing the sediment in the interior of mains, oxidized manganese or iron sediment, or potentially from a customer's internal plumbing.

Taste and odour was the other major water quality complaint for Lower Murray Water over the reporting period (16 complaints).

The taste and odour complaints can be generated by one or more factors including but not limited to the presence of Blue-green algae, soluble organics, elevated Chlorine residual, etc. Algae blooms can result in the presence of taste and odour compounds such as Geosmin and 2-methylisoborneol (MIB). Reduced water consumption and extended retention times during low flows in the reticulation system "long age", and dead ends may also contribute to imparting taste and odour to the water.

LMW systematically undertake mains cleaning programs that assist in maintaining and improving water quality and reducing the number of water quality complaints to minimal. LMW monitors algae count/biovolume during the spring and summer season, where algae growth is accelerated due to optimal weather conditions. During Algae blooms, LMW undertakes additional treatment measures involving dosing of activated carbon at water treatment plants to help absorb the taste and odour compounds.

Whilst these compounds are not harmful at levels detected in drinking water, they do have a very low detection threshold, which aesthetically affect the quality of the water.

LMW also received one alleged sickness and one Blue water complaint during the reporting period, including seven water quality complaints under the "Other" category, i.e., sticky water, Plumatella, etc.

Table – 5A below shows a comparison between the number of water quality complaints received during 2018/2019 financial year, to those of the previous year.

**Table 5A - Types of Complaints Compared to Previous Reporting Period**

Type of Complaints	Number of Complaints			Comparison with previous reporting periods	Comments
	Current reporting period	Previous 2017/18 reporting period	Previous 2016/17 reporting period		
Colour	32	17	93	Increase by fifteen complaints from the previous reporting period.	The significant increase may be attributed to LMW's water mains replacement program.
Taste & Odour	16	15	26	Increase by one complaint.	The slight increase may be attributed to individuals' level of taste and odour senses.
Blue water	1	0	0	Increase by one complaint	One complaint received, which may be attributed to light reflection
Alleged sickness	1	2	7	Decrease by one complaint.	The decrease may be attributed to customers' developing better understanding of water quality parameters and their health impact.
Air in water	1	0	0	Increase by one complaint	This may be attributed to the water main replacement program
Other	6	0	3	Increase by six complaints	This category of complaints include air in water, Plumatella, sticky water, slime in water, etc., which upon investigation were inaccurate representation of actual water quality.

Table – 5B shows the types of complaints received by each of LMW's water sampling locality.

**Table 5B - Types of Complaints By Water Sampling Locality**

Water Sampling Locality	TYPE OF COMPLAINTS					
	Colour	Taste & odour	Blue water	Alleged sickness	Other	Total
Mildura	20	7	1	1	4	33
Irymple	3	2	0	0	1	6
Merbein	0	0	0	0	0	0
Red Cliffs	4	4	0	0	0	8
Robinvale	1	1	0	0	1	3
Nyah	0	0	0	0	0	0
Nyah West	0	1	0	0	0	1
Woorinen	0	0	0	0	0	0
Piangil	0	0	0	0	0	0
Swan Hill	3	1	0	0	1	4
Lake Boga	0	0	0	0	0	0
Wakool	0	0	0	0	0	0
Koondrook	0	0	0	0	0	0
Murrabit	0	0	0	0	0	0
Kerang	1	1	0	0	0	2
<b>Total</b>	<b>32</b>	<b>16</b>	<b>1</b>	<b>1</b>	<b>7</b>	<b>57</b>

Table 5C below shows the types of water quality complaints, total water quality complaints received during 2018/2019 financial year, and the number of complaints per 100 customers supplied.

**Table 5C - Water Quality Complaints**

Type of complaint	No. of complaint	No. of complaints per 100 customers supplied
Discoloured water	32	0.092
Taste/odour	16	0.046
Blue water	1	0.003
Air in water	1	0.003
Alleged Illness	1	0.003
Other	6	0.017

# Risk Management Plan Audit Findings

## Audit Process

During the reporting period we were not required to undertake an external audit of our risk management plan pursuant to the Safe Drinking Water Act 2003.

In response to the following six opportunities for improvements (OFI's) identified in the previous Safe Drinking Water Act audit conducted in May 2018, LMW has undertaken the following actions:

1. LMW's controlled documents need to be dated and reviewed within the time required by the LMW Controlled Document Procedure.

LMW has reviewed and updated the Drinking Water Quality Management Plan and all its supporting documents. LMW also has a process in place to provide the custodians of controlled documents with a monthly report showing the status of the controlled documents and their review due date.

2. LMW should include a reference to the Sanitary Survey and the Source Vulnerability Assessment in the Document Project Report – Health Based Target Trial in section 4.1 of the DWQMP, Water Supply System Analysis.

As part of the Drinking Water Quality Management Plan review, LMW ensured that references to the Sanitary survey is included in the recent update of the DWQMP.

3. LMW should include a specific reference to the document Drinking Water Quality Contingency Plans in section 8.2 of the DWQMP, Incident and Emergency Protocols

LMW has amended the wording to reflect the actual title, i.e. Drinking Water Quality Contingency Plans, and inserted a reference to the Emergency Response Plans in the DWQMP.

4. LMW should consider establishing a Water Quality Incident Notification System to the main stakeholders, and a Register to include all water quality events (working hours and after hours) which allows for management review and the identification and consideration of trends.

LMW is currently assessing the need for a Critical Control Points (CCP) management system to alert stakeholders of CCP breaches. Water quality events are also captured and addressed via monthly callout meetings as referenced in the DWQMP.

5. LMW should consider improving the labelling of plant pipework, particularly on the dosing rigs.

LMW has commenced a Pipework Labelling review program, which involves consultation with the water Victorian Water Industry taking in account the Australian Standards AS 1345-1195.

6. LMW should include details of, or clear references to, secondary disinfection activities in the relevant Water Supply System Descriptions of the DWQMP.

A full description of the water supply systems is clearly provided in the DWQMP, including details of secondary disinfection activities (trim chlorination).



# Regulated Water

## What is Regulated Water?

Section 6 of the Safe Drinking Water Act 2003 allows the Minister for Health to declare any water that is not drinking water, but that may be supplied to the public in circumstances in which it may be mistaken as being drinking water, to be 'regulated water' for the purposes of the Act.

Following consultation between the Department of Health and Human Services and us, the Minister for Health declared the water supplied by us to the Millewa area and Mystic Park water supply systems as regulated water as per Section 6 of the Act.

The declaration for the Millewa system was gazetted in the Victoria Government Gazette Special Edition No. S28 on 15 February 2007, and the Mystic Park system was gazetted in the Victoria Government Gazette Special Edition No. S135 on 19 May 2009.

Declaration as regulated water meant that we had to prepare and implement risk management plans for the Millewa and Mystic Park water supply systems. This was to minimise the risk that the water as supplied could be mistaken for drinking water.

LMW take all reasonable steps to ensure that residents and visitors to Meringur, Werrimull, Cullulleraine and Mystic Park are aware that the mains water supply to these towns is untreated and not suitable for consumption, this includes the following:

- Provide the "Living with an Untreated Water Supply" brochure and reminder notices to LMW customers who are connected to an untreated water supply including private diverters, advising that untreated water is not suitable for drinking, teeth brushing, food preparation, and that due care should be taken when bathing and showering to avoid swallowing of untreated water.
- Supply the "Living with an Untreated Water Supply" brochure to accommodation facilities as requested to assist in informing guests that their supply is untreated and is not suitable for drinking, food preparation and that due care should be taken when bathing and showering to avoid swallowing of untreated water bathing.
- Provide 'Do Not Drink' signs free of charge to the responsible managers of all publicly accessible taps connected to untreated water (e.g. parks, public toilets, schools, halls, caravan parks, etc.).
- Provide notification via information statements of the property's untreated water supply to the intending property purchasers.
- Provide new irrigation or domestic and stock customers with an information kit including this brochure – Living with an Untreated Water Supply.
- Make a copy of our customer charter available which details the respective rights and obligations of customers supplied with untreated water.
- Make this information available on our website: [www.lmw.vic.gov.au](http://www.lmw.vic.gov.au)



# Our Regulated Water Supplies

## Millewa Water Supply System

This is a non-potable water system that supplies an area which includes the towns of Meringur, Werrimull and Cullulleraine and also the surrounding rural properties in the Millewa district. The water is sourced from Lake Cullulleraine which is filled directly from the Murray River via an earthen channel. The population served by this supply is estimated to be less than 250.

The water supply system is primarily a domestic and stock water supply to dry-land farmers in the Millewa area located to the west of Mildura. Previously, the water from Lake Cullulleraine had been chlorinated as it was pumped into the system to control the nuisance growth *Plumatella*, which if allowed to become established within a pipeline system can cause severe ongoing operational problems.

In 2013, LMW commissioned a Water Quality Plant at Lake Cullulleraine. The plant has improved water quality; provides clearer water for domestic uses such as washing and farmers can benefit as well by reducing the impact on the spraying equipment.

The treatment plant comprises two large lagoons that alternate as storages for removing turbidity. Aluminium Sulphate is used to aid in the precipitation of the suspended matter. Clarified water is chlorinated whilst gravitating into a clear water storage tank from which it is pumped into the Bambill water storage dam or into the Cullulleraine reticulation system.

The storage dam at Bambill is 182 ML earthen water storage within the Millewa system, located at Bambill South which supplies operating head for the system when the treated water pumps are not operating.

The dry-land area serviced by the Millewa supply covers an area of approximately 243,500 hectares. The total number of connections for the supply to the dry-land farming properties is 252.

## Mystic Park Water Supply System

This is a non-potable water system supplying the small township of Mystic Park which is located to the south of Swan Hill. In May 2008 we assumed responsibility for the Mystic Park untreated water supply, previously the responsibility of the Gannawarra Shire Council.

The water is sourced from nearby Kangaroo Lake before being screened and pumped to an earthen dam at the township. A small amount of coagulant is added as the water enters the dam. This dam provides some detention time assisting in the reduction of turbidity in the water, however no disinfection is provided.

The town population is currently 34 with 16 serviced properties, including a hotel, recreation reserve and cenotaph.



# Appendix A - Water Quality Tables

All samples were taken in reticulations unless otherwise noted.

Tables 1 to 3 contain results reporting against the standards listed in Schedule 2 of the Safe Drinking Water Regulations 2015.

**Table 1 E.coli**

Water Quality Standard: All samples of drinking water collected are found to contain no Escherichia coli per 100 millilitres of drinking water, with the exception of any false positive sample.

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum detected (orgs/100mL)	Number of detections and investigations conducted (s.22)	Number of samples where standard was not met (s.18)
Irymple	Weekly	51*	0	0	0
Kerang	Weekly	52	0	0	0
Koondrook	Weekly	52	0	0	0
Lake Boga	Weekly	52	0	0	0
Merbein	Weekly	52	0	0	0
Mildura	Weekly	116**	0	0	0
Murrabit	Weekly	52	0	0	0
Nyah	Weekly	52	0	0	0
Nyah West	Weekly	52	0	0	0
Piangil	Weekly	52	0	0	0
Red Cliffs	Weekly	51*	0	0	0
Robinvale	Weekly	52	0	0	0
Swan Hill	Weekly	76**	0	0	0
Woorinen South	Weekly	52	0	0	0

\*Missing results for Irymple and Red Cliffs were for samples taken 8/11/2018, as they were outside the 24hr holding period. As a result, these samples were excluded from the sampling set .

\*\*Additional number of samples were taken for Mildura & Swan Hill due to the larger populations serviced by these supplies.



## Table 2 Trihalomethanes

Water Quality Standard: Total Trihalomethanes less than or equal to 0.25 milligrams per litre of drinking water.

Water Sampling Locality	Frequency of Sampling	Number of Samples	Drinking water quality standard (mg/L)	Maximum (mg/L)	Average (mg/L)	Number of samples where standard was not met (s.18)
Irymple	Weekly	12	0.25	0.038	0.019	0
Kerang	Weekly	12	0.25	0.037	0.023	0
Koondrook	Weekly	12	0.25	0.063	0.029	0
Lake Boga	Weekly	12	0.25	0.031	0.023	0
Merbein	Weekly	12	0.25	0.042	0.028	0
Mildura	Weekly	12	0.25	0.031	0.018	0
Murrabit	Weekly	12	0.25	0.039	0.021	0
Nyah	Weekly	12	0.25	0.047	0.038	0
Nyah West	Weekly	12	0.25	0.046	0.032	0
Piangil	Weekly	12	0.25	0.044	0.026	0
Red Cliffs	Weekly	12	0.25	0.04	0.032	0
Robinvale	Weekly	12	0.25	0.038	0.025	0
Swan Hill	Weekly	12	0.25	0.027	0.015	0
Woorinen South	Weekly	12	0.25	0.038	0.028	0

### Table 3 Turbidity

Water Quality Standard: The 95th percentile of results for samples in any 12 month period must be less than or equal to 5.0 Nephelometric Turbidity Units (NTU).

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum turbidity in a sample (NTU)	Maximum 95th percentile of turbidity results in any 12 months (NTU)	Number of 95th percentile of results in of results in any 12 months above standard (s.18)
Irymple	Weekly	52	0.3	0.1	0
Kerang	Weekly	52	0.4	0.1	0
Koondrook	Weekly	52	1.5	0.2	0
Lake Boga	Weekly	52	<0.1	0.1	0
Merbein	Weekly	52	0.3	0.1	0
Mildura	Weekly	52	3	0.3	0
Murrabit	Weekly	52	0.3	0.1	0
Nyah	Weekly	52	0.2	0.1	0
Nyah West	Weekly	52	0.3	0.1	0
Piangil	Weekly	52	0.5	0.2	0
Red Cliffs	Weekly	52	0.5	0.2	0
Robinvale	Weekly	52	0.9	0.2	0
Swan Hill	Weekly	52	0.4	0.1	0
Woorinen South	Weekly	52	0.2	0.1	0

Tables 4 to 38 inclusive are results reporting against the Australian Drinking Water Guidelines 2011 (ADWG), health & aesthetic guidelines.

Tables 9 to 22 & 35 to 41, inclusive, are parameters from samples taken from LMW's 9 treatment plants entering the reticulation system, 8 localities in total (Mildura & Mildura West have a combined locality, Mildura). This differs from other parameters, which show 14 localities that are supplied from a total of 9 treatment plants.

Tables 9 to 16 inclusive, which have 6 monthly scheduling, have 4 samples reported for Mildura supply as both the Mildura & Mildura West WTP's were operating simultaneously for both of the sampling events.

Tables 17 to 20 inclusive, which have 3 monthly scheduling, have 8 samples reported for Mildura supply as both the Mildura & Mildura West WTP's were operating simultaneously for all of the quarterly sampling events.

Tables 21 & 22, Gross Alpha Activity and Gross Beta Activity are conducted every 5 years on source water samples. 2015/16 results are shown.

Tables 5, 9 to 16, 18 to 24, 27 to 31, 34, inclusive, do not have averages as the average cannot be calculated from 'less than' data.

## Table 4 Fluoride

Water Quality Standard: The total concentration of fluoride in drinking water should not exceed 1.5 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Drinking water quality standard (mg/L)	Target optimum operating fluoride concentration (mg/L)	Maximum (mg/L)	Average (mg/L)	Number of samples where standard was not met (s.18)
Irymple	Monthly	12	1.5	0.8	0.83	0.73	0
Kerang	Monthly	12	1.5	0.8	0.74	0.12	0
Lake Boga	Monthly	12	1.5	0.8	0.83	0.49	0
Merbein	Monthly	12	1.5	0.8	0.83	0.65	0
Mildura	Monthly	12	1.5	0.8	0.82	0.70	0
Nyah	Monthly	12	1.5	0.8	0.86	0.45	0
Nyah West	Monthly	12	1.5	0.8	0.84	0.46	0
Red Cliffs	Monthly	12	1.5	0.8	0.74	0.63	0
Robinvale	Monthly	12	1.5	0.8	0.73	0.66	0
Swan Hill	Monthly	12	1.5	0.8	0.84	0.49	0
Woorinen South	Monthly	12	1.5	0.8	0.86	0.50	0

\*Note: under s.5 (3) of the Health (Fluoridation) Act 1973 fluoride added to drinking water must not result in an average optimum concentration in excess of one-part fluoride per million parts of water.

No data for Koondrook, Murrabit and Piangil systems as they do not have fluoridation.

## Table 5 Chloroacetic Acid

Health Guideline Value (ADWG) 0.1 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
Irymple	Monthly	12	<0.005	Yes
Kerang	Monthly	12	<0.005	Yes
Koondrook	Monthly	12	<0.005	Yes
Lake Boga	Monthly	12	<0.005	Yes
Merbein	Monthly	12	<0.005	Yes
Mildura	Monthly	12	<0.005	Yes
Murrabit	Monthly	12	<0.005	Yes
Nyah	Monthly	12	<0.005	Yes
Nyah West	Monthly	12	<0.005	Yes
Piangil	Monthly	12	<0.005	Yes
Red Cliffs	Monthly	12	<0.005	Yes
Robinvale	Monthly	12	<0.005	Yes
Swan Hill	Monthly	12	<0.005	Yes
Woorinen South	Monthly	12	<0.005	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

## Table 6 Dichloroacetic Acid

Health Guideline Value (ADWG) 0.1 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
<b>Irymple</b>	Monthly	12	0.009	0.007	Yes
<b>Kerang</b>	Monthly	12	0.012	0.009	Yes
<b>Koondrook</b>	Monthly	12	0.018	0.011	Yes
<b>Lake Boga</b>	Monthly	12	0.012	0.009	Yes
<b>Merbein</b>	Monthly	12	0.012	0.008	Yes
<b>Mildura</b>	Monthly	12	0.006	0.006	Yes
<b>Murrabit</b>	Monthly	12	0.012	0.008	Yes
<b>Nyah</b>	Monthly	12	0.015	0.010	Yes
<b>Nyah West</b>	Monthly	12	0.015	0.009	Yes
<b>Piangil</b>	Monthly	12	0.017	0.010	Yes
<b>Red Cliffs</b>	Monthly	12	0.01	0.008	Yes
<b>Robinvale</b>	Monthly	12	0.013	0.009	Yes
<b>Swan Hill</b>	Monthly	12	0.009	0.007	Yes
<b>Woorinen South</b>	Monthly	12	0.014	0.010	Yes

\* Note: Overall, the min/max values of this parameter have decreased in comparison to the previous 2 reporting periods

## Table 7 Trichloroacetic Acid

Health Guideline Value (ADWG) 0.1 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
Irymple	Monthly	12	0.008	0.008	Yes
Kerang	Monthly	12	0.011	0.007	Yes
Koondrook	Monthly	12	0.022	0.011	Yes
Lake Boga	Monthly	12	0.011	0.007	Yes
Merbein	Monthly	12	0.010	0.009	Yes
Mildura	Monthly	12	0.006	0.006	Yes
Murrabit	Monthly	12	0.015	0.011	Yes
Nyah	Monthly	12	0.015	0.010	Yes
Nyah West	Monthly	12	0.015	0.008	Yes
Piangil	Monthly	12	0.014	0.009	Yes
Red Cliffs	Monthly	12	0.008	0.007	Yes
Robinvale	Monthly	12	0.010	0.008	Yes
Swan Hill	Monthly	12	0.008	0.008	Yes
Woorinen South	Monthly	12	0.013	0.010	Yes

\* Note: The min/max values of this parameter have decreased in comparison to the previous 2 reporting periods

## Table 8 Aluminium

Aesthetic Guideline Value (ADWG) 0.2 mg/L (acid soluble)

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
Irymple	Monthly	12	0.03	0.02	Yes
Kerang	Monthly	12	0.03	0.02	Yes
Koondrook	Monthly	12	0.05	0.02	Yes
Lake Boga	Monthly	12	0.03	0.02	Yes
Merbein	Monthly	12	0.03	0.02	Yes
Mildura	Monthly	12	0.05	0.03	Yes
Murrabit	Monthly	12	0.02	0.01	Yes
Nyah	Monthly	12	0.03	0.02	Yes
Nyah West	Monthly	12	0.03	0.02	Yes
Piangil	Monthly	12	0.08	0.05	Yes
Red Cliffs	Monthly	12	0.04	0.02	Yes
Robinvale	Monthly	12	0.01	0.01	Yes
Swan Hill	Monthly	12	0.03	0.02	Yes
Woorinen South	Monthly	12	0.03	0.02	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

## Table 9 2,4 Dichlorophenoxy acetic acid

Health Guideline Value (ADWG) 0.03 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.01	Yes
<b>Koondrook</b>	6 Monthly	2	<0.01	Yes
<b>Mildura</b>	6 Monthly	4	<0.01	Yes
<b>Murrabit</b>	6 Monthly	2	<0.01	Yes
<b>Piangil</b>	6 Monthly	2	<0.01	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.01	Yes
<b>Robinvale</b>	6 Monthly	2	<0.01	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.01	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

## Table 10 Benzene

Health Guideline Value (ADWG) 0.001 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.001	Yes
<b>Koondrook</b>	6 Monthly	2	<0.001	Yes
<b>Mildura</b>	6 Monthly	4	<0.001	Yes
<b>Murrabit</b>	6 Monthly	2	<0.001	Yes
<b>Piangil</b>	6 Monthly	2	<0.001	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.001	Yes
<b>Robinvale</b>	6 Monthly	2	<0.001	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods



**Table 11 Carbon Tetrachloride**

Health Guideline Value (ADWG) 0.003 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.001	Yes
<b>Koondrook</b>	6 Monthly	2	<0.001	Yes
<b>Mildura</b>	6 Monthly	4	<0.001	Yes
<b>Murrabit</b>	6 Monthly	2	<0.001	Yes
<b>Piangil</b>	6 Monthly	2	<0.001	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.001	Yes
<b>Robinvale</b>	6 Monthly	2	<0.001	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods.

**Table 12 1,2 Dichloroethane**

Health Guideline Value (ADWG) 0.003 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.001	Yes
<b>Koondrook</b>	6 Monthly	2	<0.001	Yes
<b>Mildura</b>	6 Monthly	4	<0.001	Yes
<b>Murrabit</b>	6 Monthly	2	<0.001	Yes
<b>Piangil</b>	6 Monthly	2	<0.001	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.001	Yes
<b>Robinvale</b>	6 Monthly	2	<0.001	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

### Table 13 1,1 Dichloroethene

Health Guideline Value (ADWG) 0.03 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.0001	Yes
<b>Koondrook</b>	6 Monthly	2	<0.0001	Yes
<b>Mildura</b>	6 Monthly	4	<0.0001	Yes
<b>Murrabit</b>	6 Monthly	2	<0.0001	Yes
<b>Piangil</b>	6 Monthly	2	<0.0001	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.0001	Yes
<b>Robinvale</b>	6 Monthly	2	<0.0001	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.0001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

### Table 14 Pentachlorophenol

Health Guideline Value (ADWG) 0.01 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.001	Yes
<b>Koondrook</b>	6 Monthly	2	<0.001	Yes
<b>Mildura</b>	6 Monthly	4	<0.001	Yes
<b>Murrabit</b>	6 Monthly	2	<0.001	Yes
<b>Piangil</b>	6 Monthly	2	<0.001	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.001	Yes
<b>Robinvale</b>	6 Monthly	2	<0.001	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

**Table 15 Tetrachloroethene**

Health Guideline Value (ADWG) 0.05 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.001	Yes
<b>Koondrook</b>	6 Monthly	2	<0.001	Yes
<b>Mildura</b>	6 Monthly	4	<0.001	Yes
<b>Murrabit</b>	6 Monthly	2	<0.001	Yes
<b>Piangil</b>	6 Monthly	2	<0.001	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.001	Yes
<b>Robinvale</b>	6 Monthly	2	<0.001	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

**Table 16 2,4,6 Trichlorophenol**

Health Guideline Value (ADWG) 0.02 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	6 Monthly	2	<0.001	Yes
<b>Koondrook</b>	6 Monthly	2	<0.001	Yes
<b>Mildura</b>	6 Monthly	4	<0.001	Yes
<b>Murrabit</b>	6 Monthly	2	<0.001	Yes
<b>Piangil</b>	6 Monthly	2	<0.001	Yes
<b>Red Cliffs</b>	6 Monthly	2	<0.001	Yes
<b>Robinvale</b>	6 Monthly	2	<0.001	Yes
<b>Swan Hill</b>	6 Monthly	2	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods

**Table 17 Sulphate**

Aesthetic Guideline Value (ADWG) 250 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	43	32	Yes
<b>Koondrook</b>	3 Monthly	4	18	15	Yes
<b>Mildura</b>	3 Monthly	8	37	24	Yes
<b>Murrabit</b>	3 Monthly	4	2	2	Yes
<b>Piangil</b>	3 Monthly	4	24	19	Yes
<b>Red Cliffs</b>	3 Monthly	4	39	27	Yes
<b>Robinvale</b>	3 Monthly	4	46	26	Yes
<b>Swan Hill</b>	3 Monthly	4	2	1	Yes

\*Note: All localities reported lower values in comparison to the previous 2 reporting periods, except Mildura, Red Cliffs & Robinvale.

**Table 18 Arsenic**

Health Guideline Value (ADWG) 0.01 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	<0.001	Yes
<b>Koondrook</b>	3 Monthly	4	<0.001	Yes
<b>Mildura</b>	3 Monthly	8	<0.001	Yes
<b>Murrabit</b>	3 Monthly	4	<0.001	Yes
<b>Piangil</b>	3 Monthly	4	<0.001	Yes
<b>Red Cliffs</b>	3 Monthly	4	<0.001	Yes
<b>Robinvale</b>	3 Monthly	4	<0.001	Yes
<b>Swan Hill</b>	3 Monthly	4	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the past 2 years

## Table 19 Selenium

Health Guideline Value (ADWG) 0.01 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	<0.001	Yes
<b>Koondrook</b>	3 Monthly	4	<0.001	Yes
<b>Mildura</b>	3 Monthly	8	<0.001	Yes
<b>Murrabit</b>	3 Monthly	4	<0.001	Yes
<b>Piangil</b>	3 Monthly	4	<0.001	Yes
<b>Red Cliffs</b>	3 Monthly	4	<0.001	Yes
<b>Robinvale</b>	3 Monthly	4	<0.001	Yes
<b>Swan Hill</b>	3 Monthly	4	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the past 2 years

## Table 20 Mercury

Health Guideline Value (ADWG) 0.001 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	<0.0001	Yes
<b>Koondrook</b>	3 Monthly	4	<0.0001	Yes
<b>Mildura</b>	3 Monthly	8	<0.0001	Yes
<b>Murrabit</b>	3 Monthly	4	<0.0001	Yes
<b>Piangil</b>	3 Monthly	4	<0.0001	Yes
<b>Red Cliffs</b>	3 Monthly	4	<0.0001	Yes
<b>Robinvale</b>	3 Monthly	4	<0.0001	Yes
<b>Swan Hill</b>	3 Monthly	4	<0.0001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods.

## Table 21 Gross Alpha Activity

Health Guideline Value (ADWG) 0.5 Bq/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (Bq/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	5 yearly	1	<0.05	Yes
<b>Koondrook</b>	5 yearly	1	<0.05	Yes
<b>Mildura</b>	5 yearly	2	<0.05	Yes
<b>Murrabit</b>	5 yearly	1	<0.05	Yes
<b>Piangil</b>	5 yearly	1	<0.05	Yes
<b>Red Cliffs</b>	5 yearly	1	<0.05	Yes
<b>Robinvale</b>	5 yearly	1	<0.05	Yes
<b>Swan Hill</b>	5 yearly	1	<0.05	Yes

\*Note: 2015 results shown, samples are taken every 5 years

## Table 22 Gross Beta Activity

Health Guideline Value (ADWG) 0.5 Bq/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (Bq/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	5 yearly	1	<0.1	Yes
<b>Koondrook</b>	5 yearly	1	<0.1	Yes
<b>Mildura</b>	5 yearly	2	<0.1	Yes
<b>Murrabit</b>	5 yearly	1	<0.1	Yes
<b>Piangil</b>	5 yearly	1	<0.1	Yes
<b>Red Cliffs</b>	5 yearly	1	<0.1	Yes
<b>Robinvale</b>	5 yearly	1	<0.1	Yes
<b>Swan Hill</b>	5 yearly	1	<0.1	Yes

\*Note: 2015 results shown, samples are taken every 5 years

## Table 23 Lead

Health Guideline Value (ADWG) 0.01 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
Irymple	3 Monthly	4	<0.001	Yes
Kerang	3 Monthly	4	0.001	Yes
Koondrook	3 Monthly	4	<0.001	Yes
Lake Boga	3 Monthly	4	<0.001	Yes
Merbein	3 Monthly	4	<0.001	Yes
Mildura	3 Monthly	4	<0.001	Yes
Murrabit	3 Monthly	4	<0.001	Yes
Nyah	3 Monthly	4	<0.001	Yes
Nyah West	3 Monthly	4	<0.001	Yes
Piangil	3 Monthly	4	<0.001	Yes
Red Cliffs	3 Monthly	4	<0.001	Yes
Robinvale	3 Monthly	4	<0.001	Yes
Swan Hill	3 Monthly	4	<0.001	Yes
Woorinen South	3 Monthly	4	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods.

**Table 24 Nickel**

Health Guideline Value (ADWG) 0.02 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
Irymple	3 Monthly	4	<0.001	Yes
Kerang	3 Monthly	4	<0.001	Yes
Koondrook	3 Monthly	4	<0.001	Yes
Lake Boga	3 Monthly	4	<0.001	Yes
Merbein	3 Monthly	4	<0.001	Yes
Mildura	3 Monthly	4	<0.001	Yes
Murrabit	3 Monthly	4	<0.001	Yes
Nyah	3 Monthly	4	<0.001	Yes
Nyah West	3 Monthly	4	<0.001	Yes
Piangil	3 Monthly	4	<0.001	Yes
Red Cliffs	3 Monthly	4	<0.001	Yes
Robinvale	3 Monthly	4	<0.001	Yes
Swan Hill	3 Monthly	4	<0.001	Yes
Woorinen South	3 Monthly	4	<0.001	Yes

\*Note: The min/max values of this parameter have decreased or remained the same in comparison to the previous 2 reporting periods.



**Table 25 Zinc**

Aesthetic Guideline Value (ADWG) 3 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
<b>Irymple</b>	3 Monthly	4	0.007	0.004	Yes
<b>Kerang</b>	3 Monthly	4	0.012	0.008	Yes
<b>Koondrook</b>	3 Monthly	4	0.021	0.014	Yes
<b>Lake Boga</b>	3 Monthly	4	0.007	0.004	Yes
<b>Merbein</b>	3 Monthly	4	0.009	0.005	Yes
<b>Mildura</b>	3 Monthly	4	0.007	0.005	Yes
<b>Murrabit</b>	3 Monthly	4	0.008	0.004	Yes
<b>Nyah</b>	3 Monthly	4	0.006	0.005	Yes
<b>Nyah West</b>	3 Monthly	4	0.019	0.008	Yes
<b>Piangil</b>	3 Monthly	4	0.005	0.003	Yes
<b>Red Cliffs</b>	3 Monthly	4	0.015	0.009	Yes
<b>Robinvale</b>	3 Monthly	4	0.007	0.005	Yes
<b>Swan Hill</b>	3 Monthly	4	0.004	0.003	Yes
<b>Woorinen South</b>	3 Monthly	4	0.017	0.011	Yes

\*Note: The min/max values of this parameter have mostly decreased in comparison to the previous 2 reporting periods. Those values that did increase (Koondrook, Lake Boga, Merbein, Nyah West and Red Cliffs), did not rise more than in the 2016/2017 reporting period.

**Table 26 Nitrate Nitrogen**

Health Guideline Value (ADWG) 50 mg/L (as Nitrate)

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum mg/L (as Nitrate)	Maximum mg/L (as Nitrate)	Met ADWG guideline value (Yes/No)
Irymple	3 Monthly	4	0.06	0.05	Yes
Kerang	3 Monthly	4	0.12	0.06	Yes
Koondrook	3 Monthly	4	0.04	0.03	Yes
Lake Boga	3 Monthly	4	0.06	0.04	Yes
Merbein	3 Monthly	4	0.08	0.07	Yes
Mildura	3 Monthly	4	0.06	0.05	Yes
Murrabit	3 Monthly	4	0.05	0.04	Yes
Nyah	3 Monthly	4	0.06	0.04	Yes
Nyah West	3 Monthly	4	0.06	0.05	Yes
Piangil	3 Monthly	4	0.02	0.02	Yes
Red Cliffs	3 Monthly	4	0.06	0.03	Yes
Robinvale	3 Monthly	4	0.06	0.05	Yes
Swan Hill	3 Monthly	4	0.05	0.03	Yes
Woorinen South	3 Monthly	4	0.06	0.05	Yes

\*Note: The min/max values of this parameter have mostly decreased in comparison to the previous 2 reporting periods.

**Table 27 Cyanide**

Health Guideline Value (ADWG) 0.08 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Irymple</b>	3 Monthly	4	<0.005	Yes
<b>Kerang</b>	3 Monthly	4	<0.005	Yes
<b>Koondrook</b>	3 Monthly	4	<0.005	Yes
<b>Lake Boga</b>	3 Monthly	4	<0.005	Yes
<b>Merbein</b>	3 Monthly	4	<0.005	Yes
<b>Mildura</b>	3 Monthly	4	<0.005	Yes
<b>Murrabit</b>	3 Monthly	4	<0.005	Yes
<b>Nyah</b>	3 Monthly	4	<0.005	Yes
<b>Nyah West</b>	3 Monthly	4	<0.005	Yes
<b>Piangil</b>	3 Monthly	4	<0.005	Yes
<b>Red Cliffs</b>	3 Monthly	4	<0.005	Yes
<b>Robinvale</b>	3 Monthly	4	<0.005	Yes
<b>Swan Hill</b>	3 Monthly	4	<0.005	Yes
<b>Woorinen South</b>	3 Monthly	4	<0.005	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods.

**Table 28 Chromium**

Health Guideline Value (ADWG) 0.05 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Irymple</b>	3 Monthly	4	<0.001	Yes
<b>Kerang</b>	3 Monthly	4	<0.001	Yes
<b>Koondrook</b>	3 Monthly	4	<0.001	Yes
<b>Lake Boga</b>	3 Monthly	4	<0.001	Yes
<b>Merbein</b>	3 Monthly	4	<0.001	Yes
<b>Mildura</b>	3 Monthly	4	<0.001	Yes
<b>Murrabit</b>	3 Monthly	4	<0.001	Yes
<b>Nyah</b>	3 Monthly	4	<0.001	Yes
<b>Nyah West</b>	3 Monthly	4	<0.001	Yes
<b>Piangil</b>	3 Monthly	4	<0.001	Yes
<b>Red Cliffs</b>	3 Monthly	4	<0.001	Yes
<b>Robinvale</b>	3 Monthly	4	<0.001	Yes
<b>Swan Hill</b>	3 Monthly	4	<0.001	Yes
<b>Woorinen South</b>	3 Monthly	4	<0.001	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods.

## Table 29 Cadmium

Health Guideline Value (ADWG) 0.002 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
Irymple	3 Monthly	4	<0.0002	Yes
Kerang	3 Monthly	4	<0.0002	Yes
Koondrook	3 Monthly	4	<0.0002	Yes
Lake Boga	3 Monthly	4	<0.0002	Yes
Merbein	3 Monthly	4	<0.0002	Yes
Mildura	3 Monthly	4	<0.0002	Yes
Murrabit	3 Monthly	4	<0.0002	Yes
Nyah	3 Monthly	4	<0.0002	Yes
Nyah West	3 Monthly	4	<0.0002	Yes
Piangil	3 Monthly	4	<0.0002	Yes
Red Cliffs	3 Monthly	4	<0.0002	Yes
Robinvale	3 Monthly	4	<0.0002	Yes
Swan Hill	3 Monthly	4	<0.0002	Yes
Woorinen South	3 Monthly	4	<0.0002	Yes

\*Note: The min/max values of this parameter have remained the same in comparison to the previous 2 reporting periods.

## Table 30 Copper

Water Quality Standard: The total concentration of copper in drinking water should not exceed 2 mg/L.

Water Sampling Locality	Frequency of Sampling	Number of Samples	Drinking water quality standard (mg/L)	Maximum (mg/L)	Average (mg/L)	Number of samples where standard was not met (s. 18)
Irymple	3 Monthly	4	2	0.002	0.005	0
Kerang	3 Monthly	4	2	0.007	0.017	0
Koondrook	3 Monthly	4	2	0.01	0.017	0
Lake Boga	3 Monthly	4	2	<0.001	0.009	0
Merbein	3 Monthly	4	2	0.002	0.006	0
Mildura	3 Monthly	4	2	0.004	0.004	0
Murrabit	3 Monthly	4	2	<0.001	0.005	0
Nyah	3 Monthly	4	2	<0.001	0.006	0
Nyah West	3 Monthly	4	2	<0.001	0.017	0
Piangil	3 Monthly	4	2	0.01	0.009	0
Red Cliffs	3 Monthly	4	2	0.002	0.003	0
Robinvale	3 Monthly	4	2	0.002	0.010	0
Swan Hill	3 Monthly	4	2	<0.001	0.013	0
Woorinen South	3 Monthly	4	2	<0.001	0.010	0

\*Note: Swan Hill, Nyah West, Nyah, Murrabit and Mildura localities saw a decrease in the min/max values of this parameter while the other localities had a marginal increase in comparison to the previous 2 reporting periods. LMW achieved well under the compliance limits set by the ADWG for Copper in all localities during the 2018/19 period.

**Table 31 Manganese**

Health Guideline Value (ADWG) 0.5 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Irymple</b>	3 Monthly	4	0.002	Yes
<b>Kerang</b>	3 Monthly	4	0.007	Yes
<b>Koondrook</b>	3 Monthly	4	0.01	Yes
<b>Lake Boga</b>	3 Monthly	4	<0.001	Yes
<b>Merbein</b>	3 Monthly	4	0.002	Yes
<b>Mildura</b>	3 Monthly	4	0.004	Yes
<b>Murrabit</b>	3 Monthly	4	<0.001	Yes
<b>Nyah</b>	3 Monthly	4	<0.001	Yes
<b>Nyah West</b>	3 Monthly	4	<0.001	Yes
<b>Piangil</b>	3 Monthly	4	0.01	Yes
<b>Red Cliffs</b>	3 Monthly	4	0.002	Yes
<b>Robinvale</b>	3 Monthly	4	0.002	Yes
<b>Swan Hill</b>	3 Monthly	4	<0.001	Yes
<b>Woorinen South</b>	3 Monthly	4	<0.001	Yes

\*Note: The min/max values of this parameter have decreased or remained the same in comparison to the previous 2 reporting periods.

**Table 32 pH**

Aesthetic Guideline Range (ADWG) 6.5-8.5 pH Units

Water Sampling Locality	Frequency of Sampling	Number of Samples	Minimum pH Units	Maximum pH Units	Average pH Units	Aesthetic operating range
<b>Irymple</b>	Weekly	52	6.6	7.8	7.2	6.5-8.5
<b>Kerang</b>	Weekly	52	6.8	7.6	7.2	6.5-8.5
<b>Koondrook</b>	Weekly	52	6.5	7.4	7.0	6.5-8.5
<b>Lake Boga</b>	Weekly	52	7	7.7	7.4	6.5-8.5
<b>Merbein</b>	Weekly	52	6.7	7.5	7.1	6.5-8.5
<b>Mildura</b>	Weekly	52	6.8	7.4	7.1	6.5-8.5
<b>Murrabit</b>	Weekly	52	6.8	7.4	7.1	6.5-8.5
<b>Nyah</b>	Weekly	52	6.7	7.4	7.1	6.5-8.5
<b>Nyah West</b>	Weekly	52	6.8	7.5	7.1	6.5-8.5
<b>Piangil</b>	Weekly	52	6.7	7.6	7.3	6.5-8.5
<b>Red Cliffs</b>	Weekly	52	7.1	7.8	7.5	6.5-8.5
<b>Robinvale</b>	Weekly	52	7.1	7.8	7.3	6.5-8.5
<b>Swan Hill</b>	Weekly	52	6.8	7.4	7.2	6.5-8.5
<b>Woorinen South</b>	Weekly	52	6.8	7.5	7.2	6.5-8.5



**Table 33 Colour**

Aesthetic Guideline Value (ADWG) 15 HU\*

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum Pt/Co Units*	Average Pt/Co Units*	Met ADWG guideline value (Yes/No)
<b>Irymple</b>	Monthly	12	2	2	Yes
<b>Kerang</b>	Monthly	12	2	2	Yes
<b>Koondrook</b>	Monthly	12	2	2	Yes
<b>Lake Boga</b>	Monthly	12	2	2	Yes
<b>Merbein</b>	Monthly	12	4	2	Yes
<b>Mildura</b>	Monthly	12	2	2	Yes
<b>Murrabit</b>	Monthly	12	2	2	Yes
<b>Nyah</b>	Monthly	12	2	2	Yes
<b>Nyah West</b>	Monthly	12	2	2	Yes
<b>Piangil</b>	Monthly	12	2	2	Yes
<b>Red Cliffs</b>	Monthly	12	2	2	Yes
<b>Robinvale</b>	Monthly	12	2	2	Yes
<b>Swan Hill</b>	Monthly	12	4	2	Yes
<b>Woorinen South</b>	Monthly	12	2	2	Yes

\*Pt-Co Units = Hazen Units (HU) = PCU = Platinum Cobalt Colour

\*\*Note: Colour has marginally improved in comparison to the previous 2 reporting periods.

**Table 34 Iron**

Aesthetic Guideline Value (ADWG) 0.3 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Met ADWG guideline value (Yes/No)
<b>Irymple</b>	3 Monthly	4	0.02	Yes
<b>Kerang</b>	3 Monthly	4	<0.01	Yes
<b>Koondrook</b>	3 Monthly	4	0.02	Yes
<b>Lake Boga</b>	3 Monthly	4	<0.01	Yes
<b>Merbein</b>	3 Monthly	4	0.01	Yes
<b>Mildura</b>	3 Monthly	4	0.02	Yes
<b>Murrabit</b>	3 Monthly	4	<0.01	Yes
<b>Nyah</b>	3 Monthly	4	<0.01	Yes
<b>Nyah West</b>	3 Monthly	4	0.03	Yes
<b>Piangil</b>	3 Monthly	4	<0.01	Yes
<b>Red Cliffs</b>	3 Monthly	4	<0.01	Yes
<b>Robinvale</b>	3 Monthly	4	<0.01	Yes
<b>Swan Hill</b>	3 Monthly	4	<0.01	Yes
<b>Woorinen South</b>	3 Monthly	4	<0.01	Yes

\*Note: The min/max values of this parameter have decreased or remained the same in comparison to the previous 2 reporting periods.

**Table 35 Hardness**Aesthetic Guideline Value (ADWG) 200 mg/L (as CaCO<sub>3</sub>)

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	38	30	Yes
<b>Koondrook</b>	3 Monthly	4	15	13	Yes
<b>Mildura</b>	3 Monthly	8	40	29	Yes
<b>Murrabit</b>	3 Monthly	4	14	13	Yes
<b>Piangil</b>	3 Monthly	4	19	17	Yes
<b>Red Cliffs</b>	3 Monthly	4	25	22	Yes
<b>Robinvale</b>	3 Monthly	4	23	20	Yes
<b>Swan Hill</b>	3 Monthly	4	18	15	Yes

\*Note: The min/max values of this parameter have decreased in comparison to the previous 2 reporting periods.

**Table 36 Chloride**

Aesthetic Guideline Value (ADWG) 250 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	10	9	Yes
<b>Koondrook</b>	3 Monthly	4	9	7	Yes
<b>Mildura</b>	3 Monthly	8	20	15	Yes
<b>Murrabit</b>	3 Monthly	4	11	8	Yes
<b>Piangil</b>	3 Monthly	4	12	9	Yes
<b>Red Cliffs</b>	3 Monthly	4	21	16	Yes
<b>Robinvale</b>	3 Monthly	4	22	13	Yes
<b>Swan Hill</b>	3 Monthly	4	13	10	Yes

\*Note: The min/max values of this parameter have decreased or remained the same in comparison to the previous 2 reporting periods.

**Table 37 Sodium**

Aesthetic Guideline Value (ADWG) 180 mg/L

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	12	10.3	Yes
<b>Koondrook</b>	3 Monthly	4	8.1	7.5	Yes
<b>Mildura</b>	3 Monthly	8	17	11.9	Yes
<b>Murrabit</b>	3 Monthly	4	6	5.1	Yes
<b>Piangil</b>	3 Monthly	4	12	11	Yes
<b>Red Cliffs</b>	3 Monthly	4	23	19	Yes
<b>Robinvale</b>	3 Monthly	4	37	20.8	Yes
<b>Swan Hill</b>	3 Monthly	4	8.8	6.7	Yes

\*Note: The min/max values of this parameter have decreased or remained the same in comparison to the previous 2 reporting periods with the exception of Robinvale, which saw only a marginal increase.

**Table 38 Conductivity**Aesthetic Guideline Value (ADWG) 830  $\mu\text{S}/\text{cm}^*$ 

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)	Met ADWG guideline value (Yes/No)
<b>Kerang</b>	3 Monthly	4	170	140	Yes
<b>Koondrook</b>	3 Monthly	4	85	82	Yes
<b>Mildura</b>	3 Monthly	8	150	141	Yes
<b>Murrabit</b>	3 Monthly	4	69	64	Yes
<b>Piangil</b>	3 Monthly	4	110	104	Yes
<b>Red Cliffs</b>	3 Monthly	4	160	148	Yes
<b>Robinvale</b>	3 Monthly	4	200	148	Yes
<b>Swan Hill</b>	3 Monthly	4	88	75	Yes

\*Total dissolved solids 600 mg/L

\*\*Note: The min/max values of this parameter have decreased in comparison to the previous 2 reporting periods.

**Table 39 Calcium**

No Guideline Value

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)
<b>Kerang</b>	3 Monthly	4	11	8.2
<b>Koondrook</b>	3 Monthly	4	2.6	2.4
<b>Mildura</b>	3 Monthly	8	12	6.9
<b>Murrabit</b>	3 Monthly	4	2.7	2.3
<b>Piangil</b>	3 Monthly	4	3.6	3.2
<b>Red Cliffs</b>	3 Monthly	4	4.2	4.9
<b>Robinvale</b>	3 Monthly	4	4	3.5
<b>Swan Hill</b>	3 Monthly	4	3	2.7

\*Note: The min/max values of this parameter have decreased in comparison to the previous 2 reporting periods.

**Table 40 Alkalinity (as CaCO<sub>3</sub>)**

No Guideline Value

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Average (mg/L)
<b>Kerang</b>	3 Monthly	4	24	21
<b>Koondrook</b>	3 Monthly	4	15	14
<b>Mildura</b>	3 Monthly	8	18	17
<b>Murrabit</b>	3 Monthly	4	19	18
<b>Piangil</b>	3 Monthly	4	18	17
<b>Red Cliffs</b>	3 Monthly	4	21	18
<b>Robinvale</b>	3 Monthly	4	42	29
<b>Swan Hill</b>	3 Monthly	4	21	19

\*Note: The min/max values of this parameter have decreased in comparison to the previous 2 reporting periods.

## Table 41 Magnesium

No Guideline Value

Water Sampling Locality	Frequency of Sampling	Number of Samples	Maximum (mg/L)	Maximum (mg/L)
<b>Kerang</b>	3 Monthly	4	2.5	2.2
<b>Koondrook</b>	3 Monthly	4	2	1.8
<b>Mildura</b>	3 Monthly	8	3.6	2.9
<b>Murrabit</b>	3 Monthly	4	2	1.7
<b>Piangil</b>	3 Monthly	4	2.6	2.2
<b>Red Cliffs</b>	3 Monthly	4	3.4	3.0
<b>Robinvale</b>	3 Monthly	4	3.1	2.6
<b>Swan Hill</b>	3 Monthly	4	2.4	2.1

\*Note: The min/max values of this parameter have decreased in comparison to the previous 2 reporting periods.



For further information please contact us

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