

Annual Drinking Water Quality Report 2016/2017

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LOWER MURRAY
WATER



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Foreword from our Managing Director



I am pleased to present Lower Murray Water's 2016/2017 Annual Drinking Water Quality Report, which reports of the quality of drinking water and regulated water supplied by us across our 16 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*. Water quality, including the bacteriological, chemical and physical characteristics of the drinking water supplied by us to our customers is discussed in the report. This report demonstrates our continued high compliance with the water quality standards and highlights water quality challenges experienced and achievements during 2016/2017.

We have a multiple barrier, catchment-to-tap approach to ensure high quality, safe drinking water. Under the *Safe Drinking Water Act 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.

During 2016/2017, we experienced extremely poor raw water quality "Blackwater" from August 2016 through to December 2016. This event was similar to that experienced in 2010/11. The sound knowledge of the catchment risks and the multiple barrier treatment systems enabled us to continue to provide safe drinking water during this water quality event in the Murray River. The Murray River 'Blackwater' significantly impacted the operation of our water treatment plants.

For the 2016/17 year, I'm pleased to advise that we continued to produce high quality drinking water to our customers, and continued ongoing compliance with the water quality standards and requirements of the *Safe Drinking Water Act 2003* and *Safe Drinking Water Regulations 2015*.

Managing Director
Phillip Endley

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



Our area of operation extends from Kerang to the South Australian border taking in the municipalities of Mildura, Swan Hill and Gannawarra.

We recognise that our overall well-being and livelihood is directly linked to the agricultural, tourism and support industries which form our economic backbone.



How we manage our water resources recognises the intrinsic inter-relationship between this resource and the social and economic fabric of our region.



Our Vision

The Board envisages that we will be the leading regional water corporation in Victoria by:

Close engagement with our community and customers

Being resilient in times of adversity and change

Being a regional leader

We will deliver outcomes to our communities by:

- Catering for sustained growth in our urban business
- Promoting growth in our rural business
- Being sustainable, measured by finance, a productive culture and a lighter environmental footprint

Objectives and Strategies

- Customer focused—right service, right time maintaining compliant ie. performance while improving cost effectiveness of operations and assets
- Increasing use of modernised infrastructure across the Corporation
- Increasing the resilience of services to changing and extreme weather

- Managing the Corporation in accordance with expected standards of corporate behaviour
- Managing the Corporation's assets and finances responsibly and sustainably
- Providing an engaged, skilled and diverse workforce to deliver our vision and mission
- providing our services equitably and with respect to a diverse community

Nature of Services Provided

We provide:

- urban water services to 14 townships 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 10 treatment plants;
- river quality water services to 4,979 customers in the four pumped irrigation districts of Merbein, Red Cliffs, Robinvale and Mildura, the Millewa rural district and some areas of the waterworks district of Yelta;
- the collection and disposal of subsurface drainage water from the four pumped irrigation districts, and Nangiloc, Robinvale and Boundary Bend private diverters;
- oversight of irrigation and drainage design in new agricultural developments ensuring conformity with salinity management plan development guidelines;
- management of the private diversion licences of 1,179 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 to important environmental and recreational sites;
- 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.

Per Capita Daily Residential Drinking Water Consumption

We provide drinking water to a population of around 72,000. The total annual consumption of water was 12,833 megalitres across this population in our region. This equates to an average of 488 litres per person, per day. This calculation is based on the population figure provided by the 2016 Census –“average household population” multiplied by our water connections for each town.

Our Commitment to our Community and our Region

Collaboration with Stakeholders /Community

As a commitment to our region, we are regularly involved in a number of stakeholder groups to share information on customer relations, communications, care of the River Murray and its environs and community and school education opportunities. We are pleased to be involved with other groups as required for specific event collaboration.

Choose Tap Coalition

In February 2017 we joined the Choose Tap Coalition, an initiative created by Yarra Valley Water. Choose Tap is a broad, community-based initiative promoting tap water as the best choice for the planet, people's health and their hip pocket. Being part of the coalition provides us with access to a strong common brand, including related support collateral and provides a platform for sharing related ideas across the water industry. The Choose Tap Coalition's vision of advocating the use of tap water is a positive fit with our existing 'Rehydrate with Cool, Clean Tap Water' campaign.

Sunraysia Regional Algal Coordination Committee

We are a Victorian Convening Agency within the region for Blue Green Algae (BGA) monitoring and reporting. The monitoring of the Murray River is undertaken by our staff and the NSW Department of Environment and Water and is reported back through the Sunraysia Regional Algal Coordination Committee (SRACC). Our Senior Manager Customer & Stakeholder is currently the Chairman of the SRACC.

Partnerships within our Communities

We have created partnerships with groups and organisations within our communities to deliver community engagement projects which result in better outcomes for our customers and stakeholders. Groups partnered with in the 2016/17 year include Lions Clubs, Historical Societies, Cultivator Inc, LaTrobe University and SuniTafe.

Sunraysia River Watch Inc (SRW)

We are proud to continue our association with SRW, a community program that aims to assist in the protection of the river and its environs. SRW is dedicated to increasing the appreciation of the river and the surrounding environment and ensuring its preservation for the benefit of current and future generations. In 2016/17 we continued our ongoing sponsorship and membership of SRW, joining other agencies and businesses in demonstrating ongoing commitment to this important community service.

Water Refill Stations

We have a number of water refill stations operating across our service area. In addition to units fully funded by ourselves, we collaborate with local groups who contribute to funding of their purchase and installation around the region. The location of existing and future units will be included on the 'Choose Tap App'.



Committing to the Environment and Region

SUSTAINABLE WATER USE

Water Recycling

We continue to encourage schemes that promote the sustainable reuse of treated and recycled water. Such schemes have a positive environmental impact by lowering the demand impact on the Murray River. Under the various schemes, water is initially treated according to the relevant EPA Guidelines and then supplied for a variety of beneficial uses.

These include:

- Koorlong Wastewater Treatment Plant—wastewater from Red Cliffs, Irymple and parts of Mildura is treated to Class C standards then supplied to a primary producer for use in horticulture
- Mildura Wastewater Treatment Plant—this plant treats wastewater from the remaining part of Mildura to Class C standards. It is then used onsite for the production of pastures, fodder and for irrigating treelots
- Robinvale Wastewater Treatment Plant—wastewater from the Robinvale area is treated to Class C standards and then used for the production of high grade fodder
- Mildura Water Treatment Plant—raw river water is treated Raw River water is treated to produce potable water that complies with schedule 2 of the *Safe Drinking Water Regulations 2015*, and the *ADWG 2011* and supplied to Mildura residents as drinking water. Water used in the backwashing and treatment operations is diverted to a separate storage lagoon and then supplied to Mildura Rural City Council for irrigation of the Aerodrome Ovals sporting complex
- West Mildura Water Treatment Plant—reclaimed water from the backwashing and treatment operations is supplied to Mildura Golf Club for the irrigation of its fairways and greens
- Irrigation drainage—water collected by our irrigation drainage system is utilised by a number of individuals for various purposes, ranging from pasture and crop production through to amenity supply



Lake Hawthorn Management Plan

Lake Hawthorn, a few kilometres northwest of the Mildura CBD is an important local water body. The Lake receives its water principally from Mildura Rural City Councils (MRCC) stormwater system and our irrigation drainage system. The Lake also plays a role in the salinity inception scheme managed by Goulburn Murray Water (GMW). In addition to these important functions, the Lake has ecological and social amenity values. We continue to work with our fellow agencies; MRCC, Mallee Catchment Management Authority (MCMA) and GMW to ensure the ecological and social amenity values of Lake Hawthorn are managed effectively.

Victorian Biodiversity Strategy

We manage a number of sites that are located in areas having high conservation values. These sites are subject to ongoing works aimed at controlling the abundance of pest plants and animals to ensure their native species populations remain viable and resilient.

Sites under our management include:

- Benetook Offset Site – Located near Lake Koorlong this 25 hectare site has been subject to intensive conservation over the last decade. All major pest animal and weed species have been removed allowing native species to re-establish. The site remains under ongoing management to ensure its conservation values are retained

- Koorlong Wastewater Treatment Plant - a 21 hectare section of old-growth mallee located within the grounds of the Koorlong Wastewater Treatment Plant and secured under the Bushbroker scheme is managed by us to ensure it remains free of weeds and animal pest species
- West Mildura Water Treatment Plant – a 15 hectare area to the south of the plant facilities is home to a population of legless lizards (*Pygopus schraderi*), one of only six locations in Victoria where they are known to exist. In addition to ongoing weed control at the site we conduct feral animal control to reduce predatory pressure on the lizards
- Fosters Swamp, Kerang – we periodically release treated water into Fosters Swamp. This water has been demonstrated to have positive effects on the wildlife in the area

Victorian Waterway Management Strategy (VWMS)

We strive to achieve healthy rivers, streams and floodplains through our own works and by supporting our partner agencies. The VWMS provides an integrated framework for management and policy direction for waterway health across the state. The VWMS has informed the development of the Mallee Regional Waterway Strategy 2014-22, of which we are a partner in the delivery of the works program.



Water Supply Systems

We provide drinking water to 14 townships via nine water treatment plants to a population of approximately 72,000 along the Murray River in Victoria from Kerang 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 24.

Our 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 below.

Source 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

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

Our drinking water supply systems are shown on the map page 3.

This report in accordance with the *Safe Drinking Water Act 2003 (SDWA)* provides an overview of Lower Murray Water's drinking water supply systems, the quality systems in place for the provision of safe drinking water and the drinking water test results for 2016/2017 financial year.

River including Albury, Wodonga, Cobram, Echuca and other smaller localities.

We have 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. We do not have any control over the management of any of the identified activities undertaken in the catchment, including cattle grazing, human habitation, agriculture and industry. Dominant agricultural

activities include extensive horticultural areas, the production of rice, dairy, wool, wheat, beef, lamb and forestry. An abundance of recreational activities are undertaken along the Murray River and its tributaries including camping, swimming, fishing, water skiing, canoeing, sightseeing and picnicking.

The Murray River is an open and unprotected catchment and therefore its water is subject to a high microbial risk from humans, stock and industry. To assess these risks we have a water quality monitoring program which involves collecting of source water samples to be analysed for a range of parameters. In addition online turbidity meters have been installed at all water treatment plants raw water offtakes 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 being 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, we have conducted

detailed microbial hazard quantification on four of our drinking water supply systems. This assessment involved the methodology outlined in the WSAA Manual for the Application of Health Based Targets (WSAA 2015).

We have 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 Blue Green Algae (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 weekly basis and the frequency can increase subject to the volume of the BGA detected in the source water, which may trigger additional Algae toxins identification.

Table 1 - LMW drinking water localities

DRINKING WATER SAMPLING LOCALITY	SOURCE WATER	POPULATION	TREATMENT PLANT
Irymple	Murray River	7,779	Mildura 7th street & Mildura West WTP's
Kerang	Murray River/Loddon River/14/2 Irrigation Channel	4,145	Kerang WTP
Koondrook	Murray River	926	Koondrook WTP
Lake Boga	Murray River	1060	Swan Hill WTP
Merbein	Murray River	3,565	Mildura 7th street & Mildura West WTP's
Mildura	Murray River	34,877	Mildura 7th street & Mildura West WTP's
Murrabit	Murray River/Storage Dam	95	Murrabit WTP
Nyah	Murray River	695	Swan Hill WTP
Nyah West	Murray River	563	Swan Hill WTP
Piangil	Murray River	220	Piangil WTP
Red Cliffs	Murray River	3,845	Red Cliffs WTP
Robinvale	Murray River	2,138	Robinvale WTP
Swan Hill	Murray River	11,277	Swan Hill WTP
Woorinen South	Murray River	434	Swan Hill WTP
Millewa *	Lake Cullulleraine	169	Millewa Water Improvement Plant
Mystic Park *	Kangaroo Lake	29	N/A

* Regulated Supplies

Total: 72,025

Drinking Water Treatment Processes

During the 2016/2017 financial year, we treated over 18,400 Megalitres of drinking water across nine water treatment plants.

Our nine water treatment plants use conventional water treatment, which involves the following process steps:

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

We disinfect our drinking water using Chlorine. Chlorine 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 contamination and can limit biological regrowth problems.

Treatment processes may slightly differ at each water treatment plant due to plant capacity, technology type or raw water quality being sourced.

Table 2 - LMW Water Treatment Processes

WATER SAMPLING LOCALITY	TREATMENT PLANT	TREATMENT PROCESS	ADDED SUBSTANCES
Kerang	Kerang	Coagulation / flocculation Sedimentation Granular media filtration Chlorination	Aluminium Sulphate Hydrated Lime/Sodium Hydroxide Chlorine gas Powdered Activated Carbon Fluorosilicic Acid
Koondrook	Koondrook	Coagulation / flocculation Sedimentation Granular media filtration Chlorination	Aluminium Sulphate Sodium Hydroxide Chlorine gas Powdered Activated Carbon
Merbein Irymple Mildura	Mildura 7th St Mildura West	Coagulation / flocculation Sedimentation / Clarification Granular Media filtration Chlorination	Aluminium Sulphate Hydrated Lime Polymer Chlorine gas Powdered Activated Carbon Fluorosilicic Acid
Murrabit	Murrabit	Coagulation / flocculation Sedimentation Granular media filtration Chlorination	Aluminium Chlorohydrate Sodium Hydroxide Chlorine gas Powdered Activated Carbon
Piangil	Piangil	Coagulation / flocculation Sedimentation Granular media filtration Chlorination	Aluminium Sulphate Sodium Hydroxide Chlorine gas Powdered Activated Carbon
Red Cliffs	Red Cliffs	Coagulation / flocculation Dissolved air floatation Granular media filtration Chlorination	Aluminium Sulphate Sodium Hydroxide Chlorine gas Powdered Activated Carbon Fluorosilicic Acid Potassium Permanganate
Robinvale	Robinvale	Coagulation / flocculation Sedimentation / Clarification Granular media filtration Chlorination	Aluminium Sulphate Soda Ash Chlorine gas Powdered Activated Carbon Sodium Hexafluorosilicate
Lake Boga Nyah Nyah West Swan Hill Woorinen South	Swan Hill	Coagulation / flocculation Sedimentation / Clarification Granular Media filtration Chlorination	Aluminium Chlorohydrate Sodium Hydroxide Chlorine gas Powdered Activated Carbon Fluorosilicic Acid

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

The process of flotation 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 flotation 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*.

pH Correction

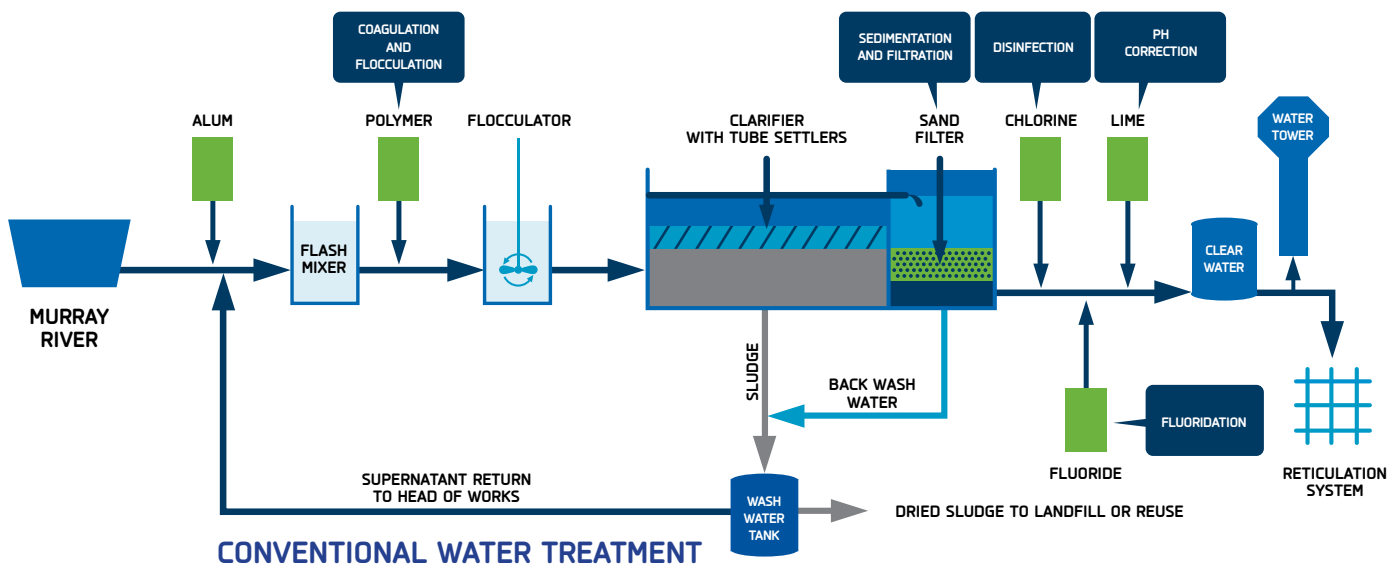
Due to the addition of some coagulants and Chlorine, the pH of the water decreases, becoming more acidic. To inhibit corrosion and make the water suitable to use, the pH is adjusted to a neutral pH of around 7.0, by adding Lime or other alkaline chemicals such as Soda Ash or Sodium Hydroxide.

Powdered Activated Carbon

PAC 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 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

We have 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.

We 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 faecal 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 2016/17 we collected over 3400 samples from our 16 water supply systems, and analysed for more than 40 parameters to assess water quality for health risks.

Sampling Points

While the sampling points are representative of the water quality within their subsequent supply systems, a review of the water sampling points was undertaken during 2015/2016 year 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.

Issues

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

The following issues related to the monitoring schedule have occurred during the 2016/2017 financial year:

- The regulatory water quality tests were not performed on the weekly Retic samples collected on 4th October 2016 due to a scheduling error. The missing parameters are shown in the following table.

DATE SAMPLED	SOURCE OF SAMPLE	TESTING FREQUENCY	WATER QUALITY TEST PARAMETERS	LOCALITY
4th Oct 2016	Retic	Weekly	Turbidity, pH	Woorinen South

- The regulatory water quality tests were not performed on the weekly Retic samples collected on 25th January 2017 due to Sampler oversight. The missing parameters are shown in the following table.

DATE SAMPLED	SOURCE OF SAMPLE	TESTING FREQUENCY	WATER QUALITY TEST PARAMETERS	LOCALITY
25th Jan 2017	Retic	Weekly	Microbiology (<i>E.coli</i> , Coliforms & PC)	Kerang, Koondrock & Murrabit

- Lake Boga sample taken 21st February 2017 had a pH of 9.1. Investigation of the water supply system for the elevated pH result was not able

to identify the root cause. The investigation considered the treatment process, chemical dosing systems, dosing equipment and a review of the online monitoring trends.

The water quality tests for turbidity & pH were not performed on the weekly Reticulation sample collected from Woorinen South, 4th October 2016. The investigation into this issue revealed that there was a scheduling error.

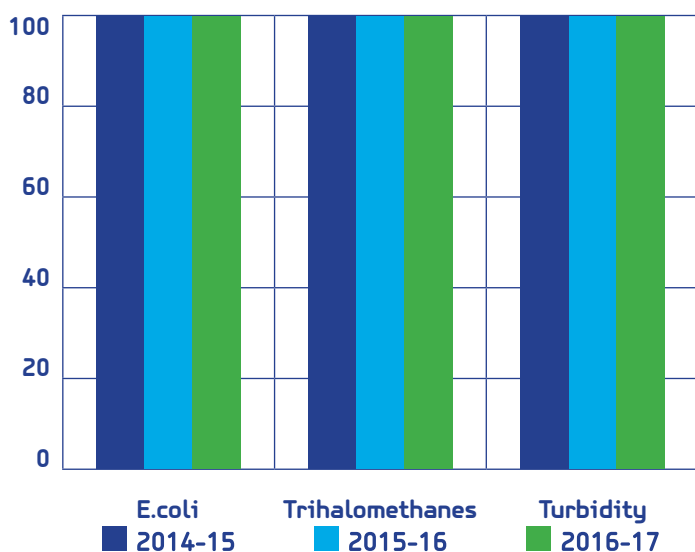
Sampling of the reticulated water at Kerang, Koondrock and Murrabit is performed on Wednesdays every week. The microbiology samples were collected and dispatched to the overnight courier service as scheduled on 25th January, however, due to 26th January being a public holiday (Australia Day) and the courier not operating on that day, the samples were delivered to the laboratory on 27th January, and therefore were out of the holding period for microbiology testing.

Regulation 14 of the Regulations 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 so we have split our sample collection over to two days instead of one day and amended our sampling collection time to ensure sufficient time is available to deliver the samples and process them before the maximum holding period of 24hrs has expired.

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 us continued for 2016/2017 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 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 2016/2017 financial year.

Table 3 – Water Quality Improvement Projects

WATER TREATMENT PLANT	IMPROVEMENT PROJECTS 2016/2017
All	Urban ClearSCADA Program - STAGE 1
All	All Sites Instrument Replacement
Mildura 7th Street	Inlet Pipe Work & Flow Splitting Upgrade
Mildura 7th Street	MWTP Filter Valves - ALL Water Minor CW Replacement
Mildura 7th Street	Upgrade Flow Meters
Mildura 7th Street	Spare Chemical Dosing Pumps
Mildura 7th Street	Secondary SCADA Licence
Mildura West	Replace Fluoride Flow Meter
Mildura West	Replace Caustic Board
Swan Hill	Install Alarms & Auto Shut offs in PAC
Swan Hill	Automation and Electrical Upgrade
Swan Hill	Cathodic Protection System Swan Hill to Lake Boga Pipeline
Swan Hill	Raw Water Pump Station Replace Council Pump
Swan Hill	Install Filter To Waste
Koondrook	Install Sludge Thickener
Murrabit	WTP Automation
Kerang	WTP Improvements
Kerang	WTP PLC Automation
Kerang	Clarifier Tube Settlers Replacement
Kerang	Replace Fluoride Meter



Water Treatment Issues

During the 2016/2017 year, we experienced a blackwater event, i.e. poor raw water quality characterised by moderate turbidity and high colour due to upstream flooding in the Murray River catchment and inundation of previously dry native riverine forests, which had immediate and significant negative impact on water treatment processes at all our WTPs.

The Murray River water quality from August to end of December 2016 was characterised by:

- Moderate turbidity early in the event.
- Elevated organics, as measured by apparent and true colour, UV absorbance and Dissolved Organic Carbon (DOC).
- Soluble Manganese likely associated with flood transport and, later, anoxic river conditions.

For Mildura WTP, turbidity peaked at 99 NTU towards the end of August 2016, while true colour peaked at 277 HU in early December but exceeded 100 HU for the four months starting from August through to December 2016. This deterioration in water quality was also experienced across all our water treatment facilities.

The key issues that confronted us during the event can be summarised as:

1. Significant increases in chemical dose rates necessary during the event. This was common for all our WTPs.
2. Impacted treatment performance including filtered water turbidity, high Chlorine demand, elevated soluble Manganese in treated water and water discolouration, resulting in significant increase in water quality complaints and reporting section 22 of the *Safe Drinking Water Act 2003* to the DHHS.

3. Decreased plant efficiency due to high sludge production rates and increased levels of clarifier wasting or filter backwashing.

4. Increased operator attendance requirements to respond to process requirements, and/or attending to mechanical issues to ensure ongoing operation of the plants, and production of water in compliance with the *Safe Drinking Water Act*.

Due to the significant impact of the poor raw water quality on the efficiency and cost of the treatment process, we engaged HunterH₂O to assist in investigating the poor raw water quality and associated treatment issues at Mildura Water Treatment Plant.

HunterH₂O was engaged to assist in the day-to-day operation of the treatment plants and undertake jar testing to identify optimal coagulants and Powdered Activated Carbon (PAC) dose rates, in a bid to improve the produced water quality, reduce chemical dosing and ensuring that water quality risks were maintained at an acceptable level.

Manganese Treatment

During the 2016/2017 financial year, we experienced elevated soluble Manganese in the raw water at all water treatment plants because of the blackwater event, resulting in a significant increase in water quality complaints related to water discolouration, taste and odour and alleged sicknesses, which warranted notification to the DHHS under section 22 of the *Safe Drinking Water Act 2003*. Whilst Manganese can lead to discolouration of treated water, which has a health guideline value of 0.5mg/L as per the ADWG 2011, all test results of samples collected from our water supply systems were compliant



and the effect of Manganese on drinking water was limited to aesthetic issues and the water remained safe to drink.

Manganese has been an ongoing issue at Red Cliffs WTP and in previous years we used Potassium Permanganate as an oxidising agent to remove Manganese out of drinking water and maintain soluble Manganese levels below limits set within the *Australian Drinking Water Guidelines 2011 (ADWG)*. Due to the reoccurring nature of this problem, we have been closely monitoring the Manganese levels in both the raw and filtered water and apply the required treatment options to reduce its content to acceptable levels in line with the ADWG. In 2016/2017 financial year we used Calgon-T at all WTPs, which is a sequestering agent that prevents the oxidation of Manganese in the treated water, thus reducing the number of water quality complaints related to water discolouration.

Improvements

The Swan Hill Water Treatment Plant Program Logic Control (PLC) has been upgraded and further modification to the process to improve control of treatment stages has taken place.

Tank Cleaning

We have ongoing scheduled inspection and maintenance programs for clear water storage tanks and service reservoirs cleaning, which were carried out in 2016/2017 financial year. This involved general inspections of the interior and exterior of the storages for sediment build-up and asset condition, the roof area and carrying out bucket water testing as required, which is a test carried out to detect leaks from the roof

area into the water storage tanks to prevent contamination that may result from rain water ingress and desludging of water storages as required.

In additional water storages, including clear water storages and service reservoirs, were inspected and modified to improve their dust and vermin proofing status where a fine mesh was installed on all ventilation openings.

Taste and Odour Treatment

PAC was dosed during the blackwater event at all WTPs to adsorb/remove the taste and odour compounds, which may result from high organics in the raw water. PAC was also used as a base "nucleolus" for floc development due to treating water with low turbidity and high colour content.

Fluoride Treatment

For the financial year, we were below the average optimum Fluoride for dental decay recommended within the Code of practice for fluoridation of drinking water supplies - *Health (Fluoridation) Act 1973*. This was due to a number of Fluoride systems being offline for required reactive and scheduled repairs and maintenance programs. We engaged a professional technician to inspect, assess and carry out necessary repairs and maintenance to Fluoride online analysers at all WTPs and train operators to undertake required maintenance and calibration tasks. In addition, our technical staff attended a Water Research Australia workshop, aimed at standardising Fluoride dosing systems and ensuring continuity of Fluoride dosing.

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 we met all water quality standards and didn't need to report under s18 of the act.

Reportable Incidents 2016-17

The following incidents have occurred during the reporting period:

- An *E.coli* was detected in a sample collected on 1st May 2017, from the locality of Merbein, which was reported under s22 of the Act to the DHHS.

In response to this incident, we immediately resampled the site including randomly selected points within the distribution system, undertook extensive flushing of the mains and resampled after flushing.

An investigation into the source of the *E.coli* was immediately undertaken. The investigation covered the water supply system and included the performance of the treatment plants and the chemical dosing systems two weeks before the event, free Chlorine residual in the distribution system, the integrity of the water storages and service reservoirs, main breaks or repairs within the Merbein distribution system, the sampling point, samples collection procedure, the sample processing at the NATA accredited lab. The investigation concluded that the sample collected from the locality of Merbein was a false positive and not representative of the water being supplied at the time the sample was collected and met the *E.coli* water quality standard.

- We reported under section s22 to the DHHS as a result of a significant increase in water quality complaints related to water discolouration, taste and odour and alleged sickness.

Elevated Manganese levels above the aesthetic guideline value were detected in the treated water in all water supply systems causing water discolouration and the presence of organic compounds residues resulting in taste and odour problems. To address this issue, we implemented immediate corrective actions involving the use of alternative treatment chemicals to remove the effect of Manganese.

Situations not Reportable under Section 22

During the reporting period we had a blackwater event in the Murray River that significantly impacted the raw water quality, where low oxygen levels, high organic matter, elevated colour and variable turbidity levels were detected.

Undertakings under Section 30

During 2016/2017 we did not have any undertakings with the DHHS.

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 analysers

Emergency Management Training

During 2016/2017 we did not carry out refresher training of our emergency management procedures. The procedure is planned to be reviewed in the current 2017/2018 financial year.



Drinking Water Quality Standards

During 2016/2017 financial year we remained 100% compliant with water quality standards specified for drinking water in Schedule 2 of the Regulations and the ADWG 2011, for all samples collected as part of our 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
<i>Escherichia coli</i>	one sample per week *	All samples of drinking water collected are found to contain No <i>Escherichia coli</i> 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.

* Subject to further testing based on locality population

Water Quality Complaints

Water Quality Complaint Management

We are 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 data base.

Water Quality Complaints

Over the reporting period there was a significant increase in the number of complaints across all categories. This increase is mainly attributed to the Blackwater event, where water discolouration, taste and odour and alleged sicknesses were the common water quality complaints.

Whilst most of the water quality complaints resulted from the Blackwater event, discoloured water can also result from a number of factors which could include burst water mains, oxidised Manganese or Iron sediment or potentially from a customer's internal plumbing. The total

number of complaints received under the water discolouration category is 93, an increase by 77 complaints in comparison to the previous year. The significant increase in the number of complaints can be attributed to the elevated Manganese levels resulting from the Blackwater event.

Taste and odour were the other major water quality complaints for us over the reporting period (26 complaints), an increase by 16 complaints comparing to the previous year, which might be attributed to the Blackwater event where the taste and odour complaints peaked in November 2016 and March 2017. In general, the taste and odour complaints can result from the presence of elevated concentrations of taste and odour compounds, such as Geosmine, 2-methylisoborneol (MIB), and other organic compounds in the source water, however, reduced water consumption and extended retention of water in the reticulation system "long age" and dead ends, may also contribute to imparting taste and odour to the water.

The alleged sickness complaints increased from zero in the previous year to seven. This increase may be attributed to water discolouration and the taste and odour resulted from the Blackwater event.



Table – 5A below shows a comparison in the current reporting period number of complaints to those received in the previous year. Table – 5B shows the types of complaints received by each of LMour water sampling locality.

Table 5A - types of complaints compared to previous reporting period

TYPE OF COMPLAINT	NO. OF COMPLAINTS		COMPARISON WITH PREVIOUS REPORTING PERIODS	COMMENTS
	CURRENT REPORTING PERIOD	PREVIOUS REPORTING PERIOD		
Colour	93	16	Increase of seventy seven complaints from previous reporting period.	The significant increase is attributed to the elevated Manganese levels resulted from the Blackwater event.
Taste & odour	26	10	Increase of sixteen complaints from previous reporting period.	The significant increase is attributed to the elevated organic carbon levels and other compounds as a result of the Blackwater event.
Blue water	0	0	No increase	
Alleged Illness	7	0	Increase of seven complaints from previous reporting period.	The increase is attributed to discolouration of the water, and elevated organic carbon levels that affected the taste and odour, which resulted from the Blackwater event.
Other	3	3	No increase	

Table 5B - types of complaints by water sampling locality

WATER SAMPLING LOCALITY	TYPE OF COMPLAINTS					TOTAL
	COLOUR	TASTE & ODOUR	BLUE WATER	ALLEGED SICKNESS	OTHER	
Mildura	67	15	0	6	1	89
Irymple	7	3	0	1	0	11
Merbein	0	5	0	0	1	6
Red Cliffs	10	0	0	0	0	10
Robinvale	3	0	0	0	0	3
Nyah	0	0	0	0	0	0
Nyah West	2	0	0	0	0	2
Woorinen	0	0	0	0	0	0
Piangil	0	0	0	0	0	0
Swan Hill	3	1	0	0	0	4
Lake Boga	0	1	0	0	0	1
Wakool	0	0	0	0	0	0
Koondrook	0	0	0	0	1	1
Murrabit	0	0	0	0	0	0
Kerang	1	1	0	0	0	2
Total	93	26	0	7	3	129

We systematically undertake mains cleaning programs that assist in improving water quality and reducing the number of complaints. During the blackwater event, we undertook additional treatment measures involving dosing of PAC at all 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.

Table 5C shows the types of water quality complaints, total water quality complaints received during 2016/2017 financial year and the number of complaints per 100 customers supplied.

Table 5C - water quality complaints

TYPE OF COMPLAINT	NO. OF COMPLAINTS	NO. OF COMPLAINTS PER 100 CUSTOMERS SUPPLIED
Discoloured water	93	0.273
Taste/odour	26	0.076
Blue water	0	0.000
Air in water	0	0.000
Alleged illness	7	0.021
Other	3	0.009

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 opportunities for improvements identified in the previous Safe Drinking Water Act audit conducted in June 2016, we have undertaken the following actions:

1. Developed a checklist to ensure that all requirements of the procedure for ordering and delivery of chemicals for our Water Treatment Plants, relevant to the receipt of chemical deliveries by plant operators are carried out on all occasions.
2. We have undertaken an extensive training program for operators based on a risk management approach and best practice guidelines. We have engaged the instrumentation suppliers to provide training to operators to ensure optimal operation and maintenance of the water quality instruments. In addition, our water treatment plant operators attend the Water Industry Operators Association conference, visit other water authorities WTPs and attend industry

based events in order to keep abreast of new technologies & innovations. We will continue to investigate opportunities for operator refreshing training.

As part of our commitment to understanding the latest water quality technological advances within the water industry, we participate in the Australian Water TAG forum and Intelligent Water Networks Program. The TAG forum provides an excellent platform to evaluate emerging technologies, share best practice and collaborate on technology trials and other projects.

3. We have revisited definition of the CCPs to ensure that it's in line with the ADWG, which resulted in transforming some of the Critical Control Points (CCPs) to process control points.
4. We have engaged the suppliers of the water quality instruments to carry out calibration and maintenance requirements, to ensure high level of accuracy, reduce instruments breakdowns and potential risks to water quality.



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 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.

We 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 all our customers who are connected to an untreated water supply including private diverters, advising that untreated water is not suitable for drinking, food preparation and bathing.
- 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 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

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. However, in 2013 we 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 182ML 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.

FURTHER INFORMATION

For further information regarding water quality information, please contact LMW directly on (03) 5051 3400

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	52	0	0	0
Kerang	Weekly	51*	0	0	0
Koondrook	Weekly	51*	0	0	0
Lake Boga	Weekly	52	0	0	0
Merbein	Weekly	52	1**	1**	0
Mildura	Weekly	116***	0	0	0
Murrabit	Weekly	51*	0	0	0
Nyah	Weekly	51	0	0	0
Nyah West	Weekly	52	0	0	0
Piangil	Weekly	52	0	0	0
Red Cliffs	Weekly	52	0	0	0
Robinvale	Weekly	52	0	0	0
Swan Hill	Weekly	76***	0	0	0
Woorinen Sth	Weekly	52	0	0	0

*Missing results for Kerang, Koondrook and Murrabit for samples taken 25/1/2017. Samples arrived at the contractor laboratory outside of the maximum holding period for microbiology testing. Protocols have been developed and implemented to prevent this re-occurring.

**A Section 22 notification and an investigation report were issued to DHHS for an *E.coli* detection at Merbein, sampled 1/5/2017. The detection was a false positive; further detail of the incident can be found on page 18.

***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	0.150	0.067	0
Kerang	Weekly	12	0.25	0.083	0.050	0
Koondrook	Weekly	12	0.25	0.110	0.059	0
Lake Boga	Weekly	12	0.25	0.160	0.070	0
Merbein	Weekly	12	0.25	0.200	0.087	0
Mildura	Weekly	12	0.25	0.180	0.067	0
Murrabit	Weekly	12	0.25	0.120	0.052	0
Nyah	Weekly	12	0.25	0.180	0.082	0
Nyah West	Weekly	12	0.25	0.160	0.071	0
Piangil	Weekly	12	0.25	0.140	0.058	0
Red Cliffs	Weekly	12	0.25	0.180	0.084	0
Robinvale	Weekly	12	0.25	0.190	0.070	0
Swan Hill	Weekly	12	0.25	0.099	0.045	0
Woorinen Sth	Weekly	12	0.25	0.150	0.070	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	1.8	0.3	0
Kerang	Weekly	52	0.6	0.2	0
Koondrook	Weekly	52	0.4	0.2	0
Lake Boga	Weekly	52	0.2	0.1	0
Merbein	Weekly	52	3.1	0.4	0
Mildura	Weekly	52	6.1	0.6	0
Murrabit	Weekly	52	0.5	0.2	0
Nyah	Weekly	52	0.2	0.1	0
Nyah West	Weekly	52	0.2	0.1	0
Piangil	Weekly	52	0.5	0.2	0
Red Cliffs	Weekly	52	0.5	0.2	0
Robinvale	Weekly	52	0.4	0.2	0
Swan Hill	Weekly	52	0.2	0.1	0
Woorinen Sth	Weekly	51*	1.7	0.2	0

*Missed sample due to contractor error

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	Weekly	12	1.5	0.8	0.74	0.50	0
Kerang	Weekly	13	1.5	0.8	0.76	0.44	0
Lake Boga	Weekly	12	1.5	0.8	0.97	0.37	0
Merbein	Weekly	12	1.5	0.8	0.82	0.65	0
Mildura	Weekly	12	1.5	0.8	0.81	0.50	0
Nyah	Weekly	12	1.5	0.8	0.82	0.41	
Nyah West	Weekly	12	1.5	0.8	0.79	0.39	0
Red Cliffs	Weekly	12	1.5	0.8	0.74	0.43	0
Robinvale	Weekly	12	1.5	0.8	0.89	0.77	0
Swan Hill	Weekly	12	1.5	0.8	0.92	0.34	
Woorinen Sth	Weekly	13	1.5	0.8	0.83	0.37	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.

Tables 5 to 38 inclusive are results reporting against the Australian Drinking Water Guidelines 2011 (ADWG), health & aesthetic guidelines.

Tables 9 to 20 & 35 to 41, inclusive, are entering reticulation samples at the treatment plants, these are indicative of the levels within the respective reticulations. These tables have 6 samples reported for the Mildura supply as both the Mildura & Mildura West WTP's were operating simultaneously for two of the quarterly sampling events.

Tables 9 to 16 inclusive, which have 6 monthly scheduling, have additional results as an extra round of testing was performed in February 2017, 5 samples are reported for Mildura supply as both the Mildura & Mildura West WTP's were operating simultaneously for two of the 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.

**Table 5 Chloroacetic Acid
Health Guideline Value (ADWG) 0.15 mg/L**

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM mg/L	MET ADWG GUIDELINE VALUE (YES/NO)
Irymple	Weekly	12	<0.005	Yes
Kerang	Weekly	12	<0.005	Yes
Koondrook	Weekly	12	<0.005	Yes
Lake Boga	Weekly	12	<0.005	Yes
Merbein	Weekly	12	<0.005	Yes
Mildura	Weekly	12	<0.005	Yes
Murrabit	Weekly	12	<0.005	Yes
Nyah	Weekly	12	<0.005	Yes
Nyah West	Weekly	12	<0.005	Yes
Piangil	Weekly	12	<0.005	Yes
Red Cliffs	Weekly	12	<0.005	Yes
Robinvale	Weekly	12	<0.005	Yes
Swan Hill	Weekly	12	<0.005	Yes
Woorinen Sth	Weekly	12	<0.005	Yes

**Table 6 Dichloroacetic 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	Weekly	12	0.025	Yes
Kerang	Weekly	12	0.030	Yes
Koondrook	Weekly	12	0.036	Yes
Lake Boga	Weekly	12	0.030	Yes
Merbein	Weekly	12	0.019	Yes
Mildura	Weekly	12	0.036	Yes
Murrabit	Weekly	12	0.036	Yes
Nyah	Weekly	12	0.021	Yes
Nyah West	Weekly	12	0.017	Yes
Piangil	Weekly	12	0.040	Yes
Red Cliffs	Weekly	12	0.043	Yes
Robinvale	Weekly	12	0.026	Yes
Swan Hill	Weekly	12	0.025	Yes
Woorinen Sth	Weekly	12	0.020	Yes

**Table 7 Trichloroacetic 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	Weekly	12	0.046	Yes
Kerang	Weekly	12	0.031	Yes
Koondrook	Weekly	12	0.051	Yes
Lake Boga	Weekly	12	0.041	Yes
Merbein	Weekly	12	0.048	Yes
Mildura	Weekly	12	0.046	Yes
Murrabit	Weekly	12	0.047	Yes
Nyah	Weekly	12	0.054	Yes
Nyah West	Weekly	12	0.047	Yes
Piangil	Weekly	12	0.048	Yes
Red Cliffs	Weekly	12	0.061	Yes
Robinvale	Weekly	12	0.057	Yes
Swan Hill	Weekly	12	0.036	Yes
Woorinen Sth	Weekly	12	0.047	Yes

**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	MET ADWG GUIDELINE VALUE (YES/NO)
Irymple	Weekly	12	0.10	Yes
Kerang	Weekly	12	0.05	Yes
Koondrook	Weekly	12	0.11	Yes
Lake Boga	Weekly	12	0.12	Yes
Merbein	Weekly	12	0.10	Yes
Mildura	Weekly	12	0.17	Yes
Murrabit	Weekly	12	0.14	Yes
Nyah	Weekly	12	0.02	Yes
Nyah West	Weekly	12	0.02	Yes
Piangil	Weekly	12	0.84	Yes
Red Cliffs	Weekly	12	0.16	Yes
Robinvale	Weekly	12	0.04	Yes
Swan Hill	Weekly	12	0.13	Yes
Woorinen Sth	Weekly	12	0.13	Yes

**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)
Kerang	6 Monthly	3	<0.01	Yes
Koondrook	6 Monthly	3	<0.01	Yes
Mildura	6 Monthly	5	<0.01	Yes
Murrabit	6 Monthly	3	<0.01	Yes
Piangil	6 Monthly	3	<0.01	Yes
Red Cliffs	6 Monthly	3	<0.01	Yes
Robinvale	6 Monthly	3	<0.01	Yes
Swan Hill	6 Monthly	3	<0.01	Yes

**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)
Kerang	6 Monthly	3	<0.001	Yes
Koondrook	6 Monthly	3	<0.001	Yes
Mildura	6 Monthly	5	<0.001	Yes
Murrabit	6 Monthly	3	<0.001	Yes
Piangil	6 Monthly	3	<0.001	Yes
Red Cliffs	6 Monthly	3	<0.001	Yes
Robinvale	6 Monthly	3	<0.001	Yes
Swan Hill	6 Monthly	3	<0.001	Yes

**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)
Kerang	6 Monthly	3	<0.001	Yes
Koondrook	6 Monthly	3	<0.001	Yes
Mildura	6 Monthly	5	<0.001	Yes
Murrabit	6 Monthly	3	<0.001	Yes
Piangil	6 Monthly	3	<0.001	Yes
Red Cliffs	6 Monthly	3	<0.001	Yes
Robinvale	6 Monthly	3	<0.001	Yes
Swan Hill	6 Monthly	3	<0.001	Yes

**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)
Kerang	6 Monthly	3	<0.001	Yes
Koondrook	6 Monthly	3	<0.001	Yes
Mildura	6 Monthly	5	<0.001	Yes
Murrabit	6 Monthly	3	<0.001	Yes
Piangil	6 Monthly	3	<0.001	Yes
Red Cliffs	6 Monthly	3	<0.001	Yes
Robinvale	6 Monthly	3	<0.001	Yes
Swan Hill	6 Monthly	3	<0.001	Yes

**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)
Kerang	6 Monthly	3	<0.0001	Yes
Koondrook	6 Monthly	3	<0.0001	Yes
Mildura	6 Monthly	5	<0.0001	Yes
Murrabit	6 Monthly	3	<0.0001	Yes
Piangil	6 Monthly	3	<0.0001	Yes
Red Cliffs	6 Monthly	3	<0.0001	Yes
Robinvale	6 Monthly	3	<0.0001	Yes
Swan Hill	6 Monthly	3	<0.0001	Yes

**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)
Kerang	6 Monthly	3	<0.001	Yes
Koondrook	6 Monthly	3	<0.001	Yes
Mildura	6 Monthly	5	<0.001	Yes
Murrabit	6 Monthly	3	<0.001	Yes
Piangil	6 Monthly	3	<0.001	Yes
Red Cliffs	6 Monthly	3	<0.001	Yes
Robinvale	6 Monthly	3	<0.001	Yes
Swan Hill	6 Monthly	3	<0.001	Yes

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)
Kerang	6 Monthly	3	<0.001	Yes
Koondrook	6 Monthly	3	<0.001	Yes
Mildura	6 Monthly	5	<0.001	Yes
Murrabit	6 Monthly	3	<0.001	Yes
Piangil	6 Monthly	3	<0.001	Yes
Red Cliffs	6 Monthly	3	<0.001	Yes
Robinvale	6 Monthly	3	<0.001	Yes
Swan Hill	6 Monthly	3	<0.001	Yes

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)
Kerang	6 Monthly	3	<0.001	Yes
Koondrook	6 Monthly	3	<0.001	Yes
Mildura	6 Monthly	5	<0.001	Yes
Murrabit	6 Monthly	3	<0.001	Yes
Piangil	6 Monthly	3	<0.001	Yes
Red Cliffs	6 Monthly	3	<0.001	Yes
Robinvale	6 Monthly	3	<0.001	Yes
Swan Hill	6 Monthly	3	<0.001	Yes

Table 17 Sulphate
Aesthetic Guideline Value (ADWG) 250 mg/L

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM mg/L	MET ADWG GUIDELINE VALUE (YES/NO)
Kerang	3 Monthly	4	63	Yes
Koondrook	3 Monthly	4	67	Yes
Mildura	3 Monthly	6	57	Yes
Murrabit	3 Monthly	4	3	Yes
Piangil	3 Monthly	4	62	Yes
Red Cliffs	3 Monthly	4	61	Yes
Robinvale	3 Monthly	4	89	Yes
Swan Hill	3 Monthly	4	11	Yes

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)
Kerang	3 Monthly	4	<0.001	Yes
Koondrook	3 Monthly	4	<0.001	Yes
Mildura	3 Monthly	6	<0.001	Yes
Murrabit	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

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)
Kerang	3 Monthly	4	<0.001	Yes
Koondrook	3 Monthly	4	<0.001	Yes
Mildura	3 Monthly	6	<0.001	Yes
Murrabit	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

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)
Kerang	3 Monthly	4	<0.0001	Yes
Koondrook	3 Monthly	4	<0.0001	Yes
Mildura	3 Monthly	6	<0.0001	Yes
Murrabit	3 Monthly	4	<0.0001	Yes
Piangil	3 Monthly	4	<0.0001	Yes
Red Cliffs	3 Monthly	4	<0.0001	Yes
Robinvale	3 Monthly	4	<0.0001	Yes
Swan Hill	3 Monthly	4	<0.0001	Yes

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)
Kerang	5 yearly	1	<0.0001	Yes
Koondrook	5 yearly	1	<0.0001	Yes
Mildura	5 yearly	2	<0.0001	Yes
Murrabit	5 yearly	1	<0.0001	Yes
Piangil	5 yearly	1	<0.0001	Yes
Red Cliffs	5 yearly	1	<0.0001	Yes
Robinvale	5 yearly	1	<0.0001	Yes
Swan Hill	5 yearly	1	<0.0001	Yes

Table 22 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)
Kerang	5 yearly	1	<0.1	Yes
Koondrook	5 yearly	1	<0.1	Yes
Mildura	5 yearly	2	<0.1	Yes
Murrabit	5 yearly	1	<0.1	Yes
Piangil	5 yearly	1	<0.1	Yes
Red Cliffs	5 yearly	1	<0.1	Yes
Robinvale	5 yearly	1	<0.1	Yes
Swan Hill	5 yearly	1	<0.1	Yes

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 Sth	3 Monthly	4	<0.001	Yes

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	0.002	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	0.002	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	0.002	Yes
Red Cliffs	3 Monthly	4	0.002	Yes
Robinvale	3 Monthly	4	0.001	Yes
Swan Hill	3 Monthly	4	<0.001	Yes
Woorinen Sth	3 Monthly	4	0.001	Yes

Table 25 Zinc**Aesthetic Guideline Value (ADWG) 3 mg/L**

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM mg/L	MET ADWG GUIDELINE VALUE (YES/NO)
Irymple	3 Monthly	4	0.011	Yes
Kerang	3 Monthly	4	0.017	Yes
Koondrook	3 Monthly	4	0.032	Yes
Lake Boga	3 Monthly	4	0.013	Yes
Merbein	3 Monthly	4	0.012	Yes
Mildura	3 Monthly	4	0.009	Yes
Murrabit	3 Monthly	4	0.019	Yes
Nyah	3 Monthly	4	0.020	Yes
Nyah West	3 Monthly	4	0.026	Yes
Piangil	3 Monthly	4	0.009	Yes
Red Cliffs	3 Monthly	4	0.077	Yes
Robinvale	3 Monthly	4	0.010	Yes
Swan Hill	3 Monthly	4	0.008	Yes
Woorinen Sth	3 Monthly	4	0.025	Yes

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	MET ADWG GUIDELINE VALUE (YES/NO)
Irymple	3 Monthly	4	0.44	Yes
Kerang	3 Monthly	4	0.35	Yes
Koondrook	3 Monthly	4	0.30	Yes
Lake Boga	3 Monthly	4	0.32	Yes
Merbein	3 Monthly	4	0.45	Yes
Mildura	3 Monthly	4	0.46	Yes
Murrabit	3 Monthly	4	0.09	Yes
Nyah	3 Monthly	4	0.17	Yes
Nyah West	3 Monthly	4	0.19	Yes
Piangil	3 Monthly	4	0.32	Yes
Red Cliffs	3 Monthly	4	0.49	Yes
Robinvale	3 Monthly	4	0.47	Yes
Swan Hill	3 Monthly	4	0.26	Yes
Woorinen Sth	3 Monthly	4	0.22	Yes

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)
Irymple	3 Monthly	4	<0.005	Yes
Kerang	3 Monthly	4	<0.005	Yes
Koondrook	3 Monthly	4	<0.005	Yes
Lake Boga	3 Monthly	4	<0.005	Yes
Merbein	3 Monthly	4	<0.005	Yes
Mildura	3 Monthly	4	<0.005	Yes
Murrabit	3 Monthly	4	<0.005	Yes
Nyah		4	<0.005	Yes
Nyah West	3 Monthly	4	<0.005	Yes
Piangil	3 Monthly	4	<0.005	Yes
Red Cliffs	3 Monthly	4	<0.005	Yes
Robinvale	3 Monthly	4	<0.005	Yes
Swan Hill	3 Monthly	4	<0.005	Yes
Woorinen Sth	3 Monthly	4	<0.005	Yes

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)
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 Sth	3 Monthly	4	<0.001	Yes

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 Sth	3 Monthly	4	<0.0002	Yes

Table 30 Copper
Health Guideline Value (ADWG) 2 mg/L

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM mg/L	MET ADWG GUIDELINE VALUE (YES/NO)
Irymple	3 Monthly	4	0.005	Yes
Kerang	3 Monthly	4	0.007	Yes
Koondrook	3 Monthly	4	0.021	Yes
Lake Boga	3 Monthly	4	0.034	Yes
Merbein	3 Monthly	4	0.013	Yes
Mildura	3 Monthly	4	0.005	Yes
Murrabit	3 Monthly	4	0.015	Yes
Nyah	3 Monthly	4	0.054	Yes
Nyah West	3 Monthly	4	0.065	Yes
Piangil	3 Monthly	4	0.014	Yes
Red Cliffs	3 Monthly	4	0.013	Yes
Robinvale	3 Monthly	4	0.030	Yes
Swan Hill	3 Monthly	4	0.031	Yes
Woorinen Sth	3 Monthly	4	0.008	Yes

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)
Irymple	3 Monthly	4	0.029	Yes
Kerang	3 Monthly	4	0.140	Yes
Koondrook	3 Monthly	4	0.056	Yes
Lake Boga	3 Monthly	4	0.008	Yes
Merbein	3 Monthly	4	0.010	Yes
Mildura	3 Monthly	4	0.023	Yes
Murrabit	3 Monthly	4	0.006	Yes
Nyah	3 Monthly	4	0.005	Yes
Nyah West	3 Monthly	4	0.005	Yes
Piangil	3 Monthly	4	0.071	Yes
Red Cliffs	3 Monthly	4	0.082	Yes
Robinvale	3 Monthly	4	0.130	Yes
Swan Hill	3 Monthly	4	0.002	Yes
Woorinen Sth	3 Monthly	4	0.007	Yes

Table 32 pH
Aesthetic Guideline Range (ADWG) 6.5-8.5 pH Units

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MIN PH UNITS	MAX PH UNITS	MET ADWG GUIDELINE VALUE (YES/NO)
Irymple	Weekly	52	7.7	6.9	6.5-8.5
Kerang	Weekly	52	7.5	7.0	6.5-8.5
Koondrook	Weekly	52	8.4	6.6	6.5-8.5
Lake Boga	Weekly	52	9.1*	6.8	6.5-8.5
Merbein	Weekly	52	7.7	7.0	6.5-8.5
Mildura	Weekly	52	7.6	6.8	6.5-8.5
Murrabit	Weekly	52	7.4	6.9	6.5-8.5
Nyah	Weekly	52	7.3	6.8	6.5-8.5
Nyah West	Weekly	52	7.5	6.9	6.5-8.5
Piangil	Weekly	52	8.0	6.7	6.5-8.5
Red Cliffs	Weekly	52	7.7	7.2	6.5-8.5
Robinvale	Weekly	52	7.7	7.2	6.5-8.5
Swan Hill	Weekly	52	7.6	6.8	6.5-8.5
Woorinen Sth	Weekly	51**	7.4	6.9	6.5-8.5

*Lake Boga sample taken 21/2/2017 had a pH of 9.1. Further details into investigation can be found on page 15 of the report.

** Sample collected but not analysed due to contractor error

Table 33 Colour

Aesthetic Guideline Value (ADWG) 15 HU*

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM Pt/Co	MET ADWG GUIDELINE VALUE (YES/NO)
Irymple	Monthly	12	6	Yes
Kerang	Monthly	12	4	Yes
Koondrook	Monthly	12	10	Yes
Lake Boga	Monthly	12	4	Yes
Merbein	Monthly	12	6	Yes
Mildura	Monthly	12	6	Yes
Murrabit	Monthly	12	4	Yes
Nyah	Monthly	12	2	Yes
Nyah West	Monthly	12	2	Yes
Piangil	Monthly	12	2	Yes
Red Cliffs	Monthly	12	8	Yes
Robinvale	Monthly	12	2	Yes
Swan Hill	Monthly	12	4	Yes
Woorinen Sth	Monthly	12	4	Yes

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)
Irymple	3 Monthly	4	0.06	Yes
Kerang	3 Monthly	4	0.01	Yes
Koondrook	3 Monthly	4	0.02	Yes
Lake Boga	3 Monthly	4	<0.01	Yes
Merbein	3 Monthly	4	0.05	Yes
Mildura	3 Monthly	4	0.05	Yes
Murrabit	3 Monthly	4	0.01	Yes
Nyah	3 Monthly	4	0.02	Yes
Nyah West	3 Monthly	4	<0.01	Yes
Piangil	3 Monthly	4	0.01	Yes
Red Cliffs	3 Monthly	4	<0.01	Yes
Robinvale	3 Monthly	4	<0.01	Yes
Swan Hill	3 Monthly	4	0.01	Yes
Woorinen Sth	3 Monthly	4	<0.01	Yes

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

Table 35 Hardness

Aesthetic Guideline Value (ADWG) 200 mg/L (as CaCO₃)

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM CaCO ₃	MET ADWG GUIDELINE VALUE (YES/NO)
Kerang	3 Monthly	4	57	Yes
Koondrook	3 Monthly	4	26	Yes
Mildura	3 Monthly	6	95	Yes
Murrabit	3 Monthly	4	35	Yes
Piangil	3 Monthly	4	44	Yes
Red Cliffs	3 Monthly	4	42	Yes
Robinvale	3 Monthly	4	43	Yes
Swan Hill	3 Monthly	4	54	Yes

Table 36 Chloride

Aesthetic Guideline Value (ADWG) 250 mg/L

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM mg/L	MET ADWG GUIDELINE VALUE (YES/NO)
Kerang	3 Monthly	4	25	Yes
Koondrook	3 Monthly	4	17	Yes
Mildura	3 Monthly	6	33	Yes
Murrabit	3 Monthly	4	21	Yes
Piangil	3 Monthly	4	38	Yes
Red Cliffs	3 Monthly	4	31	Yes
Robinvale	3 Monthly	4	23	Yes
Swan Hill	3 Monthly	4	62	Yes

Table 37 Sodium
Aesthetic Guideline Value (ADWG) 180 mg/L

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM mg/L	MET ADWG GUIDELINE VALUE (YES/NO)
Kerang	3 Monthly	4	37	Yes
Koondrook	3 Monthly	4	33	Yes
Mildura	3 Monthly	6	31	Yes
Murrabit	3 Monthly	4	9.9	Yes
Piangil	3 Monthly	4	41	Yes
Red Cliffs	3 Monthly	4	36	Yes
Robinvale	3 Monthly	4	70	Yes
Swan Hill	3 Monthly	4	32	Yes

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

WATER SAMPLING LOCALITY	FREQUENCY OF SAMPLING	NUMBER OF SAMPLES	MAXIMUM $\mu\text{S}/\text{cm}$	MET ADWG GUIDELINE VALUE (YES/NO)
Kerang	3 Monthly	4	280	Yes
Koondrook	3 Monthly	4	240	Yes
Mildura	3 Monthly	6	290	Yes
Murrabit	3 Monthly	4	140	Yes
Piangil	3 Monthly	4	330	Yes
Red Cliffs	3 Monthly	4	290	Yes
Robinvale	3 Monthly	4	440	Yes
Swan Hill	3 Monthly	4	300	Yes

*Total dissolved solids 600 mg/L

Table 39 Calcium
No Guideline Value

WATER SAMPLING LOCALITY	FREQ. OF SAMPLING	NO. OF SAMPLES	MAX mg/L
Kerang	3 Monthly	4	18.0
Koondrook	3 Monthly	4	5.2
Mildura	3 Monthly	6	30.0
Murrabit	3 Monthly	4	6.3
Piangil	3 Monthly	4	7.8
Red Cliffs	3 Monthly	4	8.5
Robinvale	3 Monthly	4	8.9
Swan Hill	3 Monthly	4	9.1

Table 40 Alkalinity (as CaCO_3)
No Guideline Value

WATER SAMPLING LOCALITY	FREQ. OF SAMPLING	NO. OF SAMPLES	MAX CaCO_3
Kerang	3 Monthly	4	33
Koondrook	3 Monthly	4	24
Mildura	3 Monthly	6	47
Murrabit	3 Monthly	4	38
Piangil	3 Monthly	4	34
Red Cliffs	3 Monthly	4	35
Robinvale	3 Monthly	4	90
Swan Hill	3 Monthly	4	50

Table 41 Magnesium
No Guideline Value

WATER SAMPLING LOCALITY	FREQ. OF SAMPLING	NO. OF SAMPLES	MAX mg/L
Kerang	3 Monthly	4	4.2
Koondrook	3 Monthly	4	3.3
Mildura	3 Monthly	6	5.2
Murrabit	3 Monthly	4	4.6
Piangil	3 Monthly	4	5.9
Red Cliffs	3 Monthly	4	5.0
Robinvale	3 Monthly	4	5.0
Swan Hill	3 Monthly	4	7.7



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