WESTERN WATER

2020-21

Drinking Water Quality Report

Acknowledgement of Country

Greater Western Water respectfully acknowledges the Traditional Owners of the lands and waters upon which we work and operate. We pay our deepest respects to the traditional custodians past, present and future. We acknowledge the continued cultural, social and spiritual connections that First Nations people have with the lands and waters and recognise and value that the Traditional Owner groups have cared for and protected them for thousands of generations. We will further develop our partnership with the Traditional Owner groups to ensure their contributions to the future of the water management landscape and to maintain their cultural and spiritual connection.

Introductory Note

In October 2020, the Minister of Water Lisa Neville, Chair of Western Water Andrew Cairns and Chair of City West Water David Middleton announced the integration of Western Water and City West Water to form Greater Western Water effective 1 July 2021. The formation of Greater Western Water has been identified as the best way to cater for population growth in the west while continuing supplying high quality, affordable water services.

The new trading name for the integrated entity is Greater Western Water (GWW). In accordance with the Ministerial determinations, GWW is making two annual drinking water quality reports: (1) this 2020-21 report, the last report for Western Water, and (2) a separate 2020-21 report for City West Water. Future drinking water quality reports will be made by GWW.

This document is available on our website:

gww.com.au

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Foreword from the Managing Director

On behalf of Greater Western Water, I am pleased to present this final Drinking Water Quality annual report for Western Water.

This report updates customers and community on details of the quality of drinking water that we supplied throughout the former Western Water service area, which encompasses large parts of metropolitan Melbourne's western and northern growth areas and towns to the north and west of Melbourne. This report addresses the 12-month period from 1 July 2020 to 30 June 2021.

This report describes the sources of our drinking water and how it is treated so that it is safe to consume. It reports on the quality of water supplied to our customers against relevant standards and guideline values.

I am pleased to report that independent chemical and microbial testing showed that the quality of our drinking water supply continued to meet the standards in Victoria's *Safe Drinking Water Act 2003* and Safe Drinking Water Regulations 2015, as well as Australian Drinking Water Guidelines 2011 (National Health and Medical Research Council of Australia).

Our drinking water quality management processes are endorsed through a consistent history of successfully retaining drinking water risk management certification and compliance of our water quality Risk Management Plan with Victoria's *Safe Drinking Water Act 2003*.

The Western Water annual customer satisfaction survey for 2020-21 indicated a water quality satisfaction level among our residential and non-residential customers of 86 per cent and 85 per cent respectively. The feedback provided in this survey is used to drive continuous improvement initiatives.

Regarding the coronavirus (COVID-19) pandemic, there is no evidence that drinking water was or will be affected by coronavirus or that it is transmitted by drinking water.

In October 2020, the Minister of Water Lisa Neville, Chair of Western Water Andrew Cairns and Chair of City West Water David Middleton announced the integration of Western Water and City West Water to form Greater Western Water effective 1 July 2021. The formation of Greater Western Water has been identified as the best way to cater for population growth in the west while continuing supplying high quality, affordable water services.

Greater Western Water is committed to reliably providing high quality, safe drinking water to all our customers and community across our expanded service area.

Maree Lang
Managing Director
Greater Western Water

Becoming Greater Western Water

On 1 July 2021, Greater Western Water became the new water corporation for Melbourne's CBD and north-western region. Greater Western Water was formed by bringing together the areas previously serviced by Western Water and City West Water.

Greater Western Water builds on the excellent work and rich legacies of these two organisations and provides for a secure, sustainable and prosperous future for the region, its customers and people. It draws on the history and deep knowledge of the region that Western Water and City West Water people have built over decades.

Since the formation of Greater Western Water was announced in October 2020, a three-year program of work commenced to manage the integration. This work is ensuring a smooth transition, where customers experience continuity of service and our people work together to create a new organisation with one culture. Through the integration work and beyond, our aim is to be an organisation that represents leading practice and exemplary governance.

A Joint Transition Committee oversaw the integration work, chaired by leading water sector expert, Cheryl Batagol, with members from both organisations' boards and support from the Department of Environment, Land, Water and Planning (DELWP). A Joint Steering Committee, which comprised executives from Western Water and City West Water, provided transition oversight and guidance and approved key decisions. A Joint Transition Office, a collaborative project team made up by employees from both businesses, managed the transition and delivered a detailed program of works in preparation for 1 July 2021. A Program Assurance Advisor and Integration Advisor, both external to Greater Western Water, provided support and confidence in governance and approach.

In the lead up to 1 July 2021, we aligned the information and messaging in our customer communications and created engagement opportunities to ask our community what they want from their new water corporation. We also worked together to create awareness of Greater Western Water and sought feedback on the Greater Western Water brand, proposed prices, customer charters and permanent water saving plan. We will continue to focus on aligning customer experiences and consolidating and evolving policies and plans.

Western Water

In 2020-21, Western Water provided drinking water, recycled water and sewerage services to 80,721 properties across a region of 3,000 square kilometres to the north-west of Melbourne.

Serviced properties grew by 5.9% during 2020-21 – particularly within the new residential estates in and around Melton, Sunbury and Bacchus Marsh. Average property growth rates over the next ten years are expected to exceed 4.6% per annum.

With an average of 2.6 people per household, the service region's population is calculated at 191,420 – up from 183,715 reported last financial year.

2020-21 Highlights

- Safely delivered 16 billion litres of drinking water to 80,721 properties.
- Increased the size of our network by 84km of drinking water and recycled water pipework.
- Passed the Department of Health (DH) biennial drinking water quality risk management plan audit.
- Increased the proportion of local water sourced to 27% of all drinking water supplied, compared to 22% last year.
- Fully complied with the requirements of the *Safe Drinking Water Act 2003* and the drinking water quality standards specified in the Safe Drinking Water Regulations 2015 (SDWR) across the distribution network.
- Engaged with thousands of customers in the development of Western Water's Price Submission 2020-23.
- Continued collaboration with the Intelligent Water Network, trialing new technologies to improve water system management.
- Continued to provide essential water supply services to customers during the coronavirus pandemic.

Table 1: Drinking water supply system – 2019-20 vs 2020-21

	2019-20	2020-21
Connected water customers	72,286	80,721
Residential	68,886	77,165
Non-residential	3,400	3556
Water consumption (ML)	16,143	16,228
Residential	12,257	12,893
Non-residential	2,421	2,161
Water losses	1,465	1,174
Water filtration plants	7	7
Water mains* (km)	2,394	2,478

* Total includes recycled water mains

Manner of establishment and responsible Minister

Established under the *Water Act 1989*, Western Region Water Corporation (trading as Western Water) was one of Victoria's 13 regional urban water corporations.

The responsible Minister for the reporting period, 1 July 2020 to 30 June 2021, was the Hon. Lisa Neville MP, Minister for Water. Western Water is responsible to the Minister for Water via the Department of Environment, Land, Water and Planning (DELWP). The Department of Treasury and Finance also has a shareholder governance role.

The Department of Health (DH) regulates drinking water quality standards, while the Environment Protection Authority (EPA) governs environmental standards, particularly for wastewater discharge, recycled water and biosolids management.

The Essential Services Commission (ESC), the Victorian Government's economic regulator for essential utility services, regulates Western Water's prices, service standards and market conduct. The Energy and Water Ombudsman Victoria receives, investigates and resolves escalated enquiries and complaints against electricity and water suppliers across Victoria.

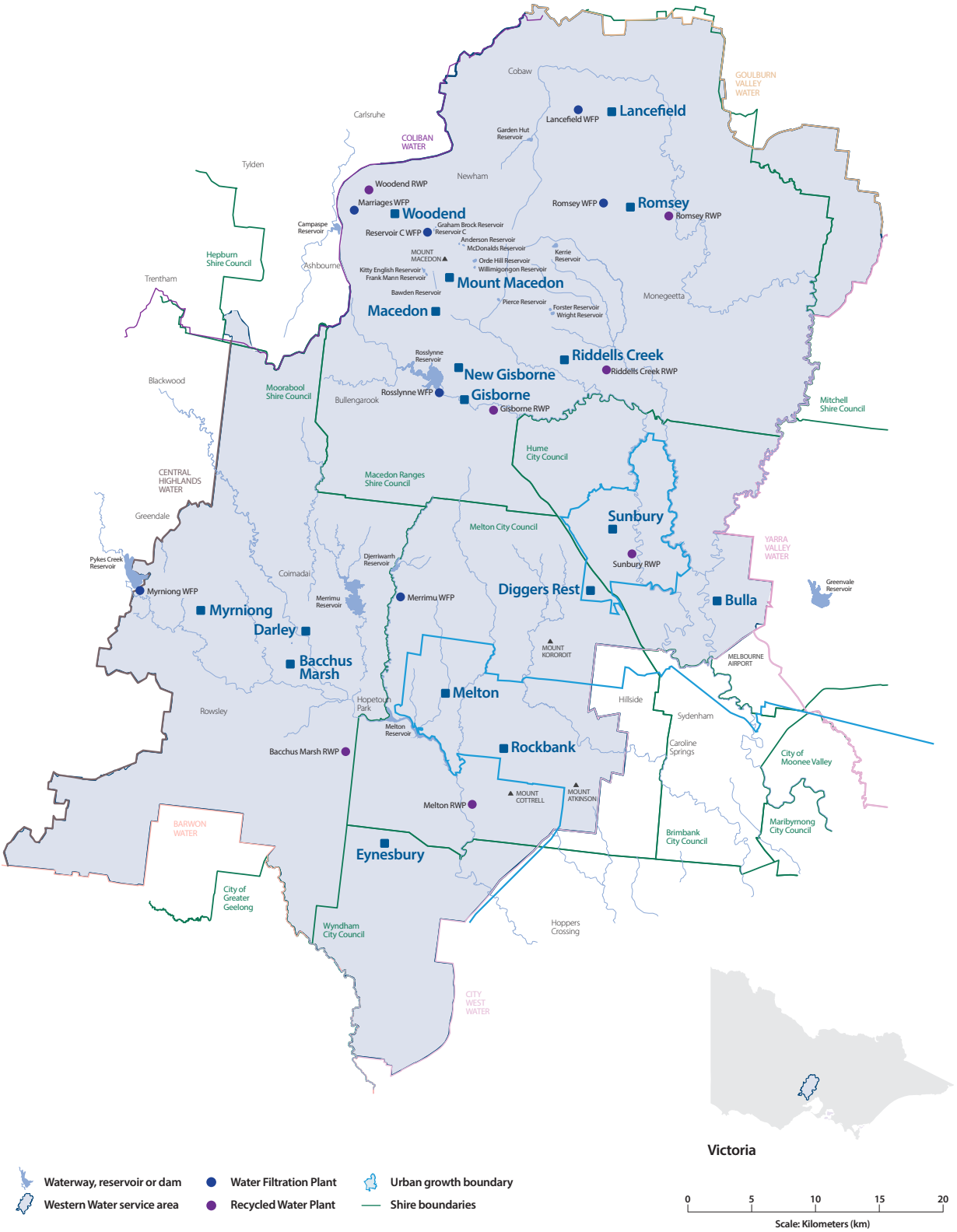
Drinking water regulations

Victoria's *Safe Drinking Water Act 2003* and Safe Drinking Water Regulations 2015, which provide a comprehensive regulatory framework for the provision of drinking water to customers have been applied by Western Water.

The framework encompasses a risk-based approach to the management of drinking water from water catchment to the customer's tap, with linkages to the Australian Drinking Water Guidelines 2011 (AWDG) where applicable.

The DH Water Unit in the Health Protection Branch of the department is responsible for administering the drinking water regulatory framework.

Figure 2: Service area map



1. Commitment to drinking water management

Western Water closely monitored the quality of drinking water supplied to ensure compliance with standards set out in the Safe Drinking Water Regulations 2015. Other industry guidelines associated with health and aesthetics of drinking water including the ADWG have also been adopted. Together, these are used to set the physical, chemical, radiological and microbiological performance targets ensuring our water quality targets are more than adequate.

Drinking water policy

Western Water's Drinking Water Policy, contained in Appendix 1, reflects the current practice in the delivery of safe drinking water, with procedures and initiatives to support policy implementation. This includes the continual application of the Drinking Water Quality Management System (DWQMS), and associated Hazard Analysis Critical Control Point (HACCP) Plans to manage and protect water quality.

The policy also outlines our aim to continuously improve processes and meet the requirements of the *Safe Drinking Water Act 2003* and subordinate legislation. Copies of the policy are displayed on noticeboards in the Sunbury office and at all water filtration plants (WFPs) and is included in inductions for new staff.

Implementation

Western Water implemented this policy through:

- application of the DWQMS
- delivery of strategic planning actions and initiatives
- communicating policy content and intent to our employees, customers and stakeholders
- educating customers and stakeholders on use of water as a precious resource
- maintaining a high standard of asset management practices
- undertaking regulatory audits, certification audits and internal audits.

Regulatory and formal requirements

Western Water maintained a register of regulatory and other formal requirements for the delivery of drinking water through the DWQMS (refer to the full list in Appendix 2). This includes Federal and Victorian legislation, codes of practice, standards, service level agreements, contracts and operating agreements that are relevant to the delivery of safe drinking water.

Responsibilities in relation to drinking water are understood by referencing the above regulatory and formal requirements in applicable policies, procedures, work instructions, position descriptions and individual performance reviews. A review of requirements is conducted periodically by Western Water's HACCP team to ensure changes are reflected throughout all systems. This HACCP system was audited during the reporting period, validating our multi-barrier approach to protecting drinking water quality.

Engaging stakeholders

A consultative and collaborative approach was undertaken with all Western Water stakeholders in the provision of a sustainable, resilient water service. The engagement of customers, the community and other stakeholders in our integrated water management approach identified uses for the full range of water resources.

Community and stakeholder engagement

Western Water built positive, cooperative relationships with all stakeholders who have the potential to either affect or be affected by our operations. These are included in the current version of the corporation's emergency contact list.

Western Water had an online customer panel of almost 40,000 members. They are kept well informed of water quality issues and changes and, when required, participate in consultation and engagement opportunities. Water Matters was an online Have Your Say consultation site, which extended engagement opportunities to customers, the wider community and stakeholders.

Major external stakeholders included regulatory bodies such as DH, EPA, DELWP and the ESC as well as suppliers, Melbourne Water and Southern Rural Water (SRW). These organisations were actively engaged through regular meetings and/or reports. Other significant external stakeholders are those contractors who provide analytical services or water treatment chemical supplies.

Internal stakeholders including management, office, plant and field workers were engaged regularly through the HACCP team and the monthly reporting program.

2. Assessment of the drinking water supply system

Water supply system analysis

Western Water addressed multiple challenges to provide our customers with quality drinking water. One of the most significant challenges we have faced in the past two decades has been ensuring water supply security. The impact of the Millennium Drought, combined with long term, sustained population growth, resulted in significant demand for water from dwindling local supplies. As a result, Western Water became reliant on water sourced from Melbourne's water system.

Our Integrated Water Management Strategy ensured long-term sustainability of water supplies in the region, while the connection to the Melbourne supply system will remain critical for supply security.

Currently the major towns of Sunbury and Melton are being supplied with Melbourne water while Bacchus Marsh and towns in the Macedon Ranges are receiving locally sourced supplies. This year, 73% of drinking water supplied in Western Water's service area was sourced from the Melbourne system. A return to average rainfall has increased local reservoir levels to a combined total of 52% of capacity.

Water supply system

Western Water utilises a cross-disciplinary team to develop the risk assessment of water supply systems including office and plant staff. Where significant changes to risks are identified, the assessment process is assisted by external consultants.

Flow diagrams have been constructed of all water supply systems and are checked periodically to ensure they reflect actual system arrangements. The DWQMS includes key documentation developed from assessment and analysis of water supply systems with a periodic review of water supply systems.

Water sampling localities

There are eight water supply systems in Western Water's region:

- Rosslynne
- Sunbury
- Melton
- Merrimu
- Romsey
- Lancefield
- Woodend
- Myrniong.

For water quality monitoring, these supply systems are divided into 19 water sampling localities, formally published by DH in the Government Gazette. Each locality is determined by the origin of the water, the location of treatment and storage facilities, and the associated delivery system. These localities form the basis of our water sampling program.

Table 2: Residential population by water sampling locality and town – 2019-20 vs 2020-21

		Residential population[2]	
Water sampling locality	**Towns[1]**	**2019-20**	**2020-21**
Bulla	Bulla, Oaklands Junction	700	790
Darley	Darley, Pentland Hills	9,060	8,890
Diggers Rest	Diggers Rest	5,820	5,850
Eynesbury	Eynesbury	2,490	2,540
Gisborne	Gisborne, New Gisborne, Bullengarook	11,390	12,001
Lancefield	Lancefield	2,330	2,450
Lerderderg	Bacchus Marsh, Coimadai,	9,590	9,890
Macedon	Macedon	1,710	1,740
Maddingley	Maddingley, Parwan	5,170	5,830
Melton South	Brookfield, Cobblebank, Grangefields, Melton, Melton South, Strathtulloh, Weir Views, Hopetoun Park,	49,170	42,400
Merrimu	Harkness, Melton West, Kurunjang, Long Forest	22,170	30,490
Mount Macedon	Mount Macedon	1,470	1,510
Myrniong	Myrniong	280	290
Riddells Creek	Riddells Creek	3,840	3,970
Rockbank	Aintree, Bonnie Brook, Caroline Springs, Deanside, Fieldstone, Fraser Rise, Mount Cottrell, Plumpton, Rockbank, Thornhill Park, Truganina	14,240	8,388
Romsey	Romsey, Kerrie, Monegeetta	5,390	5,600
Sunbury	Sunbury, Clarkefield, Wildwood	40,360	42,060
Toolern Vale	Toolern Vale	1,480	520
Woodend	Woodend, Woodend North, Ashbourne	5,820	6,210
TOTAL		**187,684**	**191,420**

1. There have been changes to the towns within localities in line with new suburb naming in Lerderderg and Gisborne during the year.
2. Population estimates are based on the number of water connections to residential properties multiplied by the average number of persons per residential property for each locality and rounded to the nearest 10.

Drinking water sources

Most towns in Western Water's service region are connected to at least two drinking water sources – Melbourne water and local reservoirs. The major local reservoirs are Rosslynne Reservoir, near Gisborne, and Merrimu Reservoir, near Bacchus Marsh.

In addition, a number of smaller local reservoirs supply water to some towns in the Macedon Ranges and Pykes Creek Reservoir supplies the community of Myrniong.

Local water sources are used for drinking water supply whenever possible but are insufficient to meet the demands of the region's growing population. As a result, 73% of drinking water supplied to the region this financial year was sourced from the Melbourne supply system.

At 30 June 2021, local storages held a combined capacity of 52%. The ongoing impacts of climate change and sustained population growth mean that the region's

future water supply security is dependent on Greater Western Water maintaining access to Melbourne water supplies.

Melbourne water supplies

Western Water has a bulk entitlement with Melbourne Water to access water from the Melbourne Headworks system. As demonstrated this year, this entitlement is critical for the region's drinking water supplies to counter the impact of extended periods of high demand and/or low rainfall.

Water in the Melbourne system is sourced from protected natural catchments (Upper Yarra Thomson and the Yarra Valley tributaries) and transferred from the Silvan Reservoir directly or via the Greenvale Reservoir filled by Silvan. These sources feed the Sunbury/Rosslynne supply system from Loemans Road Pump Station, and the Merrimu supply system via the Hillside Pump Station.

Western Water applies the same level of water restrictions as Melbourne to all customers in our region. This is a condition of the bulk entitlement agreement with Melbourne Water. Details of supply systems for all towns are outlined in Table 4.

Smaller town supply systems

Woodend, Romsey, Lancefield and Myrniong each have their own local supply systems with additional water supplemented from bulk entitlements in nearby systems. In times of drought, the bulk entitlement from Melbourne Water supplements these local supplies via the interconnected water transfer network.

Woodend

Woodend receives treated water from two local sources: Campaspe Reservoir via the Marriages WFP, near Woodend, and the Graham Brock Reservoir via Reservoir C WFP on Mt Macedon.

During 2020-21, Woodend was supplied with 273ML from Campaspe Reservoir and a further 310ML from the Graham Brock Reservoir which received 273ML from the Macedon bulk entitlement. Woodend can also receive a potable supply from the Rosslynne system during times of low local storages or water quality events. 959ML was supplied from the Rosslynne system during the year.

Romsey

Romsey receives treated water from the Romsey WFP, which is supplied with water from Kerrie Reservoir. Supplementary water can be sourced from Wright Reservoir in Riddells Creek.

In the past year, Romsey received 474ML from Kerrie Reservoir. Extra inflows were sent to Romsey from the Riddells Creek and Maribyrnong bulk entitlements this year and bore water was also used to supplement surface water storages for Romsey.

Myrniong

Myrniong receives its water supply from Pykes Creek Reservoir after treatment from the Myrniong WFP.

A total of 44ML was taken from the storage during the reporting period in compliance with its bulk entitlement. Significant inflows had resulted in a storage increase during the year.

Lancefield

The Lancefield WFP can receive and treat surface water, bore water or a mixture of both.

In 2020-21, 209ML of water was taken from Garden Hut Reservoir at Lancefield. The transfer network from Romsey to Lancefield also allowed for water to be transferred from the Romsey, Riddells Creek and Maribyrnong bulk entitlements during the year.

Table 3: Major reservoir levels (% capacity) – 10 years

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Rosslynne Reservoir	72%	85%	76%	44%	15%	38%	24%	24%	22%	40%
Merrimu Reservoir	78%	76%	63%	29%	10%	51%	37%	38%	33%	47%

Table 4: Drinking water sources

Towns supplied	Reservoir	Catchment
Melton, Melton South, Eynesbury, Hopetoun Park, Rockbank, Toolern Vale, Bacchus Marsh and Long Forest, Darley, Pentland Hills, Merrimu Coimadai, Maddingley, Parwan, Balliang, Balliang East	Greenvale Reservoir	Yan Yean, Thomson and Upper Yarra Catchment
	Merrimu Reservoir	Lerderderg River, Goodman Creek, Pyrites Creek Catchments
	Djerriwarrh Reservoir	Djerriwarrh Catchment
Gisborne, New Gisborne, Bullengarook, Mount Macedon, Macedon and Riddells Creek	Greenvale Reservoir	Yan Yean, Thomson and Upper Yarra Catchment
	Rosslynne Reservoir	Jacksons Creek Catchment
Sunbury, Goonawarra, Jacksons Hill, Clarkefield, Bulla, Oaklands Junction and Diggers Rest	Greenvale Reservoir	Yan Yean, Thomson and Upper Yarra Catchment
	Rosslynne Reservoir	Upper Maribyrnong Catchment
Woodend	Graham Brock Reservoir and Reservoir C	Falls/Smokers Creek and Graham Brock Reservoir and Reservoir C Catchments
	Campaspe Reservoir	Campaspe River Catchment
	Rosslynne Reservoir	Upper Maribyrnong Catchment
	Greenvale Reservoir	Yan Yean, Thomson and Upper Yarra Catchment
Myrniong	Pykes Creek Reservoir	Werribee River and Pykes Creek Catchment
	Greenvale Reservoir (when carting)	Yan Yean, Thomson and Upper Yarra Catchment
	Merrimu Reservoir (when carting)	Lerderderg River, Goodman Creek, Pyrites Creek Catchments
Romsey, Kerrie & Monegeeta	Kerrie Reservoir	Upper Bolinda Creek
	Romsey Bore	Local aquifer
	Greenvale Reservoir	Yan Yean, Thomson and Upper Yarra Catchment
	Rosslynne Reservoir	Upper Maribyrnong Catchment
Lancefield	Garden Hut Reservoir	Deep Creek Catchment
	Monument Creek Weir	Monument Creek Catchment
	Bore Number 3	Local aquifer
	Kerrie Reservoir	Upper Bolinda Creek
	Romsey Bore	Local aquifer
	Greenvale Reservoir	Yan Yean, Thomson and Upper Yarra Catchment
	Rosslynne Reservoir	Upper Maribyrnong Catchment

Source water monitoring

One of the key components of Western Water's Drinking Water Risk Management Plan (RMP) is the extensive source water monitoring program aimed at increasing the understanding of the source water quality in reservoirs, bores and basins. It involves monitoring and identifying hazards, sources and events that could compromise drinking water quality in a catchment to consumer, multiple barrier approach.

Through an independent National Authority of Testing Association (NATA) accredited laboratory, a comprehensive source water monitoring program was undertaken during 2020-21. An overview of the parameters tested, frequency of testing at each sampling location for pesticides, chemicals (organics and in-organics), metals, physical and radiological parameters and their results are in Appendix 4.

Microbiological monitoring

In addition to the source water monitoring conducted by an independent NATA accredited laboratory, source water samples at various sampling locations were taken routinely for physical microbiological analysis by specialist biological scientists. This involves the determination of any flagellates, diatoms, algae and cyanobacteria (blue green algae) that were present in the source water samples.

General observations provided by these assessments in relation to any water discolouration, the levels of detritus and the presence of any odour in the source water provided valuable information in assessing the quality of the source water at various times during 2020-21. This information allows Western Water to monitor the changes in conditions of source water sources and their potential impacts towards drinking water quality.

Blue green algae

For Merrimu, Rosslynne and Pykes Creek reservoirs, blue green algae (BGA) monitoring was conducted by Western Water and data was shared with water storage manager SRW. Regular results on BGA numbers in the three reservoirs allowed for the timely assessment of adverse impacts on our ability to treat and provide safe drinking water to customers.

Melbourne Water monitors water prior to the off-take entry point to Western Water's region. Monthly water quality reports were provided by Melbourne Water for Greenvale Reservoir. These included information on algal populations. Melbourne Water is required to notify Western Water of any major changes in treated water quality for supplies from the Melbourne system. These changes include any that have potential to impact on our ability to supply safe drinking water to customers and meet the ADWG.

Assessment of water quality data

An extensive history of water quality at water source, treatment plants and customer taps has been collected by Western Water. Samples were scheduled and collected by an independent NATA accredited laboratory with results sent directly to our Aquantify database to allow for investigation into trends and emerging water quality issues.

The Aquantify database includes an automatic notification process for any results that are outside defined limits. The contracted laboratory is required to immediately notify Western Water of any health-related exceedances detected in drinking water samples. In the case of drinking water samples, the limits are based upon the ADWG 2011. There were no missed samples during 2020-21.

During 2020-21, changes were made to the routine sampling program frequency for various parameters, including an update to fluoride sampling in accordance with the Code of Practice for fluoridated drinking water supplies. The changes to frequency were initiated over the course of the 2020-21 reporting period.

Water quality data obtained from the Aquantify database was used by Western Water to review trends and data from Supervisory Control and Data Acquisition (SCADA) to monitor trends of the water systems as needed.

Hazard identification and risk management

Western Water used a risk framework based on ISO 31000:2018 Risk Management – Principles and Guidelines for the management of water quality hazards and risk assessments.

In accordance with the regulatory framework, Western Water managed the quality of drinking water through implementation of a DWQMS based on the HACCP principles.

3. Preventative measures for drinking water supply

Western Water operated its drinking water supply systems under the Victorian *Safe Drinking Water Act 2003*, administered by DH. Western Water managed health risks associated with drinking water, effectively monitored the water and underwent annual audits of our management systems.

A number of processes have been adopted to ensure delivery of safe, high quality drinking water supplies to customers. This is achieved through the multiple barrier from catchment to tap approach, including various water treatment methods, which are covered within the HACCP system.

The most recent independent external audit of Western Water's RMP took place in August 2020 and confirmed Western Water as fully compliant with the *Safe Drinking Water Act 2003* RMP requirements.

Preventative measures and multiple barriers approach

The adoption of preventative strategies for the protection of drinking water supplies is one of the key elements of the Framework for Management of Drinking Water Quality, developed under the ADWG. A key aspect of this risk-based approach to the production of safe drinking water is the use of multiple water treatment processes, also known as the multiple barrier approach.

At Western Water, drinking water provided to customers was subject to a multiple barrier approach to ensure safe and aesthetically acceptable supplies. This demands a highly skilled workforce and requires constant vigilance and attention to detail. Each water quality barrier in place at Western Water is discussed in detail below, including:

- implementation of the Guidelines for Planning Permits in Open Potable Water Supply Catchments and liaison with storage managers to support protection of catchments and reservoirs in accordance with Dam Safety Council Guidelines, November 2012
- operation of water treatment and disinfection systems to meet water quality standards and improve aesthetics
- protection of water quality through a fully enclosed water distribution network to prevent possible contamination after treatment, including regular maintenance
- implementation of management systems (QMS, EMS, OH&S and HACCP) procedures that are audited and reviewed regularly, and followed by experienced operators
- delivery of training and competency assessment of operators through registered training organisations.

Catchment protection

Western Water worked alongside storage managers, SRW and Melbourne Water, to support effective water quality management from catchment to customer.

Protected reservoirs and storage tanks

The amount of time water is held in surface water supply reservoirs is a key element to maintaining good water quality as longer detention time allows sediment to settle. This improves water clarity and enables longer exposure to solar radiation, which aids in the disinfection process.

In addition to the region's three major storage reservoirs - Rosslynne, Merrimu and Pykes Creek (managed by SRW) - Western Water owns 17 smaller storages, most of which are located in or near the Macedon Ranges. With the exception of Pykes Creek, Western Water's storages are protected through restricting access. Water quality at reservoirs is also monitored to ensure safety.

A total of 30 water storage tanks and 37 pump stations are used to supply water to customers throughout the water reticulation system. The tanks are typically constructed of concrete or metal and are fully enclosed. These sites are regularly tested to ensure water safety and security.

Alternative sources of supply

Western Water's extensive interconnection to the Melbourne supply system has ensured there is capacity in all the region's towns to access alternate water supply sources through the bulk entitlement with Melbourne Water. In the case of any issues for Myrniong's supply, carting water would be required as an alternative supply.

Water treatment practices

Drinking water sourced from unprotected catchments - such as the local source water storages available to Western Water - requires both filtration and disinfection due to the surrounding agricultural and urban activity. To ensure the provision of safe and healthy drinking water at customer taps, all water is disinfected at the point where it enters the supply system and again at specified points along the delivery system.

However, drinking water sourced from the Melbourne Headworks system comes from highly protected catchments which have long detention time in reservoirs. As a result, disinfection alone is sufficient to ensure water quality. Melbourne Water carries out primary disinfection. Western Water booster stations chlorinate the water as it enters the local network.

Filtration

Western Water operates seven water filtration plants (WFPs) and an additional 14 water treatment facilities which booster chlorinate the water. Five WFPs employ dissolved air flotation filtration (DAFF), Merrimu WFP uses the traditional sedimentation-filtration process and Romsey WFP uses microfiltration.

Each process efficiently removes potential pathogens and, coupled with disinfection, maintains a healthy drinking water supply with minimal impact on taste and odour. In addition, all filtration processes deliver high aesthetic water quality with minimal chemistry added. Typically, they provide turbidity values of <0.3 NTU and true colour of <5 Platinum Cobalt Unit (PCU).

Chemical treatment and disinfection

Chlorination and chloramination are both used to disinfect water supplies. The method used depends on the supply system. This process kills any bacteria or viruses and provides disinfection residual to maintain water quality as it travels from the WFP through the distribution system. In addition, Melbourne Water adds chemicals to the supply from the Melbourne system. Lime, carbon dioxide or sodium carbonate may also be added to the water to adjust the pH level. Powder Activated Carbon is also used to combat taste and odours produced by high concentrations of naturally occurring organic carbon.

Fluoridation

Fluoride is a naturally occurring element that is found in rocks, soils, water and plants. One milligram of fluoride for every litre of water has been shown to provide maximum dental benefits to the community and this is the 'optimal' level for temperate climates such as Victoria.

Western Water supplied fluoridated local water from both Merrimu and Rosslynne WFPs.

None of Western Water's smaller WFPs currently add fluoride to their water supply.

Fluoride (dosed as sodium hexafluorosilicate or fluorosilicic acid) is added by Melbourne Water before delivery to Western Water's supply region in line with the requirements of the *Health (Fluoridation) Act 1973*.

Table 5 lists the towns that receive a fluoridated supply. Supplies to Lancefield, Myrniong, Romsey and Woodend are only fluoridated when local supplies are supplemented with water from Melbourne or Rosslynne Reservoir. During the reporting period, some water from Rosslynne supply system was used to top up local supplies for Romsey and Lancefield resulting in low levels of fluoride present in their water supply.

Table 5: Fluoridated and non-fluoridated water supply by water sampling localities

Fluoridated water supply	Non-fluoridated water supply
Bulla	Lancefield[1]
Darley	Myrniong
Diggers Rest	Romsey[1]
Eynesbury	Woodend
Gisborne	
Lerderderg	
Macedon	
Maddingley	
Melton South	
Merrimu	
Mount Macedon	
Riddells Creek	
Rockbank	
Sunbury	
Toolern Vale	

1. Lancefield and Romsey received a small proportion of fluoridated water during 2020-21 when Rosslynne Reservoir water was mixed with local water supplies to ensure supply security.

pH correction

Acidity in water is corrected to provide a neutral pH at different stages of the treatment process to ensure added chemicals are effective and that there are minimal impacts on pipes and associated fittings within the distribution network.

Water's pH level may be corrected by adding lime and carbon dioxide or sodium carbonate at the start of the treatment process to assist with coagulation. The pH may be adjusted again at the end of the process to ensure effective disinfection and limit final water corrosiveness. The average pH of water should be maintained within the ADWG specified range of 6.5-8.5 pH units for aesthetic purposes.

Table 6: Water treatment chemicals and processes by sampling locality

Locality	Population[1] supplied	System	Treatment process	Added substances	Comments
Melton South Lerderderg Maddingley Darley Merrimu Rockbank Toolern Vale Eynesbury	118,144	Merrimu system (Merrimu Reservoir via Merrimu WFP)	Coagulation Clarification/ filtration Fluoridation Chlorination Additional chlorination by booster chlorinators along reticulation system as required	Aluminium Chlorohydrate, Polyelectrolyte, Chlorine gas, Sodium Hexafluorosilicate, Sodium Hypochlorite[3]	Melton and Melton South have been supplied with Melbourne water since June 2016. Other towns in the Bacchus Marsh area of the Merrimu system have been supplied from Merrimu Reservoir. Booster chlorinators exist in Melton South, Rockbank, Merrimu, Darley, Maddingley and Lerderderg localities.
		Merrimu system (Greenvale Reservoir via Hillside Pump Station)	Fluoridation and primary chlorination by Melbourne Water Secondary chlorination at Hillside Pump Station Additional chlorination by booster chlorinators along reticulation system as required	Sodium Hexafluorosilicate, Chlorine gas, Sodium Hypochlorite[3]	
Gisborne Macedon Mount Macedon Riddells Creek	19,250	Rosslynne system (Rosslynne Reservoir via Rosslynne WFP)	Oxidation, Absorption Coagulation, pH correction, Dissolved Air Flotation Filtration, Fluoridation, Chlorination, Additional chlorination	Aluminium Sulphate, Potassium Permanganate (as required), Powder Activated Carbon, Polyelectrolyte, Lime, Carbon Dioxide, Fluorosilicic Acid, Chlorine Gas, Sodium Hypochlorite[4]	During 2020-21 Rosslynne treated water was supplied to Gisborne, Riddells Creek, Macedon and Mt Macedon. Sunbury, Bulla and Diggers Rest remain on Melbourne water supply.
			Fluoridation and primary chlorination by Melbourne Water Secondary disinfection (chlorination) at Loemans Rd Pump Station/Riddell Rd Tank Additional chlorination by booster chlorinators along reticulation system as required	Sodium Hexafluorosilicate[2], Sodium Hypochlorite[3 4]	

Table 6: Water treatment chemicals and processes by sampling locality *(continued)*

Locality	Population[1] supplied	System	Treatment process	Added substances	Comments
Sunbury Bulla Diggers Rest	48,690	Sunbury system (Greenvale Reservoir via Loemans Road Pump Station)	Fluoridation and primary chlorination by Melbourne Water or at Rosslynne WFP Secondary disinfection (chlorination) at Loemans Rd Pump Station/Riddell Rd Tank	Sodium Hexafluorosilicate[2], Sodium Hypochlorite[3 4] Fluorosilicic Acid	
Woodend	6,209	Woodend system (Campaspe Reservoir via Marriages WFP and Graham Brock Reservoir, Reservoir C & Greenvale Reservoir via Reservoir C WFP)	Coagulation pH correction Dissolved Air Flotation Filtration Chlorination Fluoridation by Rosslynne Fluoridation by Melbourne Water[5]	Powdered Activated Carbon (as required at Marriages WFP), Aluminium Sulphate, Polyelectrolyte, Sodium Carbonate ('Soda Ash'), Sodium Hypochlorite, Sodium Hexafluorosilicate[5], Fluorosilicic Acid[5]	Drinking water is supplied from two ends of the system – the Marriages Basin and Reservoir C Contact tank. Supply is fully treated at the Marriages WFP and Reservoir C WFP. If required, Woodend's water supply can be sourced from Rosslynne or Melbourne during dry periods.
Romsey	5,598	Romsey system (Kerrie Reservoir, Romsey Bore & Greenvale Reservoir via Romsey WFP)	Microfiltration Chloramination Fluoridation by Melbourne Water[6] Additional chlorination by booster chlorinators along reticulation system as required	Poly Aluminium Chlorohydrate (as required), Sodium Hypochlorite, Sodium Hydroxide, Aqueous Ammonia Sodium Hexafluorosilicate[6], Fluorosilicic Acid[6]	Drinking water is supplied from Kerrie Reservoir and Wright Reservoir and local groundwater. If required, Romsey's untreated water supply can be sourced from Rosslynne or Melbourne during dry periods.

Table 6: Water treatment chemicals and processes by sampling locality *(continued)*

Locality	Population[1] supplied	System	Treatment process	Added substances	Comments
Lancefield	2,447	Lancefield system (Garden Hut Reservoir, Lancefield Basin and groundwater)	Coagulation pH Correction Filtration Dissolved Air Flotation Chlorination Fluoridation by Melbourne Water[7]	Aluminium Chlorohydrate (as required), Polyelectrolyte, Sodium Hydroxide (Caustic Soda), Potassium Permanganate, Powdered Activated Carbon (PAC), Sodium Hypochlorite Sodium Hexafluorosilicate[7], Fluorosilicic Acid[7]	Drinking water is supplied from Garden Hut Reservoir and local groundwater. The Lancefield system is also connected to Romsey via a source water pipeline which allows transfer of water from Kerrie Reservoir into the Lancefield Basin.
Myrniong	291	Pykes Creek Reservoir	Coagulation Oxidation pH correction Dissolved Air Floatation Filtration Chlorination Fluoridation by Melbourne Water[8]	Powdered Activated Carbon (as required), Potassium Permanganate, Aluminium Sulphate, Polyelectrolyte, Sodium Carbonate ('Soda Ash'), Chlorine gas, Sodium Hypochlorite, Sodium Hexafluorosilicate[8], Fluorosilicic Acid[8]	Drinking water is supplied from Pykes Creek Reservoir. When necessary, additional water can be carted to Myrniong from Bacchus Marsh (Lerderderg locality).

1. Population estimates are based on the number of water connections to residential properties multiplied by the average number of persons per residential property for each locality and rounded to the nearest 10.
2. Chemicals may be added by Melbourne Water for treatment, chlorination and fluoridation.
3. Chemicals added by Western Water for additional disinfection at entry point from Melbourne Water mains.
4. Chemicals added by Western Water throughout the distribution system to increase chlorine residual levels.
5. When receiving water from the Mount Macedon system, and that water has been supplemented with Melbourne Water or Rosslynne Reservoir.
6. When receiving water from Melbourne Water or Rosslynne system through transfer to Wright Reservoir.
7. When receiving water from the Romsey/Lancefield pipeline, and that water has been supplemented with Melbourne Water supply or Rosslynne system water supply via Wright Reservoir.
8. When receiving water from Melbourne Water through water carting from Bacchus Marsh (Merrimu System, supplied by Merrimu Treatment Plant or supplemented with Melbourne Water supply).

Water distribution network maintenance

The maintenance of the water distribution network, particularly pipes and tanks, is essential to ensure water quality from source to customer taps.

Distribution pipe cleaning and maintenance

In 2020-21, Western Water supplied 77,165 connected properties with drinking water through 2,478km of water mains.

The extensive reticulation system was maintained through renewals, repairs and operational actions such as valve exercising, mains flushing, mains cleaning, and flow and condition monitoring and assessment. These actions help reduce water losses through leakage and bursts and assist in maintaining water quality. The number of water main bursts during 2020-21 remained at low levels (see Table 7). The reduced number of pipe breaks has been greatly influenced by the mains replacement program.

Table 7: Water main bursts per 100km – 5 years

	2016 -17	2017 -18	2018 -19	2019 -20	2020 -21
Bursts per 100km of water main	12.3	12.2	12.7	10.9	8.14

Critical control points

Hazard Analysis and Critical Control Point (HACCP), an internationally recognised food industry standard based on risk prevention and management in food processing applications, has been used by Western Water. The HACCP system is used to manage significant risks at key points in harvesting, treatment and distribution of drinking water, employing the developed Victorian legislative RMPs and Quality Management Plans as supporting tools.

Western Water's HACCP system provided comprehensive documentation and a framework for field monitoring and maintenance, with a number of HACCP plans relating to each system providing critical and alert limits for system controls, monitoring audits and maintenance guides for disinfection equipment, maintenance and inspection of plants, pump stations and tanks, equipment calibration and staff accountability. The most recent HACCP certificate is included in Appendix 3.

Storage tank integrity and cleaning

A routine cleaning program for storage tanks in the distribution system involving the use of specialised underwater cleaning equipment by scuba divers to remove any sediment accumulated at the bottom of the tanks is in place. All storage tanks are covered and checked regularly to minimise contamination from birds or animals as well as dirt, leaves and other matter.

Backflow prevention

A dedicated Backflow Prevention Officer helps target and reduce the likelihood of backflow occurrences in the system. This backflow role is part of Western Water's HACCP team and potential detections are assessed through a risk based process within the HACCP system. Backflow auditing has been performed by Western Water staff.

4. Operational procedures and process control

Operational procedures

Formal operational procedures are critical to ensure the consistent delivery of quality drinking water across the region. Standard Operating Procedures (SOPs) and Work Instructions (WIs) can be used and referenced for maintenance tasks, specific or more complex tasks, or may exist as a standalone single reference for the agreed best practice for undertaking routine operational tasks. Whenever necessary, SOPs were reviewed and updated in line with risk management requirements.

Current procedures and work instructions available include:

- Powder Activated Carbon Loading
- Fluoride Handling
- Fluoride Dosing System Maintenance
- Fluoride Chemical Delivery Procedure
- Clean In Place Procedure
- Flow Tests for Chemical Dosing Pumps
- Chlorine Strength Test Work Instructions
- Calibration Procedures and Schedules
- Tank inspection procedures
- Internal Auditing Procedure and Scheduling, and
- Non-Conformance Procedures.

Western Water's Integrated Management System (IMS) addresses and links various business practices including Health, Safety and Wellbeing (HS&W), QMS, HACCP, Environmental Management System (EMS) and Risk Management. As issues, events, audits, incidents or improvement actions are required, they are captured by a common system for coordinated monitoring and follow up.

Operational monitoring and process control

Operational monitoring was conducted at all WFPs across the region. Section 5 details the results of water quality monitoring in 2020-21.

Western Water employed online monitoring equipment which included chlorine, fluoride, conductivity, turbidity and pH sensors. All WFPs used fully automated, continuously operating SCADA technology to remotely monitor and control the processes.

Alert and critical limits obtained from HACCP plans were integrated into treatment plant control systems. This results in plants automatically shutting down and triggering alarms to plant operators if water quality fails critical limits.

5. Verification of drinking water quality

The Water Unit at DH regulates the safety of drinking water supplied by all Victorian water corporations. No undertakings, exemptions or variations were applied to Western Water potable supply during 2020-21.

Drinking water quality monitoring

Western Water closely monitored the quality of drinking water to ensure compliance with the Safe Drinking Water Regulations 2015. In addition to meeting standards for the key water quality parameters highlighted in the Safe Drinking Water legislation the water provided to customers also meets the ADWG.

These guidelines provide a benchmark for a large range of biological, radiological, physical and chemical parameters.

The health and aesthetic quality of drinking water supplied to customers is ensured through a rigorous process of water quality monitoring and reporting. Monitoring includes continuous measurement of key parameters via online instruments (linked to alarm systems and graphic displays), daily operational checks by filtration plant staff, and external independent monitoring.

To assess the quality of our water supplies, daily routine monitoring is undertaken to confirm compliance with the Safe Drinking Water legislation. Water samples are collected in each of our 19 water sampling localities, at the reservoirs, WFPs and various points throughout the supply system including water storage tanks, pump stations and customer taps.

Samples are tested for a range of microbiological, physical, chemical, algal and radiological parameters. All regulatory testing is undertaken through an independent laboratory accredited by the NATA as required by the Safe Drinking Water Regulations 2015.

Non-routine testing is also used to investigate water quality trends, source variation issues, customer complaints or any suspected contamination issues. Non-routine testing may either be done by external NATA accredited laboratories or by operational testing, depending on the nature of the issue and the water quality information required.

The water treatment chemicals used to treat our drinking water are all delivered by approved chemical suppliers. Chemical quality is verified through the quality systems built into the chemical supply contract, which ensures the approved chemicals are used throughout the treatment process according to specifications.

During 2020-21, the routine sampling program was reviewed for all sample locations and parameters. The review included a historical data assessment alongside industry knowledge, reference to ADWG and requirements stated in the Safe Drinking Water Act and Regulations. The fluoride sampling to monitor in the network was also reviewed in line with the Code of Fluoridation for drinking water supplies.

The main changes to the program were the frequency of testing for some parameters at certain sample locations, to better provide a significant dataset for current and future water quality monitoring. In addition to these changes, additional sample point locations were identified to provide representative dataset for current and future network growth.

Drinking water quality compliance

During 2020-21, all water localities complied with the microbiological requirements that 100% of drinking water samples collected during the reporting period must have zero *Escherichia coli* (*E. coli*) organisms per 100 millilitres with the exception of any false positive sample. Further details are presented in Section 6 Incident Management and Emergency Response.

Table 8 and Chart 1 provide a snapshot of Western Water's compliance on key health and aesthetic parameters for drinking water quality, as required by the Safe Drinking Water Regulations 2015 and ADWG. *E. coli* and Trihalomethanes are core indicators of drinking water health, and turbidity, pH level and true colour are core indicators of drinking water aesthetics.

Full details of Western Water's drinking water quality compliance against the standards are contained in Appendix 4, with all parameters measured compliant during the 2020-21 reporting year including:

- *Escherichia coli (E. coli)*
- chlorine-based disinfection by-product chemicals
- trihalomethanes
- other parameters
- turbidity
- fluoride
- examples of other chemicals not specified in the standards but which may pose a risk to human health are listed in Table 8.

Table 8: Drinking water quality compliance

Parameter	2018 -19	2019 -20	2020 -21
Arsenic, Filtered[2]	100%	100%	100%
Barium, as Ba	100%	100%	100%
Barium, Filtered	100%	100%	100%
Benzo(a)pyrene[2]	100%	100%	100%
Berylium, Filtered	100%	100%	100%
Beryllium, as Be	100%	100%	100%
BHC (alpha)	100%	100%	100%
BHC (beta)	100%	100%	100%
BHC (delta)	100%	100%	100%
Bicarbonate Alkalinity as CaCO3	100%	100%	100%
Boron	100%	100%	100%
Boron, Filtered	100%	100%	100%
Bromate	100%	100%	100%
Bromobenzene	100%	100%	100%
Bromodichlormethane	100%	100%	100%
Bromoform	100%	100%	100%
Cadmium	100%	100%	100%
Cadmium, Filtered	100%	100%	100%
Calcium[2]	100%	100%	100%
Carbon tetrachloride[2]	100%	100%	100%
Carbonate Alkalinity as CaCO3	100%	100%	100%
Chlordane, Total[2]	100%	100%	100%
Chlorine	100%	100%	100%
Chlorine, Free	100%	100%	100%
Chloroacetic acid	100%	100%	100%
Chlorobenzene	100%	100%	100%
Chloroform	100%	100%	100%
Chromium	100%	100%	100%
Chromium, Filtered	100%	100%	100%
cis-1.2-Dichloroethene	100%	100%	100%
cis-1.3-Dichloropropylene	100%	100%	100%
cis-Chlordane	100%	100%	100%
Cobalt, as Co	100%	100%	100%
Cobalt, Filtered	100%	100%	100%
Coliforms, Total[2]	100%	100%	100%
Colour, true[2]	100%	100%	100%
Copper[2]	100%	100%	100%

Parameter	2018 -19	2019 -20	2020 -21
Copper, Filtered[2]	100%	100%	100%
Cyanide	100%	100%	100%
Dibromochloromethane	100%	100%	100%
Dibromomethane	100%	100%	100%
Dichloroacetic acid	100%	100%	100%
1,1-Dichloroethene[2]	100%	100%	100%
1,2-Dichloroethane[2]	100%	100%	100%
1.1-Dichloropropylene	100%	100%	100%
1.1.1.2-Tetrachloroethane	100%	100%	100%
1.1.1-Trichloroethane	100%	100%	100%
1.1.2.2-Tetrachloroethane	100%	100%	100%
1.1.2-Trichloroethane	100%	100%	100%
1.1-Dichloropropylene	100%	100%	100%
1.2.3-Trichlorobenzene	100%	100%	100%
1.2.3-Trichloropropane	100%	100%	100%
1.2.4-Trichlorobenzene	100%	100%	100%
1.2.4-Trimethylbenzene	100%	100%	100%
1.2-Dibromo-3-chloropropane	100%	100%	100%
1.2-Dibromoethane (EDB)	100%	100%	100%
1.2-Dichlorobenzene	100%	100%	100%
1.2-Dichloropropane	100%	100%	100%
1.3.5 - Trimethylbenzene	100%	100%	100%
1.3-Dichlorobenzene	100%	100%	100%
1.3-Dichloropropane	100%	100%	100%
1.4-Dichlorobenzene	100%	100%	100%
2,4,6-Trichlorophenol	100%	100%	100%
2,4-D[2]	100%	100%	100%
2.3.4.6-Tetrachlorophenol	100%	100%	100%
2.4.5-T	100%	100%	100%
2.4.5-Trichlorophenol	100%	100%	100%
2.4-Dichlorophenol	100%	100%	100%
2.6-Dichlorophenol	100%	100%	100%
2-Chlorophenol	100%	100%	100%
2-Chlorotoluene	100%	100%	100%
4,4'-DDT	100%	100%	100%
4.4'-DDD	100%	100%	100%
4.4'-DDE	100%	100%	100%

Table 8: Drinking water quality compliance (continued)

Parameter	2018 -19	2019 -20	2020 -21
4-Chloro-3-Methylphenol	100%	100%	100%
4-Chlorotoluene	100%	100%	100%
Aldrin[2]	100%	100%	100%
Alkalinity, Total as CaCO3[2]	100%	100%	100%
Aluminium, filtered[2]	100%	100%	100%
Aluminium, Total as Al[2]	100%	100%	100%
Ammonia[2]	100%	100%	100%
Antimony	100%	100%	100%
Antimony, Filtered	100%	100%	100%
Arsenic	100%	100%	100%
Dissolved Organic Carbon[2]	100%	100%	100%
Dissolved Oxygen (Field)[2]	100%	100%	100%
Electrical Conductivity @ 25C2[2]	100%	100%	100%
Endosulfan I	100%	100%	100%
Endosulfan II	100%	100%	100%
Endosulfan sulfate	100%	100%	100%
Endrin	100%	100%	100%
Endrin aldehyde	100%	100%	100%
Endrin ketone	100%	100%	100%
Enterococci	100%	100%	100%
Escherichia coli[2]	99.99%[4]	100%	100%
Ethylbenzene	100%	100%	100%
Faecal Streptococci[2]	100%	100%	100%
Fluoride[2]	100%	100%	100%
Formaldehyde	100%	100%	100%
Hardness, as CaCO3[2]	100%	100%	100%
Heptachlor[2]	100%	100%	100%
Heptachlor Epoxide[2]	100%	100%	100%
Heterotrophic Plate Count, 22C	100%	100%	100%
Heterotrophic Plate Count, 37C	100%	100%	100%
Hexachlorobenzene[2]	100%	100%	100%
Hydroxide Alkalinity as CaCO3	100%	100%	100%
Iron, Filtered (Soluble)[2]	100%	100%	100%
Iron, total as Fe[2]	100%	100%	100%
Lead	100%	100%	100%
Lead, Filtered	100%	100%	100%
Lindane	100%	100%	100%

Parameter	2018 -19	2019 -20	2020 -21
Magnesium, as Mg[2]	100%	100%	100%
Manganese, Filtered (Soluble)[2]	100%	100%	100%
Manganese, total as Mn[2]	100%	100%	100%
MCPA	100%	100%	100%
Mercury, as Hg[2]	100%	100%	100%
meta- & para-Xylene	100%	100%	100%
Methoxychlor[2]	100%	100%	100%
Methylene chloride	100%	100%	100%
Molybdenum, as Mo	100%	100%	100%
Monochloramine	100%	100%	100%
n-Butylbenzene	100%	100%	100%
Nickel	100%	100%	100%
Nickel, Filtered	100%	100%	100%
Nitrate[2]	100%	100%	100%
Nitrite[2]	100%	100%	100%
n-Propylbenzene	100%	100%	100%
ortho-Xylene	100%	100%	100%
Pentachlorophenol[2]	100%	100%	100%
pH[2]	100%	100%	100%
Phosphorus, Reactive as P[2]	100%	100%	100%
p-Isopropyltoluene	100%	100%	100%
Potassium, as K[2]	100%	100%	100%
sec-Butylbenzene	100%	100%	100%
Selenium[2]	100%	100%	100%
Selenium, Filtered[2]	100%	100%	100%
Silica, Non Reactive[2]	100%	100%	100%
Silica, Reactive[2]	100%	100%	100%
Silver, Filtered as Ag	100%	100%	100%
Silver, Total as Ag	100%	100%	100%
Simazine	100%	100%	100%
Sodium	100%	100%	100%
Strontium, Filtered	100%	100%	100%
Strontium, Total	100%	100%	100%
Styrene	100%	100%	100%
Sulphate[2]	100%	100%	100%
tert-Butylbenzene	100%	100%	100%
Tetrachloroethene[2]	100%	100%	100%

Table 8: Drinking water quality compliance (continued)

Parameter	2018 -19	2019 -20	2020 -21
Thallium, Total	100%	100%	100%
Tin, Filtered	100%	100%	100%
Tin, Total as Sn	100%	100%	100%
Titanium, Filtered	100%	100%	100%
Titanium, Total	100%	100%	100%
Toluene	100%	100%	100%
trans-1.2-Dichloroethene	100%	100%	100%
trans-1.3-Dichloropropylene	100%	100%	100%
trans-Chlordane	100%	100%	100%

Parameter	2018 -19	2019 -20	2020 -21
Trichloroacetic acid	100%	100%	100%
Trichloroethene	100%	100%	100%
Trihalomethanes	100%	100%	100%
Turbidity[2]	100%	100%	100%
UV Transmission@254nm[2]	100%	100%	100%
Vanadium, as V	100%	100%	100%
Vanadium, Filtered	100%	100%	100%
Zinc	100%	100%	100%
Zinc, Filtered	100%	100%	100%

1. Discussion of non-compliances to the Safe Drinking Water Regulations 2015 is presented in detail in Section 6. The figure has been changed to be in line with Essential Services Commission reporting.
2. Parameter is tested on untreated water source, refer to Appendix 5.

Drinking water aesthetics

One of the key components of Western Water's Drinking Water RMP is the extensive source water monitoring program aimed at increasing the understanding of the source water quality in reservoirs, bores and basins.

It involves monitoring and identifying hazards, sources and events that could compromise drinking water quality in a catchment, with a multiple barrier approach.

Through an independent NATA accredited laboratory, a comprehensive source water monitoring program was undertaken during 2020-21. An overview of the parameters tested, frequency of testing at each sampling location for pesticides, chemicals (organics and in-organics), metals, physical and radiological parameters and their results are in Appendix 4.

Customer satisfaction

Western Water conducted its annual customer satisfaction survey with customers online, resulting in more than 2,000 responses from across the service region. Weighted average results were then calculated to reflect the number of serviced properties by town.

The online survey method captured responses from a more representative demographic – particularly from younger adults. Slight declines in satisfaction across some measures were noted.

Residential customer satisfaction with water quality was measured at 86%, a slight decrease from last year's 88%. Non-residential customer satisfaction with overall water quality was at a similar level at 85% (no comparative data available). Satisfaction with taste for residential customers remained on par with last year at 79%.

Water quality complaints

Western Water's holistic approach to complaints management ensured any complaint is fully addressed from receipt to resolution, ensuring fast and effective resolution and minimal adverse customer impact. A range of actions are undertaken for water quality related complaints including verbal advice, further investigation, on-site inspection and testing, and works to improve water supply.

In accordance with the ADWG, Western Water adopted a benchmark for water quality complaints of 0.400 complaints per 100 customer properties. This benchmark was met again in 2020-21 with Western Water receiving 0.284 complaints per 100 customer properties as per DH reporting requirements.

There were 209 customer complaints about water quality received during 2020-21, an increase of 24% compared to the previous year. The increase in complaints was primarily due to an increase in developer activities and unplanned network maintenance in the Sunbury, Melton and Merrimu localities. These activities can stir up natural sediment in the mains requiring flushing to restore water quality. The Sunbury and Melton localities are supplied by the Melbourne system which is an unfiltered source water containing slightly higher natural sediments than the filtered local supply. The Merrimu locality is supplied by the local supply from the Merrimu WTP, and while this water quality is typically low in sediments there has been highly active for new domestic developments in this service area.

Table 9: Customer complaints 2019-20 vs 2020-21

Complaint category	2019-20	2020-21
Water quality	161	209
Other complaints	53	25
TOTAL	**214**	**234**

Water quality complaints by locality

During the reporting period, six localities recorded 10 or more complaints. They were Diggers Rest, Gisborne, Melton South, Merrimu, Rockbank and Sunbury. The main reason for complaint was coloured/dirty water due to sediment stirred up in the mains. The locations of the coloured/dirty water were flushed via the hydrant locations in the mains.

The second highest complaint category was reported taste issues, and the three highest complaint localities were Rockbank, Merrimu and Sunbury. The main contributor in Merrimu for the taste complaints related to low turnover in the network during a low demand period of the year. Other issues affecting Rockbank and Sunbury were related to change in demand of the network. The locations of the complaint were attended by field staff for flushing the mains and performing water quality testing.

The highest number of complaints per 100 customer properties (refer to Table 11) was recorded in Rockbank due to accumulated sediments in the mains being stirred up from unplanned events. Routine flushing programs for the Western Water service region were completed with the Field Service teams. These programs assisted in determining the frequency at which some areas should be flushed and cleaned to prevent customer complaints.

The Mount Macedon and Mount Macedon localities rated second and third overall highest for water quality complaints. These were largely due to accumulated sediments in the mains getting stirred up with network demand or unplanned pipe bursts.

Table 10: Water quality complaints by type and locality

			Localities by highest no. complaints[1]		
Complaint type	**Complaints**	**Complaints per 100 properties**	**1st**	**2nd**	**3rd**
Taste/odour	40	0.055	Mount Macedon	Romsey	Diggers Rest
Dirty/discoloured	147	0.201	Mount Macedon	Macedon	Diggers Rest
Illness	1	0.001	Macedon	N/A	N/A
Other	21	0.029	Bulla	Rockbank	Sunbury
TOTAL	**209**	**0.284**			

1. Based on the number of complaints per 100 customer properties supplied.

Table 11: Water quality complaints by locality

Locality	Complaints	Complaints per 100 properties[1]
Bulla	1	0.331
Darley	6	0.176
Diggers Rest	12	0.534
Eynesbury	1	0.102
Gisborne	14	0.302
Lancefield	3	0.319
Lerderderg	4	0.105
Macedon	5	0.749
Maddingley	1	0.045
Melton South	47	0.288
Merrimu	37	0.316
Mount Macedon	4	0.690
Riddells Creek	5	0.328
Rockbank	26	0.806
Romsey	3	0.139
Sunbury	36	0.223
Woodend	4	0.168

1. Based on the number of complaints per 100 customer properties supplied. No complaints were received from Myrniong and Toolern Vale localities.

Table 12: Water quality complaints per 100 customers[1] – 5 years

Complaint category	2016-17	2017-18	2018-19	2019-20	2020-21
Complaints per 100 customers	0.235	0.262	0.201	0.217	0.284

1. For this reporting format, a customer is one customer property. Complaints are tracked through internal business performance reporting.

6. Incident management and emergency response

Communication protocols

Western Water's incident response procedures described the protocols for communication to the public and other stakeholders in the event of a significant water quality event, such as the need to issue a boil water notice.

This is further supported by a Boil Water Notice Procedure which identifies the key stakeholders to be contacted and provides information on the appropriate communication methods for each stakeholder.

In 2020-21 there were no boil water advisories implemented.

Incident and emergency management

As an essential service provider, incident and emergency management is vital to Western Water. We have systems and resources ready to respond to emergencies 24 hours a day, seven days a week with crews strategically located across our region including a Duty Officer roster system for Treatment Plants, Field Services and Business Services.

Each year several situations are escalated to an incident, in which case established response processes are followed to resolution. Once the incident has been de-escalated, it is analysed in detail via an incident debrief session to minimise the risk of recurrence by identifying the likely cause and additional controls that would apply. This process is vital for large scale incidents that present major risks and offer useful learnings.

All *E. coli* detections above the standards are reported to DH under Section 18 of the *Safe Drinking Water Act 2003* and investigated using the guidelines published by the Secretary's office in the Safe Drinking Water Regulations 2015 under Schedule 2 Appendix 1. Turbidity and Total Trihalomethanes exceedances are also reported as required by Safe Drinking Water Regulations 2015 under Section 15.

Other water quality tested parameters that exceed health guideline values are also reported to the DH under Section 15 of the Regulations.

All incidents that may affect public health, and as defined by Section 22 of the *Safe Drinking Water Act 2003*, are immediately reported to DH, and applicable paperwork provided within 24 hours of occurrence.

All incidents that confirm any non-conformance with standards at the time of sampling the supplied drinking water are reported under Section 18 requirements of the Act, within 10 days of the initial report to DH by Western Water.

During the reporting period of 2020-21, there were three Section 22 reports of potential issues, however the investigation findings did show the water sampled was not representative of the water supplied to customers.

Incidents reported under Section 22 *Safe Drinking Water Act 2003*

a. Darley network, Darley (March 2021)

Issue – A routine sample from the Darley network that was representative of the Darley High Tank on 30th March reported a result of 1orgs/100mL *E. coli* (SDWR limit is 0orgs/100ml *E. coli*). Additional water quality results included total chlorine of 1.1mg/L, free chlorine of 0.8mg/L, turbidity of less than 0.1NTU and coliform (a general bacteria test) of 17orgs/100ml.

Actions – A rapid risk assessment was performed after receiving the laboratory notification, including the following:

- The resample and follow up sample results at the tap and designated sampling points within the Darley (Lerderderg) network was performed.
- Overview of how the sample site is supplied in the network, including the source water.
- Site-based investigation of the assets (including tank roof and hatch) supplying the sample location and wider network, before and during the detection.
- Online monitoring assessment to demonstrate performance of nearby storage tank (Darley High Tank) before and during the detection.
- Results of previous sampling performed before and on the same day of detection at storage tanks and other customer tap locations were assessed for trends.
- The sensitivity of the test and sampling, in relation to environmental conditions at the sample site.
- Review of possible impacts that may have affected the source water quality.
- Clearly documenting the potentially affected area on a map including sample tap locations, pipework and tank locations.

Outcome – Based on the investigation and the resampling results reporting no additional *E. coli* detections, the sample with the *E. coli* detection was determined as not representative of water supplied to customers at the time of sampling. Ongoing discussion with the laboratory and samplers is part of continuous improvement for the routine sampling program. A comprehensive program to review the condition of sample taps was performed during 2020-21 and identified a priority list for tap maintenance.

b. Merrimu 5ML Tank, Merrimu (May 2021)

Issue – *E. coli* detected 27th May (1 orgs/100ml) in a water sample taken from the Merrimu 5ML tank during routine sampling (SDWR limit is 0orgs/100ml *E. coli*). Additional water quality results included total chlorine of 1.7mg/L, free chlorine of 1.3mg/L, turbidity of 0.1NTU and coliform (a general bacteria test) of 1orgs/100ml.

Actions –

- The resample and follow up sample results at the tap and designated sampling points within the Merrimu network was performed.
- Overview of how the sample site is supplied in the network, including the source water.
- Site-based investigation of the assets (including tank roof and hatch) supplying the sample location and wider network, before and during the detection.
- Online monitoring assessment to demonstrate performance of Merrimu WTP filters and disinfection process before and during the detection.
- Results of previous sampling performed before and on the same day of detection at storage tanks and other customer tap locations were assessed for trends.
- The sensitivity of the test and sampling, in relation to environmental conditions at the sample site.
- Review of possible impacts that may have affected the source water quality.
- Clearly documenting the potentially affected area on a map including sample tap locations, pipework, and tank locations.

Outcome – Based on the investigation and the resampling results reporting no additional *E. coli* detections, the sample with the *E. coli* detection was determined as not representative of water supplied to customers at the time of sampling. Ongoing discussion with the laboratory and samplers is part of continuous improvement for the routine sampling program. A comprehensive program to review the condition of sample taps was performed during 2020-21 and identified a priority list for tap maintenance.

c. Romsey network, Romsey (June 2021)

Issue – A routine sample from the Romsey network on 15th June reported a result of 1orgs/100mL *E. coli* (SDWR limit is 0orgs/100ml *E. coli*). No other detections of *E. coli* were in other Romsey samples from the same day of sampling. Additional water quality results included total chlorine of 0.87mg/L, free chlorine of 0.40mg/L, monochloramine of 0.33mg/L, turbidity of less than 0.1NTU and coliform (a general bacteria test) of 1orgs/100ml.

Actions –

- The resample and follow up sample results at the tap and designated sampling points within the Romsey network was performed.
- Overview of how the sample site is supplied in the network, including the source water.
- Site-based investigation of the assets (including tank roof and hatch) supplying the sample location and wider network, before and during the detection.
- Online monitoring assessment to demonstrate performance of the disinfection process and filtration system before and during the detection.
- Results of previous sampling performed before and on the same day of detection at storage tanks and other customer tap locations were assessed for trends.
- The sensitivity of the test and sampling, in relation to environmental conditions at the sample site.
- Review of possible impacts that may have affected the source water quality.
- Clearly documenting the potentially affected area on a map including sample tap locations, pipework and tank locations.

Outcome – Based on the investigation and the resampling results reporting no additional *E. coli* detections, the sample with the *E. coli* detection was determined as not representative of water supplied to customers at the time of sampling. Ongoing discussion with the laboratory and samplers is part of continuous improvement for the routine sampling program. A comprehensive program to review the condition of sample taps was performed during 2020-21 and identified a priority list for tap maintenance.

Incidents not reported under Section 22 *Safe Drinking Water Act 2003*

There were no incidents outside of the Section 22 reporting requirements during 2020-21. COVID-safe actions did not impact general activities for reservoir, plant or tank operation. Most actions were performed remotely to minimise movement in the community.

Blue green algae (BGA)

During 2020-21, there were no BGA notifications that impacted drinking water quality at Rosslynne Reservoir, Pykes Creek Reservoir, Merrimu Reservoir, local reservoirs or the Melbourne supply from Greenvale Reservoir.

Several reports of blooms were reported to the DELWP web portal including a bloom at the Campaspe and Rosslynne reservoirs. While these reservoirs are not used directly for drinking water supply without treatment or for direct recreation, SRW was notified for irrigation purposes.

Notifications of water blooms were received from the independent external laboratory as part of the biological monitoring at the treatment plants. However, numbers detected in the samples were very low, if present, and confirmed by online monitoring at the treatment plants.

7. Employee awareness and training

Western Water's water quality team is a significant asset to the business with their experience, skills and training, ensuring the ongoing safe delivery of drinking water across the region. We are committed to ensuring all employees are fully aware of their responsibilities and trained appropriately for our water supply systems.

During 2020-21, the water quality team consisted of 13 staff with five based in the Sunbury office, six based at Rosslynne WFP and another three based at Merrimu WFP.

There was one role created, the Water Quality Data Scientist, to act as a data analyst and senior advisor alongside the Water Quality Advisor.

Employee awareness and involvement

Staff attend regular site/team meetings to remain up to date with the latest developments. Changes to existing policies and the introduction of new ones are also included in meeting agendas and can be accessed on our intranet. Western Water reinforces key safety messages via safety alerts, the intranet and site/toolbox meetings. All water systems staff as well as the Board and Executive are considered accountable for implementation of Western Water's Drinking Water Policy.

Employee training

All water quality team members undertook training during the year with some attending the Water Industry Training Centre, Geelong and Chisholm Institute of TAFE. In addition to formal training, ongoing training and reskilling is required as procedures are revised due to new equipment or techniques. This ensures the safety of both employees and the community.

Water treatment operators were mapped across to the National Certification Framework for Water Operator, as part of DH recommendations to industry. Over the course of two years, the operators will be assessed to ensure the qualifications are documented in Greater Western Water's training database, including the Recognised Prior Learning assessment process.

Western Water's water quality team members took part in more than 100 different training opportunities during 2020-21. Courses and activities covered a range of specialised water treatment and general workplace training and learning opportunities. The water treatment specialised training included:

- AIIMS Emergency Incident Workshop
- Bushfire Awareness
- Chlorine Changeover
- Defensive Driving
- Ferric Sulfate
- First Aid
- Lone Worker Procedure
- Taking water tank inspections into the future (Lunch and Learn)
- Manual Handling
- Monitor and control Dam Operations
- Conduct and Report Dam Safety Instrumentation Monitoring
- Monitor and Implement Dam Maintenance
- Inspect and Report on Concrete Dam Safety
- Inspect and Report on Embankment Dam Safety
- Operating Breathing Apparatus
- Providing CPR
- Radio Training
- Sodium Hydroxide Solution

Staff also had the opportunity to participate in several learning and development opportunities over the year including:

- Boil water incident triggers, challenge workshop 2021
- WSAA Lead Working Group 2021
- Lead in Drinking Water Research presentation 2021
- Catchment to Tap risk assessment 2020
- DH Fluoride Feasibility Study 2020

Water industry operations

Western Water strongly encouraged operational staff to obtain their certificate qualifications in water industry operations through the provision and funding of training opportunities, as well as linking the achievement of Certificate III to banding progression opportunities. Due to the impacts of the coronavirus pandemic, Water Industry Operations Conference attendance was deferred during 2020-21. Western Water continued its commitment to employee learning and development through a range of training advisory bodies during 2020-21, including:

- VicWater Industry Training Consultative Committee
- National Water Industry Training Forum
- Victorian Employers' Chamber of Commerce and Industry (VECCI)
- Water Services Association Australia's (WSAA) Water Quality Network
- Water Industry Training Centre
- Water Industry Operators Association of Australia
- Victorian Water Industry Advisory Committee.

8. Community involvement and awareness

Western Water engaged and educated the community about the safe delivery of its quality water supply. Future community involvement and engagement will be delivered as Greater Western Water community engagement programs.

Community involvement

Western Water was recognised as a responsible corporate citizen within the community and its community sponsorship program was an important element of this strategy.

Western Water's commitment to improving the biodiversity value of its properties and enhancing the environment across the region was demonstrated by long-standing partnerships with Pinkerton Landcare and Environment Group, Deep Creek Landcare and Friends of Toolern Creek.

Consultation

Western Water's customer advisory network included an online customer panel which provided a significant additional resource for community consultation including contacts for over 50,000 customers.

The establishment of the Water Matters consultation site expanded customer communications and engagement capabilities where customers joined in discussions on critical topics and provided input for decision making.

An important component of our ongoing consultation with customers about water quality was encouraging reporting of concerns through a variety of channels to enable us to better understand any issues presenting across the network. This will continue through Greater Western Water as part of the YourSay section of the website.

Education programs

Western Water recognised that educating young people on crucial issues such as climate variability and water conservation creates a ripple effect reaching far beyond the classroom. Presentations, programs and teacher resources for children were offered at the preschool, prep, primary and secondary school levels.

More than 13,500 students from across the region took part in Western Water's preschool and primary school education presentations during the year. We also introduced a community education presentation program aimed at migrants and adults with low literacy about the benefits of drinking tap water.

Tours and presentations

Western Water offered free tours and presentations to schools and community groups. Free guided tours are offered at our largest treatment plants at Gisborne and Merrimu. In 2020-21, educational tours and community presentations were conducted for a range of groups including primary, secondary, tertiary and community groups. Due to the coronavirus (COVID-19) pandemic, the majority of these tours and presentations were conducted online.

Sponsorship and grants

Western Water supported local community relations through sponsorships and offering grants across the service region. In addition, our mobile water tanks were made available free of charge to various community activities across the region, when these activities were possible during the coronavirus pandemic.

We strongly supported the Choose Tap program providing bottles and key messages via local cafés, businesses, sporting groups and via drinking water fountains in public places.

Publications

Apart from the annual Drinking Water Quality Report, Western Water produced other water treatment publications, available on the website, including the following factsheets:

- Bore water for drinking
- Drinking water for health
- Rosslynne WFP treatment
- T155 (Water use around the home, saving water, plant selection)
- Water by agreement
- Water supply changes
- Your water supply.

Community awareness and communications

To ensure the community fully comprehends our issues and actions, Western Water produced a range of planned and reactive communication materials including the customer newsletter, email campaigns, factsheets, brochures, media stories, social media and customer letters.

Western Water's social media communication channels, online consultation panel and growing SMS capability increased the means of communicating with customers about critical water quality issues. They go well beyond traditional channels by offering timely, direct, two-way communication.

Facebook and email were significant communication channels for Western Water – particularly when customers had issues with their water quality or supply.

9. Research and development

Western Water was committed to improving understanding and delivery of quality drinking water. To this end, investment in new technologies specifically aimed at better water quality monitoring and delivery has been made. In addition, we created a link with WSAA and the American Water Research Foundation to access best practice water industry research on both a national and international scale. A small library of 170 core reference texts and research papers on water quality and other matters has also been set up.

Western Water participated in the statewide Drinking Water Quality Network and the metropolitan retailers' network. These foster good working relationships across the industry and will continue as part of Greater Western Water.

Research

During 2020-21, some new projects were delayed due to coronavirus health control requirements. However, Western Water continued to pursue new technologies to further improve and quantify the water quality risks to various networks and reservoirs as part of comprehensive water quality studies.

Online reservoir profile monitoring

This ongoing project was expanded to include Merrimu Reservoir and Campaspe Reservoir to improve online monitoring. Installation of the monitoring devices will be finalised during 2021-22 and will significantly improve oversight as part of prevention activities related to health and aesthetic issues including BGA, manganese (black water events), iron (coloured water events) and taste issues. Previously, this monitoring has been performed in the laboratory by operators or by specialist external laboratory providers exclusively. The use of online monitoring improves response times at the plant to optimise the treatment process.

Trihalomethane investigation at Rosslynne WFP

During 2020-21, the Rosslynne WTP PAXTM system was successfully commissioned. The system uses tank mixing and aeration to release the volatile compounds from the treated water to tank air space, and venting the air to external atmosphere. Ongoing assessments will be performed to monitor the success of the PAXTM system under various water quality conditions, including impacts due to rainfall and catchment runoff.

Rapid microbial field testing

Assessment of the network used LuminUltra rapid microbial testing in the field during 2020-21, for operational drinking water monitoring and incident management. The focus of the technology is the ease of use in the field and the timely response delivered to provide an indication of residual bacteria level in the water sample. The testing can assist in identifying locations where biofilm presence is above the desired level and corrective action such as flushing or additional chlorination can be implemented.

Intelligent Water Networks – ongoing trials

During early 2021, planning commenced for a BactoSense trial to be implemented in 2021-22, to further improve the assessment of untreated water microbiology. The trial will provide important data about the influence of raw water quality and process optimisation on the bacterial loading to the disinfection process. There will also be a study on bacteria influenced by seasonal change to improve process performance.

Waternamics data integration initiative

Like many water corporations, Western Water used several different systems to manage information about customers and our network of pipes, valves, pumps and tanks. Having information in different places meant we were more likely to respond to an incident after it was reported by a customer, rather than identifying them before they become an issue.

Western Water trialled Waternamics, an IWN initiative, which is a new data integration system that changes the way we view our network and improves the service we provide to customers. Waternamics was developed with the assistance of Veolia and IBM.

Waternamics pulls data from five existing systems into a single platform to obtain a comprehensive view of our network and customers in one place. This has helped us:

- identify issues and fix them before they impact on customers
- reduce the time it takes to respond to priority faults
- improve the speed of our response to customer enquiries and complaints.

Further development of Waternamics during 2020-21 improved general operation of the tool and optimised assessments during water quality incident investigations.

Industry knowledge

Western Water maintained active membership of industry groups such as Australian Water Association (AWA), Water Industry Operators Association (WIOA), Water Services Association of Australia (WSAA), VicWater and the Institute of Water Administration (IWA) to ensure awareness, communication and involvement with our broader stakeholder groups. This will continue as part of Greater Western Water.

As part of Western Water's membership of the WSAA, we supported the WSAA research program, including international collaborative research. Working cooperatively with other WSAA members provides significant leverage in research dollars in a range of important water research areas including customer service, water quality, recycling and environmental impacts.

Staff participated in industry associations including the AWA Victoria Branch Committee and the IWA. Staff also attended seminars and conferences to access up-to-date industry knowledge. Western Water also took part in the statewide Drinking Water Quality Network and the metropolitan retailers' network.

10. Documentation and reporting

Management of documentation

Reporting water quality data and performance is an integral component of Western Water's Water QMS. All documentation was regularly reviewed and updated in line with HACCP for water supply systems and the internal water QMS. This is part of our Integrated Management System (IMS).

HACCP documents reviewed and/or rewritten in 2020-21 include:

- Filtration system HACCP plan
- Microfiltration membrane system HACCP plan
- Dissolved air floatation filtration system HACCP plan
- Tanks without chlorinators HACCP plan
- Tanks with chlorinators HACCP plan
- Tanks with raw water interconnections HACCP plans
- Product specification

An annual review of documentation for the following sites was carried out:

- Swans Rd Booster Chlorinator
- Darley High Chlorinator
- McMullins Rd (formally Gisborne Rd) Chlorinator
- Underbank Chlorinator
- Settlement Rd Booster Chlorinator
- Sandy Creek Booster Chlorinator
- Loemans Rd Entry Point
- Norton Rd Booster Chlorinator
- Salisbury Rd Booster Chlorinator
- Hillside Entry Point
- Shepherds Rd Tank and pump station
- McDonalds Rd Booster Chlorinator
- Greens Hill Tank
- Aitken St Chlorinator
- Romsey Water Filtration Plant
- Merrimu Water Filtration Plant
- Lancefield Water Filtration Plant
- Marriages Water Filtration Plant
- Reservoir C Water Filtration Plant
- Rosslynne Water Filtration Plant
- Myrniong Water Filtration Plant
- Customer tap

Water quality excursions/non-conformances and incidents were reviewed by the HACCP team on a monthly basis and tracked and closed out using the IMS database. Western Water's centralised water quality database is provided by Aquantify. This system ensures automated data storage and generates automated emails advising of any water quality exceedances.

Reporting

Western Water used a corporate Balanced Scorecard (BSC) to manage and report on strategic business performance and ensure the business progressed toward its strategic intent of 'engaging with our community on the provision of water services to enable regional economic growth and resilience in a climate-changing environment'.

Through BSC reporting, key objectives, actions and system performance were monitored by the Board, Executive and management on a monthly basis. Providing quality water services is a key objective of the BSC with actions including maintaining water quality practices and managing water main assets.

11. Evaluation and audit

Evaluating and auditing water quality management systems ensures the successful management of water quality data and processes. This report is an integral part of the review and evaluation process.

Long-term evaluation

Water quality data has been collected from various sites across Western Water's service area for more than ten years, including catchments, reservoirs, plants and customer taps. This data is used to develop trends of long-term changes to water quality, which is essential to recognise and understand risks to water quality. It also assists in identifying possible solutions.

Audit of drinking water quality management

Audits ensure that operational procedures and processes are in place so that accurate water quality data is collected, and appropriate management systems are maintained. One external surveillance audit was conducted by a certified auditor in February 2020, confirming the ongoing HACCP certification.

In 2020-21, 26 internal gap audits on the Drinking Water HACCP System were undertaken by members of Western Water's HACCP team. The internal gap audits included review of Western Water's internal procedures and practices to ensure compliance with the requirements for ADWG and HACCP certification. The reports were noted in monthly HACCP meeting minutes and reported in the BSC and to the IMS Committee on a monthly basis.

Reports were also registered in the IMS database to ensure efficient close out of any opportunities for improvement in the HACCP system. An audit schedule is maintained and reviewed by the HACCP team to ensure ongoing compliance.

Department of Health regulatory audit

Western Water successfully passed its seventh Regulatory Audit for Drinking Water Risk in August 2020. This result confirmed Western Water's commitment to delivering high quality and safe drinking water to customers. The audit was based on the ADWG and the requirements of the *Safe Drinking Water Act 2003* and the Safe Drinking Water Regulations 2015.

2020 audit outcomes and actions

Three opportunities for improvement noted by the auditor included:

- The field observations on ground showed some fading of dual reticulation parts and loss of the lilac colour. Some tighter specification for dual reticulation parts and fittings might assist reduce this risk and is worth considering.

Action update: Greater Western Water continues to be part of ongoing discussions with an industry working group as the observation of fading coloured pipework is a whole of industry issue. Development of a preferred fittings list is ongoing during 2021 and includes recommended parts with low risk of fading.

- On ground review of critical limits as set by operators was that they were often tighter than necessary. A formal Greater Western Water position on setting critical limits as 'speed limits' rather than absolute limits, or some change management process, might assist in preventing a potential non-compliance in future audits.

Action update: reference to 'speed limits' for operators has been included in the HACCP Scope Catchment to Tap document 29 January 2020. There is currently a change of management process in place, and all changes are discussed at the monthly HACCP committee meetings.

- Batch and lot identification of assets is clearly shown on the new parts but is not necessarily captured in the contract inspection and test plans and is not captured in Western Water's GIS system. Western Water is encouraged to consider whether it is worth capturing batch and lot IDs for infrastructure.

Action update: development of the asset master system to include these assets commenced in 2019 and has identified the opportunity to include asset tagging such as batch and lot identification. This is a continuous improvement action and will be updated as part of the Drinking Water Risk Management Plan.

Progress on 2018 Audit Outcomes and Actions

As reported in last year's 2020 Annual Drinking Water Quality Report, two opportunities for improvement remained in progress. The status of these actions during 2021 is provided below.

- There would be value in progressing with plans to create a suitably sized and outfitted storage depot that permits chemicals, parts, and fittings to be stored undercover, off the ground, in clean, sanitary conditions, out of sunlight and at suitable temperatures.

Response update: The Southern Depot was updated to match the improvements made at the Northern Depot, including pipe sanitation station, valve wrapping and suitably sized undercover storage area. These works were completed during 2019-2020.

- There may be locations where Western Water and ALS would see a benefit in labelling or tagging sample points as used for verification sampling to minimise the risk of sample point misunderstandings arising.

Response update: The locations and design of labelling was developed during 2020-21. However, due to restrictions on travel as a control for the coronavirus pandemic, the labelling was delayed to 2021-22. Temporary labels were created, in the interim, by the operators to prevent confusion for tap location, and internal training by ALS of new samplers was implemented during 2020. The labelling project will be completed by end of 2021-22, with ongoing development of the asset master system to include the taps as documented assets.

12. Review and continual improvement

Management reviews

Water quality is a vital performance indicator for Western Water at the most senior level. The performance of the Drinking Water QMS was reviewed monthly by the management team, which included the Managing Director and five General Managers. All audit outcomes are assessed and resources allocated as necessary to resolve critical issues.

All water quality complaints logged in CARE are assigned to the relevant staff member who then follows the complaint from receipt to resolution in accordance with Western Water's Correspondence and Complaints Management Procedure. Should the customer be dissatisfied with the initial outcome, an internal dispute resolution process is introduced whereby the complaint is reviewed by management with appropriate actions taken as necessary. If a customer remains dissatisfied, they may be directed to an external dispute resolution forum such as the Energy and Water Ombudsman of Victoria.

Drinking water quality management improvement plan

Western Water had an extensive Drinking Water QMS in place, framed around the 12 elements of the ADWG. Regular review of the management system will ensure continual improvement measures are identified, and strengths and weaknesses in water quality risk management are well understood, by the Board, Executive, senior management and staff.

Water supply – capital works improvement

During 2020-21, Western Water invested close to $26 million in the region's water supply system. Of this, nearly $13 million was invested on new infrastructure during 2020-21.

- Minns Rd Tank Replacement $3.1M
- Deanside Village Water Main $1.8M
- Water pump stations at Loemans Road and Shephards Lane, Sunbury $1.4M
- Bald Hill to Diggers Rest Water Main $1.4M
- Taylors Rd Bridge Crossing $1.2M
- Merrimu WFP Fluoride Upgrade $1M
- Griffith St Water Main $884k
- Customer Water Meters Install and Replacement $803k
- East Maddingley Water Main $696k
- Mt Cottrell Rd Water Main $500k

Non-potable supply

Non-potable water is water that has not been treated to the standards considered acceptable for drinking water under the *Safe Drinking Water Act 2003*. It can include source (untreated) water direct from reservoirs as well as partially treated water.

There are no regulated water declarations, regarding the non-potable water supply to customers of Western Water. Regulated water is defined by the DH as water that is not intended for drinking but could reasonably be mistaken as drinking water.

Western Water managed the supply of non-potable water by agreement contracts with individual customers. During 2020-21, Western Water had 15 non-potable water by agreement residential customers located across our system. Typically, they are customers who have made special arrangements for connection to Western Water's system between the untreated source water and the treatment plant.

Western Water advised, under Section 25, those customers that this (non-potable) water is not suitable for either drinking or food preparation through the individual contracts as well as ongoing notification on all applicable customer bills.

Appendix 1– Drinking water policy

Western Water will continue to meet the requirements of the *Safe Drinking Water Act 2003* and subordinate legislation, as well as Western Water's Customer Service Charter.

Our community will be provided with safe (biologically, chemically, radiologically and physically), cost effective and reliable drinking water and associated services throughout our area of operations. Drinking water quality will also be maintained to be aesthetically acceptable to the majority of customers. Drinking water is defined as water intended for human consumption or purposes connected with human consumption.

Western Water will provide adequate resources for ongoing implementation and improvement of the Drinking Water Quality Management System (DWQMS), which is developed from the ADWG Framework for the Management of Drinking Water Quality (also known as "The Twelve Elements").

Certification of Western Water's Hazard Analysis and Critical Control Point (HACCP) system will be maintained in order to provide a catchment-to-tap multi-barrier approach in line with international best practice.

Western Water supports Government policy regarding the introduction of fluoridation to all water supplies. Fluoridation of water will be maintained to all areas supplied from the Melbourne Water entitlement and intermittent fluoridated areas will be appropriately managed.

Class A water will be maintained as microbiologically safe to minimise any public health risk from incidental human consumption.

Delivery of actions and initiatives related to this Policy through the current and future Price Submissions and Corporate Plans.

Provision of advisory notices via billing statements to Supply by Agreement customers in order to ensure customers understand the fit-for-purpose implications.

Appendix 2 – Regulatory and formal requirements for drinking water

Related legislation, policies, systems and procedures include:

- *Safe Drinking Water Act 2003* and Safe Drinking Water Regulations 2015
- *Health (Fluoridation) Act 1973*
- *Code of Practice for Fluoridation of Drinking Water Supplies* Second Edition 2018
- *Food Act 1984*
- *Essential Services Commission Act 2001*
- *Environmental Protection Act 1970*
- *Water Efficiency Labelling and Standards Act 2005*
- Dangerous Goods (Storage and Handling) Regulations 2000
- NHMRC/ARMCANZ Australian Drinking Water Guidelines 2011
- Risk Management (AS/NZS ISO 31000)
- Relevant State Environment Protection Policies (SEPPs)
- Environmental Management Systems – ISO 14001
- Quality Management Systems – ISO 9001
- Occupational Health & Safety Management Systems – AS 4801
- Drinking Water Quality Management System
- HACCP Principles & Systems Procedures
- Integrated Management System procedures
- All relevant Western Water policies

Appendix 3 – HACCP certification and Drinking Water DH audit certificate

Lloyd's Register

Certificate of Approval

This is to certify that:

Western Region Water Corporation

36 Macedon Street Sunbury, Melbourne, 3429, VIC, Australia

has been approved to the following standards:

HACCP Codex Alimentarius Annex to CAC/RCP 1-1969 (2009)

Basem Obaid - Global Head of Training and Improvement Services

Issued by: Lloyd's Register Quality Assurance Limited

Current issue date:	12 March 2019
Original approval date:	08 December 2015
Expiry date:	21 March 2022
Certificate number:	10178095
Approval number(s):	0050017

The scope of this approval is applicable to:
Storage, treatment and distribution of drinking water.

Risk management plan audit certificate

Safe Drinking Water Regulations 2015 - Regulation 10

Certificate Number: 178

Audit period: 31 May 2018 to 28 August 2020

To: Rebecca Chapman, Water Quality Advisor

Western Water, 36 Macedon Road, Sunbury, Vic 3429

Australian Business Number (ABN): 67 433 835 375

I, Dr Daniel Deere, after conducting a risk management plan audit of the water supplied by Western Water am of the opinion that -

Western Water has complied with the obligations imposed by section 7(1) of the ***Safe Drinking Water Act 2003*** during the audit period.

Signature of approved auditor: DADeere Date: 28 Aug 2020

Department of Health & Human Services

State Government Victoria

Appendix 4 – Water quality compliance results

A4.0 Compliance with drinking water quality standards

This section reports on 2020-21 compliance with the Safe Drinking Water Regulations 2015. The limits for all parameters tested by Western Water - as specified by various guides such as the Australian Drinking Water Guidelines - are outlined below in Table A2. In some cases, a parameter does not have a limit specified but has been identified through risk assessments as a parameter of interest in case a limit is determined in the future.

Table A1: Drinking water quality standards

Parameter	Sampling frequency	Water quality standard
Escherichia coli	Weekly	100% of 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.
Trihalomethanes	Monthly	Must not exceed 0.25 mg/L
Turbidity	Weekly	Samples in any 12-month period must be less than or equal to the 95th percentile of 5.0 Nephelometric Turbidity Units (NTU)

Table A2: Drinking water quality compliance

Parameter	Sampling frequency	Water quality standard
1,1-Dichloroethene	Various	should not exceed 0.03mg/L
1,2-Dichloroethane	Various	should not exceed 0.06mg/L
1.1-Dichloropropylene	Various	currently no recommended health guideline value set
1.1.1.2- Tetrachloroethane	Various	should not exceed 1mg/L
1.1.1-Trichloroethane	Various	currently no recommended health guideline value set
1.1.2.2-Tetrachloroethane	Various	should not exceed 1mg/L
1.1.2-Trichloroethane	Various	currently no recommended health guideline value set
1.1-Dichloropropylene	Various	currently no recommended health guideline value set
1.2.3-Trichlorobenzene	Various	should not exceed 0.005mg/L
1.2.3-Trichloropropane	Various	should not exceed 0.007mg/L
1.2.4-Trichlorobenzene	Various	should not exceed 0.005mg/L
1.2.4-Trimethylbenzene	Various	currently no recommended health guideline value set
1.2-Dibromo-3- chloropropane	Various	currently no recommended health guideline value set
1.2-Dibromoethane (EDB)	Various	should not exceed 40mg/L
1.2-Dichlorobenzene	Various	should not exceed 0.001mg/L
1.2-Dichloropropane	Various	should not exceed 75mg/L
1.3.5 - Trimethylbenzene	Various	should not exceed 25mg/L
1.3-Dichlorobenzene	Various	currently no recommended health guideline value set
1.3-Dichloropropane	Various	currently no recommended health guideline value set
1.4-Dichlorobenzene	Various	should not exceed 0.0003mg/L
2,4,6-Trichlorophenol	Various	currently no recommended health guideline value set
2,4-D	Various	should not exceed 0.03mg/L

Table A2: Drinking water quality compliance *(continued)*

Parameter	Sampling frequency	Water quality standard
2.3.4.6-Tetrachlorophenol	Various	currently no recommended health guideline value set
2.4.5-T	Various	should not exceed 0.1mg/L
2.4.5-Trichlorophenol	Various	should not exceed 0.02mg/L
2.4-Dichlorophenol	Various	should not exceed 0.02mg/L
2.6-Dichlorophenol	Various	should not exceed 0.02mg/L
2-Chlorophenol	Various	should not exceed 0.2mg/L
2-Chlorotoluene	Various	should not exceed 1mg/L
4,4'-DDT	Various	should not exceed 0.009mg/L
4.4'-DDD	Various	currently no recommended health guideline value set
4.4'-DDE	Various	currently no recommended health guideline value set
4-Chloro-3-Methylphenol	Various	currently no recommended health guideline value set
4-Chlorotoluene	Various	should not exceed 1mg/L
Aldrin	Various	should not exceed 0.0003mg/L
Alkalinity, Total as CaCO3	Various	aesthetic limit is 200mg/L
Aluminium, filtered	Various	currently no recommended health guideline value set
Aluminium, Total as Al	Various	currently no recommended health guideline value set
Ammonia	Various	aesthetic limit is 0.5 mg/L
Antimony	Various	should not exceed 0.003mg/L
Antimony, Filtered	Various	should not exceed 0.003mg/L
Arsenic	Various	should not exceed 0.01mg/L
Arsenic, Filtered	Various	should not exceed 0.01mg/L
Barium, as Ba	Various	should not exceed 2mg/L
Barium, Filtered	Various	limit based on Barium
Benzo(a)pyrene	Various	should not exceed 0.00001mg/L
Berylium, Filtered	Various	should not exceed 0.06mg/L
Beryllium, as Be	Various	should not exceed 0.06mg/L
BHC (alpha)	Various	should not exceed 1.2mg/L
BHC (beta)	Various	should not exceed 1.2mg/L
BHC (delta)	Various	should not exceed 1.2mg/L
Bicarbonate Alkalinity as CaCO3	Various	aesthetic limit is 200mg/L
Boron	Various	should not exceed 4mg/L
Boron, Filtered	Various	Limit based on Boron
Bromate	Various	should not exceed 0.02mg/L
Bromobenzene	Various	should not exceed 50mg/L
Bromodichlormethane	Various	should not exceed 0.25mg/L
Bromoform	Various	should not exceed 0.25mg/L
Cadmium	Various	should not exceed 0.002mg/L

Table A2: Drinking water quality compliance *(continued)*

Parameter	Sampling frequency	Water quality standard
Cadmium, Filtered	Various	Limit based on Cadmium
Calcium	Various	currently no recommended health guideline value set
Carbon tetrachloride	Various	should not exceed 0.003mg/L
Carbonate Alkalinity as CaCO3	Various	aesthetic limit is 200mg/L
Chlordane, Total	Various	should not exceed 0.002mg/L
Chlorine, Total	Various	should not exceed 5 mg/L
Chlorine, Free	Various	Limit based on Chlorine, Total
Chloroacetic acid	Various	should not exceed 0.15 mg/L
Chlorobenzene	Various	should not exceed 0.01mg/L
Chloroform	Various	should not exceed 0.25mg/L
Chromium	Various	should not exceed 0.05mg/L
Chromium, Filtered	Various	should not exceed 0.05mg/L
cis-1.2-Dichloroethene	Various	should not exceed 0.06mg/L
cis-1.3-Dichloropropylene	Various	should not exceed 0.03mg/L
cis-Chlordane	Various	should not exceed 0.002mg/L
Cobalt, as Co	Various	should not exceed 0.02mg/L
Cobalt, Filtered	Various	Limit based on Cobalt
Coliforms, Total	Various	currently no recommended health guideline value set
Colour, true	Various	should not exceed 15HU
Copper	Various	should not exceed 1mg/L
Copper, Filtered	Various	Limit based on Copper
Cyanide	Various	should not exceed 0.08 mg/L
Dibromochloromethane	Various	should not exceed 0.25mg/L
Dibromomethane	Various	should not exceed 0.04mg/L
Dichloroacetic acid	Various	should not exceed 0.1mg/L
Dissolved Organic Carbon	Various	currently no recommended health guideline value set
Dissolved Oxygen (Field)	Various	currently no recommended health guideline value set
Electrical Conductivity @ 25C	Various	aesthetic limit of 940µS/cm
Endosulfan I	Various	should not exceed 0.02mg/L
Endosulfan II	Various	should not exceed 0.02mg/L
Endosulfan sulfate	Various	currently no recommended health guideline value set
Endrin	Various	should not exceed 0.00002mg/L
Endrin aldehyde	Various	should not exceed 0.01mg/L
Endrin ketone	Various	should not exceed 0.005mg/L
Enterococci	Various	Should not exceed 0 orgs/100ml
Escherichia coli	Weekly	100%of 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.

Table A2: Drinking water quality compliance *(continued)*

Parameter	Sampling frequency	Water quality standard
Ethylbenzene	Various	should not exceed 0.003mg/L
Faecal Streptococci	Various	Should not exceed 0 orgs/100ml
Fluoride	Various	should exceed the limit of 1.5 mg/L
Formaldehyde	Various	should not exceed 0.5mg/L
Hardness, as CaCO3	Various	aesthetic limit is 200 mg/L
Heptachlor	Various	should not exceed 0.0003mg/L
Heptachlor Epoxide	Various	should not exceed 0.0003mg/L
Heterotrophic Plate Count, 22C	Various	currently no recommended health guideline value set
Heterotrophic Plate Count, 37C	Various	currently no recommended health guideline value set
Hexachlorobenzene	Various	currently no recommended health guideline value set
Hydroxide Alkalinity as CaCO3	Various	aesthetic limit is 200mg/L
Iron, Filtered (Soluble)	Various	Limit based on Iron, total
Iron, total as Fe	Various	aesthetic limit 0.3 mg/L
Lead	Various	should not exceed 0.01 mg/L
Lead, Filtered	Various	Limit based on Lead, total
Lindane	Various	should not exceed 0.01mg/L
Magnesium, as Mg	Various	currently no recommended health guideline value set
Manganese, Filtered (Soluble)	Various	limit based on Manganese, total
Manganese, total as Mn	Various	Aesthetic limit should not exceed 0.1mg/L, should not exceed 0.5mg/L
MCPA	Various	should not exceed 0.04 mg/L
Mercury, as Hg	Various	should not exceed 0.001 mg/L
meta- & para-Xylene	Various	should not exceed 0.02mg/L
Methoxychlor	Various	should not exceed 0.3mg/L
Methylene chloride	Various	should not exceed 0.004mg/L
Molybdenum, as Mo	Various	should not exceed 0.05mg/L
Monochloramine	Various	should not exceed 3 mg/L
Nickel	Various	should not exceed 0.02 mg/L
Nickel, Filtered	Various	Limit based on Nickel
Nitrate	Various	should not exceed 50 mg/L
Nitrite	Various	should not exceed 3 mg/L
n-Propylbenzene	Various	currently no recommended health guideline value set
ortho-Xylene	Various	should not exceed 0.02mg/L
Pentachlorophenol	Various	should not exceed 0.01mg/L
pH	Various	aesthetic limits are no less than 6.5, and no greater than 8.5
Phosphorus, Reactive as P	Various	should not exceed 1mg/L
p-Isopropyltoluene	Various	currently no recommended health guideline value set
Potassium, as K	Various	currently no recommended health guideline value set

Table A2: Drinking water quality compliance *(continued)*

Parameter	Sampling frequency	Water quality standard
sec-Butylbenzene	Various	currently no recommended health guideline value set
Selenium	Various	should not exceed 0.01mg/L
Selenium, Filtered	Various	Limit based on Selenium
Silica, Non Reactive	Various	currently no recommended health guideline value set
Silica, Reactive	Various	currently no recommended health guideline value set
Silver, Filtered as Ag	Various	limit based on Silver
Silver, Total as Ag	Various	should not exceed 0.1mg/L
Simazine	Various	should not exceed 0.02mg/L
Sodium	Various	aesthetic limit should not exceed 180 mg/L
Strontium, Filtered	Various	limit based on Strontium
Strontium, Total	Various	should not exceed 1.5mg/L
Styrene	Various	should not exceed 0.004mg/L
Sulfate	Various	aesthetic limit should not exceed 250 mg/L
tert-Butylbenzene	Various	currently no recommended health guideline value set
Tetrachloroethene	Various	should not exceed 0.05mg/L
Thallium, Total	Various	should not exceed 2mg/L
Tin, Filtered	Various	currently no recommended health guideline value set
Tin, Total as Sn	Various	currently no recommended health guideline value set
Titanium, Filtered	Various	currently no recommended health guideline value set
Titanium, Total	Various	currently no recommended health guideline value set
Toluene	Various	should not exceed 0.025mg/L
trans-1.2-Dichloroethene	Various	should not exceed 0.06mg/L
trans-1.3- Dichloropropylene	Various	should not exceed 0.03mg/L
trans-Chlordane	Various	should not exceed 0.002mg/L
Trichloroacetic acid	Various	should not exceed 0.1mg/L
Trichloroethene	Various	currently no recommended health guideline value set
Trihalomethanes	Monthly	must not exceed 0.25 mg/L (reference Safe Drinking Water Regulations 2015)
Turbidity	Weekly	5th percentile limit of drinking water samples collected in the preceding 12 months must be less than or equal to 5.0 Nephelometric Turbidity Units (NTU) (reference Safe Drinking Water Regulations 2015)
UV Transmission@254nm	Various	currently no recommended health guideline value set
Vanadium, as V	Various	should not exceed 0.021mg/L
Vanadium, Filtered	Various	should not exceed 0.021mg/L
Zinc	Various	should not exceed 3mg/L
Zinc, Filtered	Various	limit based on Zinc

NB: where detailed result information of the listed parameters is not shown in the following tables, this information is available on request.

A4.1 *E. coli*

Escherichia coli (E. coli) is abundant in human and animal faeces and is tested as a specific indicator of faecal contamination in the drinking water supply. Detection of *E. coli* can indicate a failure in water treatment, contamination of a water storage facility or possible infiltration of the enclosed system.

Treatment through disinfection removes *E. coli*. Western Water applies chemical disinfection by chlorination or chloramination in all its supply systems. A level of disinfection residual is maintained within the distribution system to prevent potential regrowth of microorganisms before reaching customer taps.

Table A3: *Escherichia coli* results

Water sampling locality	Sampling frequency	No. of sample[1]	No. of samples detecting *E. coli*	No. of *E. coli* investigations completed	No. of false detections of *E. coli*	Max. detected result (orgs/mL)	Complying (Yes/No)	Compliance %, as per ESC reporting
Bulla	Weekly	53	0	0	0	0	Yes	100%
Darley[2]	Weekly	433	1	1	1	1	Yes	100%
Diggers Rest	Weekly	106	0	0	0	0	Yes	100%
Eynesbury	Weekly	158	0	0	0	0	Yes	100%
Gisborne	64/year	331[5]	0	0	0	0	Yes	100%
Lancefield	Weekly	101	0	0	0	0	Yes	100%
Lerderderg	64/year	222[6]	0	0	0	0	Yes	100%
Macedon	Weekly	157	0	0	0	0	Yes	100%
Maddingley	Weekly	160	0	0	0	0	Yes	100%
Melton South	112/year	244	0	0	0	0	Yes	100%
Merrimu[3]	64/year	220	1	1	1	1	Yes	100%
Mount Macedon	Weekly	205	0	0	0	0	Yes	100%
Myrniong	Weekly	262	0	0	0	0	Yes	100%
Riddells Creek	Weekly	159	0	0	0	0	Yes	100%
Rockbank	Weekly	208	0	0	0	0	Yes	100%
Romsey[4]	Weekly	327	1	1	1	1	Yes	100%
Sunbury	112/year	436	0	0	0	0	Yes	100%
Toolern Vale	Weekly	104	0	0	0	0	Yes	100%
Woodend	64/year	219	0	0	0	0	Yes	100%

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Darley, *E. coli* detection, refer to refer to Section 6 Incident management and Emergency Response.
3. Merrimu, Merrimu 5ML Tank *E. coli* detection, refer to Section 6 Incident management and Emergency Response.
4. Romsey *E. coli* detection , refer to Section 6 Incident management and Emergency Response.
5. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
6. Dodemaide Tank offline during 2020-21.

A4.2 Chlorine-based disinfection by-product chemicals

Western Water disinfects its drinking water supplies by either chlorination or chloramination. Chlorine-based disinfection by-products measured under the Safe Drinking Water Regulations 2015 include total trihalomethanes. The following section reports the results for the 2020-21 monitoring program.

Total trihalomethanes

Trihalomethanes are present in drinking water principally as a by-product of disinfection from chlorination or chloramination, where chlorine reacts with organic material.

Trihalomethanes

Table A4: Trihalomethanes results

Water sampling locality	Sampling frequency	No. of samples[1]	No. of non-complying samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying (Yes/No)[2]
Bulla	Monthly	12	0	0.05	0.04	0.04	Yes
Darley	Monthly	98	0	0.19	0.07	0.12	Yes
Diggers Rest	Monthly	12	0	0.04	0.02	0.03	Yes
Eynesbury	Monthly	22	0	0.05	0.03	0.04	Yes
Gisborne	Monthly	105[3,5]	0	0.10	0.01	0.05	Yes
Lancefield	Monthly	24	0	0.21	0.08	0.15	Yes
Lerderderg	Monthly	36[4]	0	0.19	0.08	0.12	Yes
Macedon	Monthly	41	0	0.14	0.03	0.07	Yes
Maddingley	Monthly	23	0	0.21	0.09	0.14	Yes
Melton South	Monthly	42	0	0.04	0.02	0.03	Yes
Merrimu	Monthly	40	0	0.12	0.02	0.06	Yes
Mount Macedon	Monthly	48	0	0.15	0.03	0.09	Yes
Myrniong	Monthly	42	0	0.15	0.02	0.08	Yes
Riddells Creek	Monthly	36	0	0.14	0.02	0.07	Yes
Rockbank	Monthly	41	0	0.04	0.01	0.02	Yes
Romsey	Monthly	48	0	0.09	0.00	0.02	Yes
Sunbury	Monthly	72	0	0.12	0.01	0.04	Yes
Toolern Vale	Monthly	24	0	0.13	0.06	0.10	Yes
Woodend	Monthly	46	0	0.11	0.02	0.06	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the guideline values set out in the SDWR2015 and ADWG for total trihalomethanes in drinking water based on health. considerations should not exceed 0.25mg/L.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. PAX™ commissioning, refer to Section 9, Research and Development.

Ozone-based disinfection by-product chemicals

The ozone-based disinfection by-products bromate and formaldehyde are not deemed to be a significant risk in drinking water supplied by Western Water as the largest potential risk for the presence of these by-products in drinking water exceeding compliance levels is through ozonation.

Western Water does not use ozone-based chemicals for disinfection of drinking water. Accordingly, sampling and analyses for bromate and formaldehyde were not undertaken in the 2020-21 reporting period.

A4.3 Turbidity

Turbidity is the measurement of the light scattering properties of water and is caused by the presence of fine suspended matter in the supply. Based on aesthetic considerations, the turbidity standard is set at 5 nephelometric turbidity units (NTU), which is the point where water may appear slightly discoloured in a glass.

The following table reflects the reporting period 1 July 2020 to 30 June 2021, under the Safe Drinking Water Regulations 2015.

A summary of the turbidity results for samples taken at customer taps in 2020-21 is listed below. It includes the statistical measure of the 95th percentile for samples taken for turbidity over a 12-month period.

Turbidity

Table A5: Turbidity results

Water sampling locality	Sampling frequency	No. of samples[1]	Max. NTU	Min. NTU	95th percentile	Complying (Yes/No)
Bulla	Weekly	53	1.0	0.4	0.8	Yes
Darley	Weekly	432[4]	0.9	0.1	0.2	Yes
Diggers Rest	Weekly	106	1.2	0.4	1.2	Yes
Eynesbury	Weekly	156	1.3	0.3	1.1	Yes
Gisborne	Weekly	318[2]	1.0	0.1	0.9	Yes
Lancefield	Weekly	101	0.2	0.1	0.1	Yes
Lerderderg	Weekly	209[3]	0.4	0.1	0.3	Yes
Macedon	Weekly	154	1.2	0.1	0.8	Yes
Maddingley	Weekly	160	0.7	0.1	0.3	Yes
Melton South	Weekly	183	1.0	0.4	0.7	Yes
Merrimu	Weekly	208[5]	0.7	0.1	0.6	Yes
Mount Macedon	Weekly	205	0.8	0.1	0.8	Yes
Myrniong	Weekly	261	3.2	0.1	0.3	Yes
Riddells Creek	Weekly	159	1.0	0.1	1.0	Yes
Rockbank	Weekly	208	1.4	0.4	0.9	Yes
Romsey	Weekly	316[6]	0.8	0.1	0.1	Yes
Sunbury	Weekly	373	1.1	0.1	1.3	Yes
Toolern Vale	Weekly	104	0.3	0.1	0.2	Yes
Woodend	Weekly	207	0.3	0.1	0.1	Yes

NTU: nephelometric turbidity unit

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
3. Dodemaide Tank offline during 2020-21.
4. Darley, *E. coli* detection, refer to refer to Section 6 Incident management and Emergency Response.
5. Merrimu, Merrimu 5ML Tank *E. coli* detection, refer to Section 6 Incident management and Emergency Response.
6. Romsey *E. coli* detection , refer to Section 6 Incident management and Emergency Response.

A4.4 Fluoride

Both the *Health (Fluoridation) Act 1973* and the Department of Health require that the optimal range of fluoride in drinking water supplied by Western Water must be between 0.8mg/L and 1.0mg/L, and a minimum of 0.6mg/L. Fluoride levels in any individual sample from drinking water supplied must also not exceed 1.5 mg/L, according to the ADWG.

The following table reflects the reporting period 1 July 2020 to 30 June 2021 under the Safe Drinking Water Regulations 2015.

Fluoride is added to the drinking water to improve dental health. In supplies where fluoride is not added, naturally occurring sources, such as soils and rock, may impart fluoride to the water.

For further information on water fluoridation, please visit the Victorian Department of Health website for water fluoridation:

www2.health.vic.gov.au/public-health/water/water-fluoridation

Fluoride

Table A6: Fluoride results

Water sampling locality	Sampling frequency	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)[3]	Complying (Yes/ No)
Bulla	Fortnightly	24	0.8	0.7	0.8	Yes
Darley	Fortnightly	50	0.9	0.6	0.8	Yes
Diggers Rest	Fortnightly	36	0.9	0.7	0.8	Yes
Eynesbury	Fortnightly	57	0.9	0.7	0.7	Yes
Gisborne	Fortnightly	178[4]	0.9	0.6	0.8	Yes
Lancefield[2]	Quarterly	10	0.2	0.1	0.1	Yes
Lerderderg	Fortnightly	40[5]	0.9	0.6	0.8	Yes
Macedon	Fortnightly	85	0.9	0.6	0.8	Yes
Maddingley	Fortnightly	38	0.9	0.6	0.8	Yes
Melton South	Fortnightly	24	0.8	0.7	0.7	Yes
Merrimu	Fortnightly	67	0.9	0.6	0.7	Yes
Mount Macedon	Fortnightly	105	0.9	0.7	0.8	Yes
Myrniong[2]	Quarterly	24	0.1	0.1	0.1	Yes
Riddells Creek	Fortnightly	88	0.9	0.6	0.8	Yes
Rockbank	Fortnightly	55	0.8	0.7	0.7	Yes
Romsey[2]	Quarterly	39	0.3	0.1	0.2	Yes
Sunbury	Fortnightly	100	0.9	0.7	0.7	Yes
Toolern Vale	Fortnightly	26	1.0	0.6	0.8	Yes
Woodend[2]	Quarterly	28	0.2	0.1	0.1	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Non-fluoridated supplies (unless supplied with external water sources).
3. *Health (Fluoridation) Act 1973*, fluoride added to an extent that must not results in an average optimum concentration in excess of one part fluoride per million parts of water. Hence, 1.0 mg/L.
4. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
5. Dodemaide Tank offline during 2020-21.

A4.5 Other chemicals not specified in Schedule 2 but which may pose a risk to human health

Besides those parameters tested under the Safe Drinking Water Regulations 2015, Western Water also tests for other substances that may pose a risk to human health, as required by Section 12 of the SDWR. These results are measured in accordance with the ADWG. All results presented in this report are available to customers on request. Any further explanation on any parameters of concern is provided as required.

The following reports 2020-21 compliance against the health-related guideline values set out in ADWG or other cited guidelines for other parameters measured at customers' taps that may pose a risk to human health. All samples complied with the health-related guideline values for ADWG or other cited guidelines.

Chloroacetic acid

Chloroacetic acid is a by-product of the reaction between chlorine and naturally-occurring humic and fulvic acids in the drinking water supply.

Table A7: Chloroacetic acid results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Mean (mg/L)	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Yearly	1	0.005	0.005	0.005	Yes
Darley	Yearly	1	0.005	0.005	0.005	Yes
Diggers Rest	Yearly	1	0.005	0.005	0.005	Yes
Eynesbury	Yearly	2	0.005	0.005	0.005	Yes
Gisborne	Yearly	11	0.005	0.005	0.005	Yes
Lancefield	Yearly	2	0.005	0.005	0.005	Yes
Lerderderg	Yearly	1	0.005	0.005	0.005	Yes
Macedon	Yearly	5	0.005	0.005	0.005	Yes
Maddingley	Yearly	1	0.005	0.005	0.005	Yes
Melton South	Yearly	4	0.005	0.005	0.005	Yes
Merrimu	Yearly	2	0.005	0.005	0.005	Yes
Mount Macedon	Yearly	7	0.005	0.005	0.005	Yes
Myrniong	Yearly	1	0.005	0.005	0.005	Yes
Riddells Creek	Yearly	5	0.005	0.005	0.005	Yes
Rockbank	Yearly	3	0.005	0.005	0.005	Yes
Romsey	Yearly	4	0.005	0.005	0.005	Yes
Sunbury	Yearly	7	0.005	0.005	0.005	Yes
Toolern Vale	Yearly	1	0.005	0.005	0.005	Yes
Woodend	Yearly	1	0.005	0.005	0.005	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the guideline values set out in ADWG for total chloroacetic acid in drinking water based on health considerations should not exceed 0.15mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Dichloroacetic acid

Dichloroacetic acid is a by-product of the reaction between chlorine and naturally occurring humic and fulvic acids in the drinking water supply.

Table A8: Dichloroacetic acid results

Water sampling locality	Sampling frequency[4]	No. of samples[1]	Mean (mg/L)	Max. (mg/L)	Min. (mg/L)[2]	Complying[3] (Yes/No)
Bulla	Yearly	1	0.005	0.005	0.005	Yes
Darley	Yearly	1	0.024	0.024	0.024	Yes
Diggers Rest	Yearly	1	0.009	0.009	0.009	Yes
Eynesbury	Yearly	2	0.015	0.015	0.014	Yes
Gisborne	Yearly	11	0.010	0.032	0.005	Yes
Lancefield	Yearly	2	0.016	0.023	0.009	Yes
Lerderderg	Yearly	1	0.005	0.005	0.005	Yes
Macedon	Yearly	5	0.014	0.018	0.008	Yes
Maddingley	Yearly	1	0.027	0.027	0.027	Yes
Melton South	Yearly	4	0.006	0.009	0.005	Yes
Merrimu	Yearly	2	0.006	0.007	0.005	Yes
Mount Macedon	Yearly	7	0.017	0.019	0.015	Yes
Myrniong	Yearly	1	0.013	0.013	0.013	Yes
Riddells Creek	Yearly	5	0.011	0.016	0.005	Yes
Rockbank	Yearly	3	0.007	0.010	0.005	Yes
Romsey	Yearly	4	0.013	0.037	0.005	Yes
Sunbury	Yearly	7	0.009	0.026	0.005	Yes
Toolern Vale	Yearly	1	0.010	0.010	0.010	Yes
Woodend	Yearly	1	0.022	0.022	0.022	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. A result of <0.005 mg/L is a result less than the detection limit for total dichloroacetic acid.
3. Compliance as measured against the guideline values set out in ADWG for total dichloroacetic acid in drinking water based on health considerations should not exceed 0.1mg/L.
4. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Trichloroacetic acid

Trichloroacetic acid is a by-product of the reaction between chlorine and naturally occurring humic and fulvic acids in the drinking water supply.

Table A9: Trichloroacetic acid results

Water sampling locality	Sampling frequency[4]	No. of samples[1]	Mean (mg/L)	Max. (mg/L)	Min. (mg/L)[2]	Complying[3] (Yes/No)
Bulla	Yearly	1	0.015	0.015	0.015	Yes
Darley	Yearly	1	0.019	0.019	0.019	Yes
Diggers Rest	Yearly	1	0.013	0.013	0.013	Yes
Eynesbury	Yearly	1	0.021	0.021	0.021	Yes
Gisborne	Yearly	11	0.007	0.013	0.005	Yes
Lancefield	Yearly	2	0.021	0.022	0.020	Yes
Lerderderg	Yearly	1	0.011	0.011	0.011	Yes
Macedon	Yearly	5	0.009	0.014	0.005	Yes
Maddingley	Yearly	1	0.021	0.021	0.021	Yes
Melton South	Yearly	4	0.010	0.012	0.008	Yes
Merrimu	Yearly	2	0.017	0.021	0.012	Yes
Mount Macedon	Yearly	7	0.009	0.014	0.005	Yes
Myrniong	Yearly	1	0.007	0.007	0.007	Yes
Riddells Creek	Yearly	5	0.007	0.012	0.005	Yes
Rockbank	Yearly	3	0.008	0.013	0.005	Yes
Romsey	Yearly	4	0.011	0.028	0.005	Yes
Sunbury	Yearly	7	0.011	0.026	0.005	Yes
Toolern Vale	Yearly	1	0.010	0.010	0.010	Yes
Woodend	Yearly	1	0.020	0.020	0.020	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. A result of <0.005 mg/L is a result less than the detection limit for total trichloroacetic acid.
3. Compliance as measured against the guideline values set out in ADWG for total trichloroacetic acid in drinking water based on health considerations should not exceed 0.1mg/L.
4. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Manganese

Table A10: Manganese (total as Mn) results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying[2] (Yes/No)
Bulla	Quarterly	95	0.003	0.001	0.002	Yes
Darley	Quarterly	79	0.007	0.001	0.001	Yes
Diggers Rest	Quarterly	21	0.003	0.001	0.002	Yes
Eynesbury	Quarterly	46	0.007	0.001	0.002	Yes
Gisborne	Quarterly	94[3]	0.006	0.001	0.003	Yes
Lancefield	Quarterly	32	0.004	0.001	0.001	Yes
Lerderderg	Quarterly	29[4]	0.002	0.001	0.001	Yes
Macedon	Quarterly	17	0.004	0.001	0.002	Yes
Maddingley	Quarterly	26	0.004	0.001	0.001	Yes
Melton South	Quarterly	57	0.003	0.001	0.002	Yes
Merrimu	Quarterly	69	0.005	0.001	0.002	Yes
Mount Macedon	Quarterly	19	0.011	0.001	0.003	Yes
Myrniong	Quarterly	72	0.008	0.001	0.001	Yes
Riddells Creek	Quarterly	17	0.007	0.001	0.002	Yes
Rockbank	Quarterly	75	0.005	0.001	0.002	Yes
Romsey	Quarterly	99	0.021	0.001	0.005	Yes
Sunbury	Quarterly	140	0.005	0.001	0.002	Yes
Toolern Vale	Quarterly	12	0.001	0.001	0.001	Yes
Woodend	Quarterly	87	0.015	0.001	0.002	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline values set out in ADWG for manganese in drinking water should not exceed 0.1 mg/L for aesthetics and 0.5mg/L for health limit.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Lead

Table A11: Lead (total as Pb) results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Quarterly	4	0.001	0.001	Yes
Darley	Quarterly	4	0.001	0.001	Yes
Diggers Rest	Quarterly	4	0.001	0.001	Yes
Eynesbury	Quarterly	6	0.001	0.001	Yes
Gisborne	Quarterly	5	0.001	0.001	Yes
Lancefield	Quarterly	6	0.001	0.001	Yes
Lerderderg	Quarterly	4	0.001	0.001	Yes
Macedon	Quarterly	4	0.001	0.001	Yes
Maddingley	Quarterly	4	0.002	0.001	Yes
Melton South	Quarterly	10	0.001	0.001	Yes
Merrimu	Quarterly	6	0.001	0.001	Yes
Mount Macedon	Quarterly	4	0.001	0.001	Yes
Myrniong	Quarterly	6	0.001	0.001	Yes
Riddells Creek	Quarterly	4	0.001	0.001	Yes
Rockbank	Quarterly	8	0.001	0.001	Yes
Romsey	Quarterly	10	0.001	0.001	Yes
Sunbury	Quarterly	15	0.001	0.001	Yes
Toolern Vale	Quarterly	4	0.001	0.001	Yes
Woodend	Quarterly	7	0.001	0.001	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline values set out in ADWG for lead in drinking water should not exceed 0.01 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Copper

Table A12: Copper (total as Cu) results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Quarterly	4	0.002	0.001	Yes
Darley	Quarterly	4	0.010	0.002	Yes
Diggers Rest	Quarterly	4	0.006	0.003	Yes
Eynesbury	Quarterly	6	0.007	0.001	Yes
Gisborne	Quarterly	4	0.004	0.001	Yes
Lancefield	Quarterly	6	0.007	0.001	Yes
Lerderderg	Quarterly	4	0.008	0.002	Yes
Macedon	Quarterly	4	0.005	0.001	Yes
Maddingley	Quarterly	4	0.025	0.004	Yes
Melton South	Quarterly	10	0.006	0.001	Yes
Merrimu	Quarterly	6	0.004	0.001	Yes
Mount Macedon	Quarterly	4	0.003	0.001	Yes
Myrniong	Quarterly	6	0.076	0.001	Yes
Riddells Creek	Quarterly	4	0.001	0.001	Yes
Rockbank	Quarterly	6	0.009	0.001	Yes
Romsey	Quarterly	10	0.022	0.001	Yes
Sunbury	Quarterly	13	0.005	0.001	Yes
Toolern Vale	Quarterly	4	0.005	0.002	Yes
Woodend	Quarterly	5	0.002	0.001	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the guideline values set out in ADWG for copper in drinking water should not exceed 2 mg/L based on health considerations, and 1mg/L base on aesthetic considerations.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Arsenic

Table A13: Arsenic results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	1	0.001	0.001	Yes
Darley	Annually	1	0.001	0.001	Yes
Diggers Rest	Annually	1	0.001	0.001	Yes
Eynesbury	Annually	1	0.001	0.001	Yes
Gisborne	Annually	1	0.001	0.001	Yes
Lancefield	Annually	1	0.001	0.001	Yes
Lerderderg	Annually	1	0.001	0.001	Yes
Macedon	Annually	1	0.001	0.001	Yes
Maddingley	Annually	1	0.001	0.001	Yes
Melton South	Annually	1	0.001	0.001	Yes
Merrimu	Annually	1	0.001	0.001	Yes
Mount Macedon	Annually	1	0.001	0.001	Yes
Myrniong	Annually	1	0.001	0.001	Yes
Riddells Creek	Annually	1	0.001	0.001	Yes
Rockbank	Annually	2	0.001	0.001	Yes
Romsey	Annually	1	0.001	0.001	Yes
Sunbury	Annually	2	0.001	0.001	Yes
Toolern Vale	Annually	1	0.001	0.001	Yes
Woodend	Annually	1	0.001	0.001	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for arsenic in drinking water should not exceed 0.01 mg/L. The detection limit for arsenic is 0.001 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Chlorite

Chlorite is a by-product of chlorine dioxide disinfection. Western Water does not use chlorine dioxide as a disinfectant for drinking water. For this reason, is unlikely to be present in the drinking water supplied by Western Water as it does not occur naturally. As a result, sampling for chlorite was not undertaken in the 2020-21 reporting period.

Monochloramine

Sampling for monochloramine was conducted in all localities receiving water supply disinfected by chloramination. Routine sampling for monochloramine in some localities that are chlorinated occurred as the disinfection mode had changed, but the sampling regime had not.

During 2020-21, no monochloramine sampling was performed in Bulla, Diggers Rest or Sunbury. These localities were disinfected by chlorination.

Table A14: Monochloramine results

Water sampling locality	Sampling frequency	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying[2] (Yes/No)
Romsey	Weekly	275[3]	0.93	0.05	0.50	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for monochloramine in drinking water should not exceed 3 mg/L.
3. Romsey *E. coli* detection , refer to Section 6 Incident management and Emergency Response.

Nickel

Table A15: Nickel (total as Ni) results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	2	0.001	0.001	Yes
Darley	Annually	2	0.001	0.001	Yes
Diggers Rest	Annually	2	0.001	0.001	Yes
Eynesbury	Annually	3	0.001	0.001	Yes
Gisborne	Annually	7	0.001	0.001	Yes
Lancefield	Annually	4	0.001	0.001	Yes
Lerderderg	Annually	2	0.001	0.001	Yes
Macedon	Annually	4	0.001	0.001	Yes
Maddingley	Annually	2	0.001	0.001	Yes
Melton South	Annually	5	0.001	0.001	Yes
Merrimu	Annually	3	0.001	0.001	Yes
Mount Macedon	Annually	5	0.001	0.001	Yes
Myrniong	Annually	3	0.002	0.001	Yes
Riddells Creek	Annually	4	0.001	0.001	Yes
Rockbank	Annually	3	0.001	0.001	Yes
Romsey	Annually	8	0.001	0.001	Yes
Sunbury	Annually	9	0.001	0.001	Yes
Toolern Vale	Annually	2	0.001	0.001	Yes
Woodend	Annually	4	0.001	0.001	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for nickel in drinking water should not exceed 0.02 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Chlorine

Table A16: Total Chlorine results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying[2] (Yes/No)
Bulla	Weekly	53	0.88	0.07	0.38	Yes
Darley	Weekly	433	3.40	0.14	0.96	Yes
Diggers Rest	Weekly	106	1.10	0.05	0.46	Yes
Eynesbury	Weekly	158	1.30	0.38	0.87	Yes
Gisborne	64/year	359[3]	2.20	0.18	1.04	Yes
Lancefield	Weekly	101	1.70	0.17	1.10	Yes
Lerderderg	64/year	222[4]	1.70	0.20	1.00	Yes
Macedon	Weekly	161	1.30	0.06	0.87	Yes
Maddingley	Weekly	160	1.70	0.09	1.04	Yes
Melton South	112/year	244	1.40	0.11	0.65	Yes
Merrimu	64/year	220	2.50	0.05	0.82	Yes
Mount Macedon	Weekly	205	1.60	0.45	0.89	Yes
Myrniong	Weekly	262	3.10	0.05	1.03	Yes
Riddells Creek	Weekly	159	1.40	0.06	0.97	Yes
Rockbank	Weekly	208	1.80	0.39	1.00	Yes
Romsey	Weekly	327	1.60	0.25	0.84	Yes
Sunbury	112/year	436	1.60	0.05	0.84	Yes
Toolern Vale	Weekly	104	2.00	0.11	0.79	Yes
Woodend	64/year	219	1.60	0.12	0.94	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for chlorine in drinking water should not exceed 5 mg/L. Western Water has an internal benchmark of maximum 1.10 mg/L for total chlorine at its customer taps.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Chromium

Table A17: Chromium (total as Cr) results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	2	0.001	0.001	Yes
Darley	Annually	2	0.001	0.001	Yes
Diggers Rest	Annually	2	0.001	0.001	Yes
Eynesbury	Annually	3	0.001	0.001	Yes
Gisborne	Annually	12	0.001	0.001	Yes
Lancefield	Annually	4	0.001	0.001	Yes
Lerderderg	Annually	2	0.001	0.001	Yes
Macedon	Annually	6	0.001	0.001	Yes
Maddingley	Annually	2	0.001	0.001	Yes
Melton South	Annually	5	0.001	0.001	Yes
Merrimu	Annually	3	0.001	0.001	Yes
Mount Macedon	Annually	10	0.001	0.001	Yes
Myrniong	Annually	2	0.001	0.001	Yes
Riddells Creek	Annually	6	0.001	0.001	Yes
Rockbank	Annually	4	0.001	0.001	Yes
Romsey	Annually	8	0.001	0.001	Yes
Sunbury	Annually	11	0.001	0.001	Yes
Toolern Vale	Annually	2	0.001	0.001	Yes
Woodend	Annually	6	0.001	0.001	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality g/L.
2. Compliance as measured against the health related guideline value set out in ADWG for chromium in drinking water should not exceed 0.05 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Cyanide

Table A18: Cyanide results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	1	0.005	0.005	Yes
Darley	Annually	1	0.005	0.005	Yes
Diggers Rest	Annually	1	0.005	0.005	Yes
Eynesbury	Annually	1	0.005	0.005	Yes
Gisborne	Annually	1	0.005	0.005	Yes
Lancefield	Annually	1	0.005	0.005	Yes
Lerderderg	Annually	1	0.005	0.005	Yes
Macedon	Annually	1	0.005	0.005	Yes
Maddingley	Annually	1	0.005	0.005	Yes
Melton South	Annually	1	0.005	0.005	Yes
Merrimu	Annually	1	0.005	0.005	Yes
Mount Macedon	Annually	1	0.005	0.005	Yes
Myrniong	Annually	1	0.005	0.005	Yes
Riddells Creek	Annually	1	0.005	0.005	Yes
Rockbank	Annually	2	0.005	0.005	Yes
Romsey	Annually	1	0.005	0.005	Yes
Sunbury	Annually	2	0.005	0.005	Yes
Toolern Vale	Annually	1	0.005	0.005	Yes
Woodend	Annually	1	0.005	0.005	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for cyanide in drinking water should not exceed 0.08 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Mercury

Table A19: Mercury results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	2	0.0001	0.0001	Yes
Darley	Annually	2	0.0001	0.0001	Yes
Diggers Rest	Annually	2	0.0001	0.0001	Yes
Eynesbury	Annually	3	0.0001	0.0001	Yes
Gisborne	Annually	2	0.0001	0.0001	Yes
Lancefield	Annually	4	0.0001	0.0001	Yes
Lerderderg	Annually	2	0.0001	0.0001	Yes
Macedon	Annually	2	0.0001	0.0001	Yes
Maddingley	Annually	2	0.0001	0.0001	Yes
Melton South	Annually	5	0.0001	0.0001	Yes
Merrimu	Annually	3	0.0001	0.0001	Yes
Mount Macedon	Annually	2	0.0001	0.0001	Yes
Myrniong	Annually	2	0.0001	0.0001	Yes
Riddells Creek	Annually	2	0.0001	0.0001	Yes
Rockbank	Annually	4	0.0001	0.0001	Yes
Romsey	Annually	8	0.0001	0.0001	Yes
Sunbury	Annually	9	0.0001	0.0001	Yes
Toolern Vale	Annually	2	0.0001	0.0001	Yes
Woodend	Annually	2	0.0001	0.0001	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for mercury in drinking water should not exceed 0.001 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Nitrate

Table A20: Nitrate results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Monthly	12	0.180	0.065	Yes
Darley	Monthly	38	0.130	0.029	Yes
Diggers Rest	Monthly	12	0.180	0.065	Yes
Eynesbury	Monthly	18	0.180	0.075	Yes
Gisborne	Annually	18[3]	0.220	0.080	Yes
Lancefield	Monthly	22	0.160	0.016	Yes
Lerderderg	Monthly	20[4]	0.120	0.042	Yes
Macedon	Annually	3	0.160	0.069	Yes
Maddingley	Monthly	15	0.120	0.048	Yes
Melton South	Monthly	12	0.160	0.084	Yes
Merrimu	Monthly	17	0.170	0.044	Yes
Mount Macedon	Annually	5	0.200	0.069	Yes
Myrniong	Monthly	59	0.470	0.130	Yes
Riddells Creek	Annually	3	0.180	0.095	Yes
Rockbank	Monthly	16	0.160	0.077	Yes
Romsey	Monthly	37	0.260	0.047	Yes
Sunbury	Monthly	26	0.220	0.067	Yes
Toolern Vale	Monthly	16	0.200	0.041	Yes
Woodend	Monthly	32	0.160	0.005	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for that specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for nitrate in drinking water should not exceed 50 mg/L.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Nitrite

Table A21: Nitrite results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Monthly	12	0.002	0.002	Yes
Darley	Monthly	38	0.002	0.002	Yes
Diggers Rest	Monthly	12	0.002	0.002	Yes
Eynesbury	Monthly	18	0.005	0.002	Yes
Gisborne	Annually	18[3]	0.002	0.002	Yes
Lancefield	Monthly	21	0.010	0.002	Yes
Lerderderg	Monthly	20[4]	0.002	0.002	Yes
Macedon	Annually	3	0.002	0.002	Yes
Maddingley	Monthly	15	0.002	0.002	Yes
Melton South	Monthly	12	0.002	0.002	Yes
Merrimu	Monthly	17	0.002	0.002	Yes
Mount Macedon	Annually	5	0.002	0.002	Yes
Myrniong	Monthly	59	0.002	0.002	Yes
Riddells Creek	Annually	3	0.002	0.002	Yes
Rockbank	Monthly	16	0.010	0.002	Yes
Romsey	Monthly	37	0.130	0.002	Yes
Sunbury	Monthly	26	0.010	0.002	Yes
Toolern Vale	Monthly	16	0.002	0.002	Yes
Woodend	Monthly	32	0.003	0.002	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for that specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for nitrite in drinking water should not exceed 3 mg/L.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Selenium

Table A22: Selenium results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	1	0.001	0.001	Yes
Darley	Annually	1	0.001	0.001	Yes
Diggers Rest	Annually	1	0.001	0.001	Yes
Eynesbury	Annually	1	0.001	0.001	Yes
Gisborne	Annually	1	0.001	0.001	Yes
Lancefield	Annually	2	0.001	0.001	Yes
Lerderderg	Annually	1	0.001	0.001	Yes
Macedon	Annually	1	0.001	0.001	Yes
Maddingley	Annually	1	0.001	0.001	Yes
Melton South	Annually	1	0.001	0.001	Yes
Merrimu	Annually	1	0.001	0.001	Yes
Mount Macedon	Annually	1	0.001	0.001	Yes
Myrniong	Annually	1	0.001	0.001	Yes
Riddells Creek	Annually	1	0.001	0.001	Yes
Rockbank	Annually	2	0.001	0.001	Yes
Romsey	Annually	7	0.001	0.001	Yes
Sunbury	Annually	2	0.001	0.001	Yes
Toolern Vale	Annually	1	0.001	0.001	Yes
Woodend	Annually	1	0.001	0.001	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for that specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for selenium in drinking water should not exceed 0.01 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Cadmium

Table A23: Cadmium results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	2	0.0002	0.0002	Yes
Darley	Annually	2	0.0002	0.0002	Yes
Diggers Rest	Annually	2	0.0002	0.0002	Yes
Eynesbury	Annually	3	0.0002	0.0002	Yes
Gisborne	Annually	7	0.0002	0.0002	Yes
Lancefield	Annually	4	0.0002	0.0002	Yes
Lerderderg	Annually	2	0.0002	0.0002	Yes
Macedon	Annually	4	0.0002	0.0002	Yes
Maddingley	Annually	2	0.0002	0.0002	Yes
Melton South	Annually	5	0.0002	0.0002	Yes
Merrimu	Annually	4	0.0002	0.0002	Yes
Mount Macedon	Annually	5	0.0002	0.0002	Yes
Myrniong	Annually	3	0.0002	0.0002	Yes
Riddells Creek	Annually	4	0.0002	0.0002	Yes
Rockbank	Annually	3	0.0002	0.0002	Yes
Romsey	Annually	8	0.0002	0.0002	Yes
Sunbury	Annually	9	0.0004	0.0002	Yes
Toolern Vale	Annually	2	0.0002	0.0002	Yes
Woodend	Annually	4	0.0002	0.0002	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for that specific water sampling locality.
2. Compliance as measured against the health related guideline value set out in ADWG for cadmium in drinking water should not exceed 0.002 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

A4.6 Drinking water aesthetics results

Western Water tests for parameters in the drinking water supply that may affect appearance or taste and odour, as well as those that may interact with pipes and fittings within the distribution system and within hot water services.

These results are measured in accordance with the aesthetic measures in the ADWG or other cited guidelines. Compliance calculations hereafter are based on mean results for samples taken throughout the year, as outlined in ADWG or other cited guidelines.

The following tables reflect the reporting period 1 July 2020 to 30 June 2021 under the Safe Drinking Water Regulations 2015.

Aluminium

Aluminium can be present in water through the natural leaching of soils and the use of aluminium salts as coagulants during the water treatment process. Acid-soluble aluminium concentrations in excess of 0.2 mg/L, caused by post-flocculation may lead to aesthetic problems such as 'milky coloured' water in the distribution system which may result in the precipitation of aluminium hydroxide depending on the pH level.

Total aluminium is measured quarterly at customer taps at all 19 localities whether or not aluminium is added as a coagulant as part of the water treatment process. Where aluminium is not used in the treatment process, any detection of aluminium will likely be due to naturally-occurring microscopic clay particles.

Table A24: Total Aluminium results

Water sampling locality	Sampling frequency[6]	No. of samples[1]	Average (mg/L)	Max. (mg/L)	Min. (mg/L)[2]	Complying[3] (Yes/No)
Bulla	Quarterly	5	0.11	0.14	0.08	Yes
Darley	Quarterly	43	0.03	0.08	0.01	Yes
Diggers Rest	Quarterly	17	0.10	0.13	0.06	Yes
Eynesbury	Quarterly	21	0.10	0.17	0.04	Yes
Gisborne	Quarterly	73[4]	0.08	0.13	0.03	Yes
Lancefield[3]	Quarterly	30	0.01	0.02	0.01	Yes
Lerderderg	Quarterly	25[5]	0.03	0.04	0.02	Yes
Macedon[3]	Quarterly	9	0.10	0.14	0.04	Yes
Maddingley	Quarterly	22	0.03	0.04	0.02	Yes
Melton South	Quarterly	11	0.09	0.15	0.06	Yes
Merrimu	Quarterly	25	0.04	0.12	0.01	Yes
Mount Macedon[3]	Quarterly	11	0.10	0.14	0.06	Yes
Myrniong[3]	Quarterly	45	0.01	0.03	0.01	Yes
Riddells Creek[3]	Quarterly	9	0.08	0.11	0.02	Yes
Rockbank	Quarterly	37	0.11	0.16	0.08	Yes
Romsey	Quarterly	79	0.01	0.01	0.01	Yes
Sunbury	Quarterly	52	0.10	0.16	0.02	Yes
Toolern Vale	Quarterly	9	0.02	0.04	0.01	Yes
Woodend[3]	Quarterly	64	0.02	0.05	0.01	Yes

1. Compliance as measured against the guideline values set out in ADWG for acid soluble aluminium in drinking water based on aesthetic considerations should not exceed 0.2mg/L. There is no ADWG limit for total aluminium.
2. A result of <0.01 mg/L is a result less than the detection limit for total aluminium.
3. Alum is added to these supplies.
4. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
5. Dodemaide Tank offline during 2020-21.
6. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

pH

Table A25: pH results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max[6]	Min.	Mean	Complying[2] (Yes/No)
Bulla	Weekly	53	9.7	7.5	8.3	Yes
Darley	Weekly	378	8.4	7.4	7.8	Yes
Diggers Rest	Weekly	106	8.3	7.3	7.5	Yes
Eynesbury	Weekly	148	7.7	7.3	7.5	Yes
Gisborne	Weekly	303[3]	9.1	7.1	7.6	Yes
Lancefield	Weekly	101	8.2	7.5	7.7	Yes
Lerderderg	Weekly	190[4]	8.0	7.4	7.7	Yes
Macedon	Weekly	139	9.7	7.4	8.3	Yes
Maddingley	Weekly	151	8.0	7.4	7.7	Yes
Melton South	Weekly	156	8.2	7.3	7.5	Yes
Merrimu	Weekly	190	8.1	7.1	7.6	Yes
Mount Macedon	Weekly	178	9.4	7.9	8.5	Yes
Myrniong	Weekly	237	8.7	7.0	7.7	Yes
Riddells Creek	Weekly	142	9.1	7.5	8.1	Yes
Rockbank	Weekly	181	8.7	7.2	7.5	Yes
Romsey	Weekly	292	7.9	7.2	7.5	Yes
Sunbury	Weekly	321	9.9	7.3	7.9	Yes
Toolern Vale	Weekly	95	8.1	7.2	7.5	Yes
Woodend	Weekly	189	8.1	7.2	7.7	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the aesthetic guideline range set out in ADWG for pH in drinking water of 6.5-8.5, based on the mean result in each locality for the reporting period.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.
6. Where pH exceeds the guideline range the corrective actions implement include source water assessments, slow turnover in the network resolved by flushing, and long-term changes include mains replacement projects to improve water movement throughout the network.

Iron

Table A26: Iron (total) results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying[2] (Yes/No)
Bulla	Quarterly	12	0.10	0.07	0.08	Yes
Darley	Quarterly	82	0.06	0.01	0.02	Yes
Diggers Rest	Quarterly	24	0.09	0.05	0.07	Yes
Eynesbury	Quarterly	49	0.22	0.05	0.09	Yes
Gisborne	Quarterly	119[3]	0.11	0.01	0.04	Yes
Lancefield	Quarterly	22	0.02	0.01	0.01	Yes
Lerderderg	Quarterly	32[4]	0.03	0.01	0.01	Yes
Macedon	Quarterly	20	0.09	0.01	0.06	Yes
Maddingley	Quarterly	29	0.07	0.01	0.02	Yes
Melton South	Quarterly	60	0.09	0.04	0.06	Yes
Merrimu	Quarterly	72	0.08	0.01	0.03	Yes
Mount Macedon	Quarterly	22	0.15	0.01	0.07	Yes
Myrniong	Quarterly	75	0.21	0.01	0.03	Yes
Riddells Creek	Quarterly	20	0.21	0.01	0.07	Yes
Rockbank	Quarterly	78	0.10	0.04	0.07	Yes
Romsey	Quarterly	102	0.03	0.01	0.01	Yes
Sunbury	Quarterly	143	0.09	0.01	0.07	Yes
Toolern Vale	Quarterly	15	0.03	0.01	0.01	Yes
Woodend	Quarterly	91	0.08	0.01	0.01	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the aesthetic related guideline value set out in ADWG for the mean concentration of iron in drinking water not exceeding 0.3 mg/L.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Total hardness

Table A27: Total hardness (as calcium carbonate) results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Ave. (mg/L)	Complying[2] (Yes/No)
Bulla	Quarterly	12	23	15	19	Yes
Darley	Quarterly	49	130	88	110	Yes
Diggers Rest	Quarterly	12	18	13	16	Yes
Eynesbury	Quarterly	12	20	7	14	Yes
Gisborne	Quarterly	28[3]	110	15	63	Yes
Lancefield	Quarterly	15	130	49	71	Yes
Lerderderg	Quarterly	19[4]	120	88	107	Yes
Macedon	Quarterly	21	120	15	86	Yes
Maddingley	Quarterly	12	120	89	108	Yes
Melton South	Quarterly	11	25	8	16	Yes
Merrimu	Quarterly	13	130	12	71	Yes
Mount Macedon	Quarterly	27	120	13	86	Yes
Myrniong	Quarterly	16	150	100	123	Yes
Riddells Creek	Quarterly	11	110	17	57	Yes
Rockbank	Quarterly	14	19	10	15	Yes
Romsey	Quarterly	30	71	36	54	Yes
Sunbury	Quarterly	25	83	10	19	Yes
Toolern Vale	Quarterly	12	140	97	112	Yes
Woodend	Quarterly	26	46	12	30	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the aesthetic guideline value set out in ADWG for hardness as calcium carbonate in drinking water of 200 mg/L based on the mean result for the reporting period 2016/17. Note, the unit milligrams per litre (mg/L) is equivalent to parts per million (ppm). For conversion from mg/L to °dH (German Hardness), multiply mg/L by 0.056. Conversely, multiply °dH by 17.9 for conversion to mg/L or ppm.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Calcium

Table A28: Total calcium (as Ca) results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)[2]
Bulla	Quarterly	12	9	6	6
Darley	Quarterly	49	23	13	18
Diggers Rest	Quarterly	12	5	3	4
Eynesbury	Quarterly	12	6	2	4
Gisborne	Quarterly	28[3]	27	4	15
Lancefield	Quarterly	15	16	7	10
Lerderderg	Quarterly	19[4]	20	13	17
Macedon	Quarterly	21	34	4	21
Maddingley	Quarterly	12	21	13	17
Melton South	Quarterly	11	6	2	4
Merrimu	Quarterly	13	22	2	12
Mount Macedon	Quarterly	27	29	4	21
Myrniong	Quarterly	16	27	14	19
Riddells Creek	Quarterly	11	29	5	15
Rockbank	Quarterly	14	5	3	4
Romsey	Quarterly	30	14	6	10
Sunbury	Quarterly	25	20	3	5
Toolern Vale	Quarterly	12	25	15	18
Woodend	Quarterly	26	10	2	5

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. There is currently no recommended guideline value set out for the concentration of calcium in drinking water.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Magnesium

Table A29: Total magnesium (as Mg) results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)[2]
Bulla	Quarterly	12	1.1	0.3	0.8
Darley	Quarterly	49	19	13	16
Diggers Rest	Quarterly	12	1.5	1.1	1.3
Eynesbury	Quarterly	12	1.5	0.7	1.2
Gisborne	Quarterly	28[3]	11	1.3	6.2
Lancefield	Quarterly	15	21	7.4	11
Lerderderg	Quarterly	19[4]	18	13	16
Macedon	Quarterly	21	12	1.1	7.9
Maddingley	Quarterly	12	18	14	16
Melton South	Quarterly	11	2.7	0.7	1.3
Merrimu	Quarterly	13	19	1.4	10
Mount Macedon	Quarterly	27	11	0.9	7.8
Myrniong	Quarterly	16	24	14	19
Riddells Creek	Quarterly	11	9.9	1.2	4.9
Rockbank	Quarterly	14	1.6	0.6	1.3
Romsey	Quarterly	30	8.9	5.1	7.3
Sunbury	Quarterly	25	7.9	0.6	1.5
Toolern Vale	Quarterly	12	18	14	16
Woodend	Quarterly	26	7.7	1.4	4.4

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. There is currently no recommended guideline value set out for the concentration of magnesium in drinking water.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Ammonia

Table A30: Ammonia results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying[2] (Yes/No)
Bulla	Monthly	12	0.005	0.002	0.003	Yes
Darley	Monthly	38	0.004	0.002	0.002	Yes
Diggers Rest	Monthly	12	0.004	0.002	0.002	Yes
Eynesbury	Monthly	18	0.005	0.002	0.002	Yes
Gisborne	Annually	18[3]	0.004	0.002	0.002	Yes
Lancefield	Monthly	22	0.009	0.002	0.003	Yes
Lerderderg	Monthly	20[4]	0.003	0.002	0.002	Yes
Macedon	Annually	3	0.004	0.002	0.003	Yes
Maddingley	Monthly	15	0.003	0.002	0.002	Yes
Melton South	Monthly	12	0.004	0.002	0.002	Yes
Merrimu	Monthly	17	0.004	0.002	0.002	Yes
Mount Macedon	Annually	5	0.003	0.002	0.002	Yes
Myrniong	Monthly	59	0.010	0.002	0.003	Yes
Riddells Creek	Annually	3	0.004	0.002	0.003	Yes
Rockbank	Monthly	16	0.006	0.002	0.002	Yes
Romsey	Monthly	37	0.280	0.002	0.178	Yes
Sunbury	Monthly	26	0.011	0.002	0.003	Yes
Toolern Vale	Monthly	16	0.005	0.002	0.003	Yes
Woodend	Monthly	32	0.003	0.002	0.002	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the aesthetic guideline value set out in ADWG for the mean concentration of ammonia in drinking water should not exceed 0.5 mg/L. There is no health-based guideline for ammonia. The aesthetic consideration is to limit the corrosion of pipe and fittings and to reduce any nuisance growth of micro-organisms.
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

True Colour

Table A31: True colour results

Water sampling locality	Sampling frequency[5]	No. of samples[1]	Max. (TCU)	Min. (TCU)	Mean (TCU)	Complying[2] (Yes/No)
Bulla	Weekly	53	6	2	3	Yes
Darley	Weekly	372	4	2	2	Yes
Diggers Rest	Weekly	106	6	2	3	Yes
Eynesbury	Weekly	133	10	2	3	Yes
Gisborne	Weekly	209[3]	4	2	2	Yes
Lancefield	Weekly	101	6	2	3	Yes
Lerderderg	Weekly	190[4]	4	2	2	Yes
Macedon	Weekly	100	4	2	2	Yes
Maddingley	Weekly	151	4	2	2	Yes
Melton South	Weekly	73	6	2	3	Yes
Merrimu	Weekly	142	4	2	2	Yes
Mount Macedon	Weekly	122	4	2	2	Yes
Myrniong	Weekly	171	4	2	2	Yes
Riddells Creek	Weekly	101	4	2	2	Yes
Rockbank	Weekly	101	6	2	3	Yes
Romsey	Weekly	239	6	2	4	Yes
Sunbury	Weekly	174	4	2	3	Yes
Toolern Vale	Weekly	95	4	2	2	Yes
Woodend	Weekly	189	4	2	2	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the aesthetic guideline value set out in ADWG for true colour in drinking water should not exceed 15 HU (True Colour Units – TCU)
3. Rosslynne 3ML tank offline for much of 2020-21 as part of Rosslynne/Melbourne Water top up.
4. Dodemaide Tank offline during 2020-21.
5. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Sodium

Table A32: Sodium (as Na) results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	1	4.7	4.7	4.7	Yes
Darley	Annually	1	33	33	33	Yes
Diggers Rest	Annually	1	5	5	5	Yes
Eynesbury	Annually	1	6.2	6.2	6.2	Yes
Gisborne	Annually	4	35	5.4	26	Yes
Lancefield	Annually	3	48	47	47	Yes
Lerderderg	Annually	1	32	32	32	Yes
Macedon	Annually	1	36	36	36	Yes
Maddingley	Annually	1	32	32	32	Yes
Melton South	Annually	1	5.7	5.7	5.7	Yes
Merrimu	Annually	2	35	5.7	20	Yes
Mount Macedon	Annually	1	36	36	36	Yes
Myrniong	Annually	3	52	48	50	Yes
Riddells Creek	Annually	1	31	31	31	Yes
Rockbank	Annually	8	6	5	5.6	Yes
Romsey	Annually	4	25	24	25	Yes
Sunbury	Annually	8	5.8	4.9	5.4	Yes
Toolern Vale	Annually	1	36	36	36	Yes
Woodend	Annually	7	50	21	38	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for the specific water sampling locality.
2. Compliance as measured against the aesthetic (taste) guideline value set out in ADWG for the mean concentration of sodium in drinking water should not exceed 180 mg/L. No health-related guideline has been set for sodium. (Note: No health-based guideline value is proposed by the ADWG for sodium. The ADWG Sodium fact sheet suggests that medical practitioners treating people with severe hypertension or congestive heart failure should be aware if the sodium concentration in the patient's drinking water exceeds 20mg/L. To provide some further background, in Australia the average dietary sodium intake has been estimated at about 4g/day. Low-sodium diets may restrict this to less than 2 g/day. For reference, 1g is 1,000mg. To provide further context, on a low sodium intake the 2g/day equates to 2,000mg/day. An average person typically consumes 40mg/day of sodium in 2L of water, well below the low sodium intake recommendation.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Zinc

Table A33: Zinc (total as Zn) results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Ave. (mg/L)	Complying[2] (Yes/No)
Bulla	Quarterly	4	0.001	0.001	0.001	Yes
Darley	Quarterly	4	0.009	0.001	0.005	Yes
Diggers Rest	Quarterly	4	0.002	0.001	0.002	Yes
Eynesbury	Quarterly	6	0.008	0.001	0.003	Yes
Gisborne	Quarterly	6	0.004	0.001	0.002	Yes
Lancefield	Quarterly	6	0.005	0.001	0.002	Yes
Lerderderg	Quarterly	4	0.005	0.001	0.004	Yes
Macedon	Quarterly	4	0.013	0.001	0.004	Yes
Maddingley	Quarterly	4	0.017	0.003	0.009	Yes
Melton South	Quarterly	10	0.003	0.001	0.002	Yes
Merrimu	Quarterly	6	0.004	0.001	0.002	Yes
Mount Macedon	Quarterly	4	0.001	0.001	0.001	Yes
Myrniong	Quarterly	6	0.007	0.001	0.002	Yes
Riddells Creek	Quarterly	4	0.001	0.001	0.001	Yes
Rockbank	Quarterly	8	0.004	0.001	0.002	Yes
Romsey	Quarterly	10	0.010	0.001	0.002	Yes
Sunbury	Quarterly	15	0.007	0.001	0.002	Yes
Toolern Vale	Quarterly	4	0.005	0.001	0.003	Yes
Woodend	Quarterly	7	0.003	0.001	0.002	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for that specific water sampling locality.
2. Compliance as measured against the aesthetic (taste) guideline value set out in ADWG for the mean concentration of zinc in drinking water should not exceed 3 mg/L. No health-related guideline limits were set for zinc.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Sulfate

Table A34: Sulfate (as SO4) results

Water sampling locality	Sampling frequency[3]	No. of samples[1]	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying[2] (Yes/No)
Bulla	Annually	1	1	1	1	Yes
Darley	Annually	1	81	81	81	Yes
Diggers Rest	Annually	1	1	1	1	Yes
Eynesbury	Annually	1	1	1	1	Yes
Gisborne	Annually	4	63	1	43	Yes
Lancefield	Annually	3	9	1	5	Yes
Lerderderg	Annually	1	81	81	81	Yes
Macedon	Annually	1	52	52	52	Yes
Maddingley	Annually	1	80	80	80	Yes
Melton South	Annually	1	1	1	1	Yes
Merrimu	Annually	2	67	1	34	Yes
Mount Macedon	Annually	1	51	51	51	Yes
Myrniong	Annually	4	74	43	55	Yes
Riddells Creek	Annually	1	67	67	67	Yes
Rockbank	Annually	3	1	1	1	Yes
Romsey	Annually	4	5	1	2	Yes
Sunbury	Annually	3	1	1	1	Yes
Toolern Vale	Annually	1	91	91	91	Yes
Woodend	Annually	5	64	23	43	Yes

1. No. of samples includes routine program sampling at network taps, tank and pump station taps for that specific water sampling locality.
2. Compliance as measured against the aesthetic (taste) guideline value set out in ADWG for the mean concentration of sulfate in drinking water should not exceed 250 mg/L.
3. Updates to the sampling program were made during the reporting period in line with historical water quality data. The changes in frequency will be shown in the following full year of program implementation.

Appendix 5 – Source water monitoring

Western Water used the principles of the 12 elements of the ADWG framework for the management of its drinking water quality. This framework was incorporated within Western Water's Drinking Water Risk Management Plan (DWRMP), and formed part of the business' strategic approach to providing quality drinking water to customers and protecting public health.

One of the key components of Western Water's DWRMP was the extensive source water monitoring program aimed at increasing the understanding of source water quality in the reservoirs, bores and basins. It involved the monitoring and identification of hazards, sources and events which could compromise drinking water quality in a catchment-to- consumer multiple barrier approach.

The source water monitoring program for 2020-21 allowed for the assessment of source water quality at water storages for key chemicals with health-related guidelines, physical features such as turbidity and colour, impacts of rainfall events, organic matter and common waterborne disease pathogens.

This continual monitoring of source water quality enabled Western Water to conduct historical trending analysis, review individual system risk assessment plans, identify new hazards and review risk at each source of water. This information better positioned Western Water to appropriately select the type of disinfectant to use for each water system and provide the most effective water treatment.

Through an independent NATA-accredited laboratory, a comprehensive source water monitoring program at reservoirs, bores and final source water entry points to WFPs was undertaken during 2020-21.

An overview of the parameters tested and the frequency of testing at each sampling location for pesticides, chemicals (organics and in-organics), metals, physical and radiological parameters and their results is contained in this appendix. Table A35 on the following page is a list of all parameters monitored during 2020-21.

In addition to the source water monitoring conducted by a contracted, independent NATA-accredited laboratory, source water samples at various sampling locations were taken routinely for physical microbiological analysis by qualified microbiologists. This involves the determination of any flagellates, diatoms, algae and cyanobacteria (blue green algae) present in the source water sources.

General observations provided by microbiologists in relation to any water discolouration, the levels of detritus and the presence of any odour in the source water provided valuable information in assessing the quality of the source water. This information allows Western Water to monitor changes in conditions of source water sources and their potential impacts on drinking water quality.

For Merrimu, Rosslynne and Pykes Creek Reservoirs, BGA monitoring was conducted by water storage manager, Southern Rural Water. Western Water received regular results on BGA numbers in the three reservoirs during the reporting period, which allowed for Western Water to assess the adverse impacts on its ability to treat and provide safe drinking water to customers.

Water sourced from Melbourne Water prior to the off-take entry point to Western Water's region was monitored by Melbourne Water during 2020-21. Western Water receives monthly water quality reports from Melbourne Water for Greenvale and Silvan reservoirs, which include information on algal populations. Melbourne Water is required to notify Western Water of any major changes in treated water quality that could potentially impact the ability to supply safe drinking water to customers and to meeting the ADWG.

Table A35: List of all source water parameters monitored during 2020-21

Parameter	Type
1,1-Dichloroethane	Chemical organics
1,2-Dichloroethane	Chemical organics
2,4 D	Pesticides
4,4' – DDT	Pesticides
Aldrin	Pesticides
Alkalinity, total as CaCO3	Physical
Aluminium, filtered	Metals
Aluminium, total	Metals
Ammonia	Chemical inorganics
Amoebae (Naegleria SPP)	Microbiological
Arsenic	Chemical inorganics
Atrazine	Pesticides
Benzene	Chemical organics
Benzo(a)pyrene	Chemical organics
Calcium	Chemical inorganics
Carbon Tetrachloride	Chemical organics
Chlordane, total	Pesticides
Chloride	Chemical inorganics
Chromium	Metals
Coliforms, total	Microbiological
Colour, true	Physical
Copper	Metals
Cryptosporidium spp.	Microbiological
Cyanide	Chemical inorganics
Dieldrin	Pesticides
Dissolved organic carbon	Chemical organics
Dissolved oxygen	Physical
Electrical conductivity @ 25ºC	Physical
Escherichia coli	Microbiological
Faecal streptococci	Microbiological
Fluoride*	Chemical inorganics
FRNA Coliphage	Microbiological
Giardia spp.	Microbiological
Gross alpha activity	Radiological
Gross beta activity	Radiological
Hardness, as CaCO3	Physical
Hardness, as MgCO3	Physical
HCHC (gamma) (Lindane)	Pesticides
Helminth (Ascaris ova)	Microbiological
Helminth (Taenia ova)	Microbiological
Heptachlor	Chemical organics
Heptachlor epoxide	Chemical organics
Hexachlorobenzene	Chemical organics
Iron, filtered	Metals
Iron, total as Fe	Metals
Magnesium, as Mg	Metals
Manganese, filtered	Metals
Manganese, total as Mn	Metals
Mercury, as Hg	Metals
Methoxychor	Chemical organics
Nitrate	Chemical inorganics
Nitrite	Chemical inorganics
Pentachlorophenol	Chemical organics
pH	Physical
Phosphorus, reactive as P	Chemical inorganics
Potassium	Metals
Selenium	Chemical inorganics
Silica, total as SiO2	Chemical inorganics
Silicon	Chemical inorganics
Sodium	Chemical inorganics, Metals
Sulphate	Chemical organics
Tetrachloride	Chemical organics
Tetrachloroethene	Chemical organics
Total dissolved solids	Physical
Trichloroethene	Chemical organics
Turbidity	Physical
UVT 254	Physical

Glossary

Algae	Simple types of plant with no root, stems or leaves. They occur mostly in freshwater and marine environments.
Algal bloom	A rapid growth of algae in aquatic environments often triggered by an input of high levels of nutrients and an increase in temperature. Blue-green algae (or cyanobacteria) are of most concern.
Alum	An aluminium sulphate based chemical used as a coagulant in the water treatment process.
Aluminium (Al)	A naturally occurring element in soils which can enter water from catchments.
Ammonia (NH3)	A highly soluble compound resulting from the decomposition of organic matter containing nitrogen. Usually only found in small concentrations in surface waters.
Aquifer	A layer or section of earth or rock that contains freshwater (known as groundwater), any water that is stored naturally underground or that flows through rock or soil, supplying springs and wells.
ADWG	National Health and Medical Research Council's Australian Drinking Water Guidelines 2011.
AWA	Australian Water Association.
Blue-green algae (cyanobacteria) (BGA)	Single celled, filamentous or colony-forming organisms which are widely distributed in the freshwater and marine environments. Under favourable conditions of light, temperature and nutrient supply, extensive growth of blue green algae may occur, leading to blooms. These can result in environmental problems and can create challenges for water treatment.
Bulk entitlement (BE)	An agreement that outlines the conditions for supply of bulk drinking water from reservoirs managed by Southern Rural Water and drinking water supplied by the Melbourne Water Corporation to Western Water.
Calcium (Ca)	A naturally occurring element which can enter water from catchments. It may also be added to water in the treatment process to reduce the acidity levels or increase the capacity of water to buffer pH changes.
Catchment	An area of land surrounding a water storage. The runoff water from rain falling over the catchment drains into the storage and may collect nutrients, minerals and other contaminants including microorganisms from the surface of the land.
Chlorination	The disinfection of water, wastewater and industrial waste through the application of chlorine (Cl) as part of the water treatment process. Chlorination kills microorganisms and oxidises undesirable compounds.
Chloramination	The application of the chlorine followed by ammonia to create monochloramine (NH2Cl), a stable disinfectant that is added to drinking water to kill bacteria or to oxidise undesirable compounds. Chloramines persist for a longer time than chlorine and as a result are used in longer water distribution systems.
Coliforms	Coliform bacteria are used as one of the indicators of the quality of drinking water and the possible presence of disease-causing microorganisms. These bacteria are killed by chlorine.
Cryptosporidium	A parasitic protozoan (microorganism) which causes gastroenteritis in humans. These organisms occur in the gut of infected warm-blooded animals and can be introduced into source water through faecal contamination.
DH	Department of Health.
Disinfection	Inactivation (killing) of pathogens or organisms capable of causing infectious disease by chemical or physical processes, including chlorination.

Drinking Water Quality Management System (DWQMS)	Western Water's DWQMS is used to ensure our drinking water supplies are managed effectively to provide high quality drinking water and to ensure the protection of public health.
EPA	Environment Protection Authority.
ESC	Essential Services Commission.
Escherichia coli (E. coli)	The most common heat tolerant coliform present in faeces, which is regarded as the most specific indicator of recent faecal contamination. *E. coli* can be killed by standard disinfection practices.
Filtration	A process for removing particles from water by passing through a porous barrier, such as a screen, membrane, sand or gravel. Often used in conjunction with a coagulant to settle contaminants.
Fluoride (F)	Fluoride is regarded as a useful constituent of drinking water, particularly for the prevention of tooth decay. Fluoride is added to the water supply at Merrimu WFP, Rosslynne WFP and all water supplied from the Melbourne system.
Groundwater	Water beneath the earth's surface (often between saturated soil and rock) that supplies bores, wells and springs.
HACCP	Hazard Analysis and Critical Control Point. A system that identifies, evaluates and controls hazards that are significant for food safety (Codex 1997).
Incident	Any event or circumstance that causes or is likely to cause: a) threat to community health or safety; or b) creation of the need for urgent action under statute or legislation.
Inflows	Water flowing from the catchment to the reservoirs through streams, rivers and creeks.
Iron (Fe)	An element which when found in water leads to brownish discolouration. Limits on the amount of iron in water are usually due to taste and appearance factors rather than any detrimental health effects.
IWA	Institute of Water Administration.
kL	kilolitres (thousand litres).
Manganese (Mn)	Manganese in a water supply may affect taste, cause staining of clothes, produce deposits in pipes and contribute to turbidity.
mg/L	milligrams per litre.
ML	megalitres (million litres).
µg/L	micrograms per litre.
National Association of Testing Authorities (NATA)	NATA is Australia's national laboratory accreditation authority. NATA accreditation recognises and promotes facilities competent in specific types of testing, measurement, inspection and calibration.
National Health and Medical Research Council (NHMRC)	NHMRC is Australia's peak body for supporting health and medical research for developing health advice for the Australian community, health professionals and governments.
Nitrogen (N)	Nitrogen is an essential nutrient for plant growth. It is used in fertilisers and is present in sewage effluent. High levels of nutrients can lead to excessive algal growth.
Nitrate ($N0_3$)	The most stable form of combined nitrogen in water. Present in surface waters in small amounts, the major sources are from human and animal wastes.
Nephelometric turbidity unit (NTU)	A measure of the turbidity in water.
Nutrients	Compounds required for growth by plants and other organisms. Major nutrients for plant growth are phosphorous and nitrogen.

Pathogens	Disease causing organisms such as bacteria and viruses.
pH	The pH value indicates if a substance is acidic, neutral or alkaline. It is calculated from the number of hydrogen ions present and is measured on a scale of 0 to 14. A pH greater than 7 is alkaline, less than 7 is acidic and 7 is neutral.
Phosphorous (P)	Phosphorous is an essential nutrient for plant growth. High levels of phosphorous can lead to excessive algal growth and can be due to inputs from human activity such as fertiliser run-off and land clearing.
Potable water (drinking water)	Water that is intended for human consumption or for purposes connected with human consumption (e.g., food preparation, making of ice, preservation of unpackaged food).
QMS	Quality Management System.
Reservoir	A natural or artificial body of water used as storage for water supply.
Risk assessment	A scientifically based process consisting of the following steps: i) hazard identification; ii) hazard characterisation; iii) exposure assessment; and, iv) risk characterisation.
Risk management	The process of weighing policy alternatives in the light of the results of risk assessment and, if required, selecting and implementing an appropriate control option, including regulatory measures.
Risk management plan	As set out in Section 9 of the *Safe Drinking Water Act 2003*.
SCADA	Supervisory Control and Data Acquisition system.
Source water	Water that has not been treated in any way.
SRW	Southern Rural Water, bulk water supplier responsible for Merrimu, Rosslynne and Pyke Creek Reservoirs.
Total dissolved solids	A measure of organic salts and small amounts of organic matter that are dissolved in water.
Total hardness	Total hardness is the sum of the concentrations of calcium and magnesium ions expressed as calcium carbonate equivalent. Waters with a total hardness in excess of 200mg/L are considered hard.
Treatment (water)	The filtration and disinfection processes employed to produce drinking water.
Trihalomethanes	Compounds that may occur in a chlorinated water supply as a by-product of organic materials present in the water reacting with chlorine.
True colour	True colour refers to the colour of water after particles of organic matter have been removed through filtration and is the measurement of the extent to which light is absorbed by the water. Measured in Hazen Units (HU).
Turbidity	Refers to the presence of suspended solids in water causing a muddy or discoloured appearance. Turbidity is measured in Nephelometric Turbidity Units (NTUs).
Water Filtration Plant	Drinking water treatment plant.
Water quality standard	A quality standard specified for drinking water by regulations made for the purposes of Section 17 of the *Safe Drinking Water Act 2003*.
Water supply system	The complete system that provides a water supply to customers. It includes all infrastructure from the water source to the customer including the catchment, water storage, treatment and delivery systems and networks.
WIOA	Water Industry Operators Association.
WSAA	Water Services Association of Australia.

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