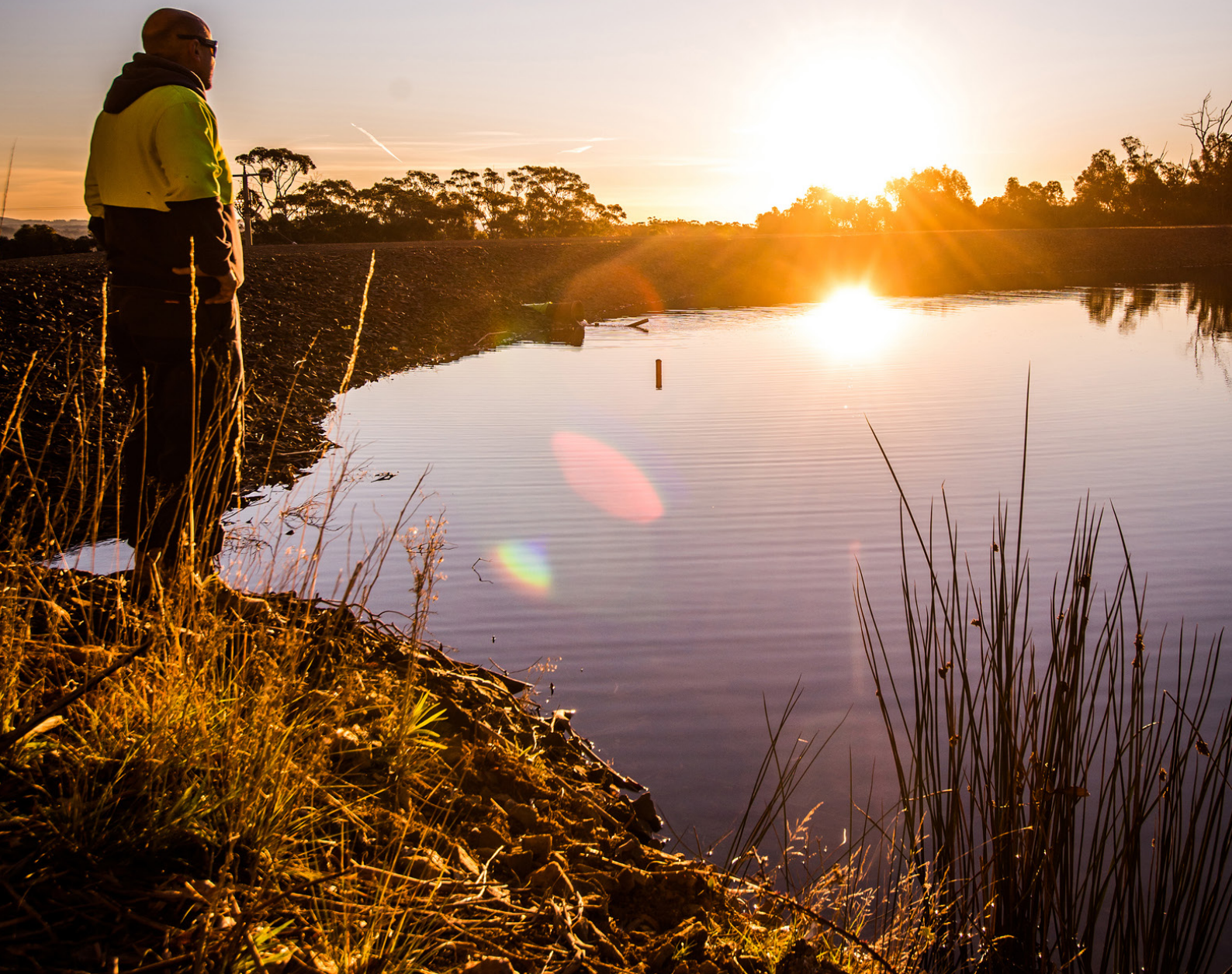
WESTERN WATER

Water Quality Report 2014/15



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Introduction

About Western Water

In 2014/15, Western Water provided water, recycled water and sewerage services to 61,190 properties - with a population of more than 161,000 - across a region of 3,000 square kilometres to the north-west of Melbourne.

Historically, this region has been one of the fastest growing in Victoria, with average population growth rates of 3-4% per annum over the past decade.

In the past year, the region experienced lower population growth of 1.0% while serviced properties grew by 2.6% in the same period.

This lower rate of population growth, particularly compared to higher growth in properties, reflects a return to buoyant housing market which will result in strong population growth rates in coming years.

Manner of establishment and responsible Minister

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

During the reporting period, 1 July 2014 to 30 June 2015, the relevant minister was:

- Hon Peter Walsh MLA, Minister for Water from 1 July 2014 until 3 December 2014, and
- Hon Lisa Neville MP, Minister for Environment, Climate Change and Water from 4 December 2014 to 30 June 2015.

Western Water is responsible to the current Minister for Environment, Climate Change and Water via the Department of Environment, Land, Water and Planning (DELWP). DELWP is a new department formed 1 January 2015. Prior to that, Western Water was responsible to the Minister via the Department of Environment and Primary Industries (DEPI). The Department of Treasury and Finance (DTF) also has a shareholder governance role.

The Department of Health and Human Services (DHHS) sets and supervises 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 (EWOV) receives, investigates and resolves escalated enquiries and complaints against electricity and water suppliers across Victoria.

Drinking water regulations

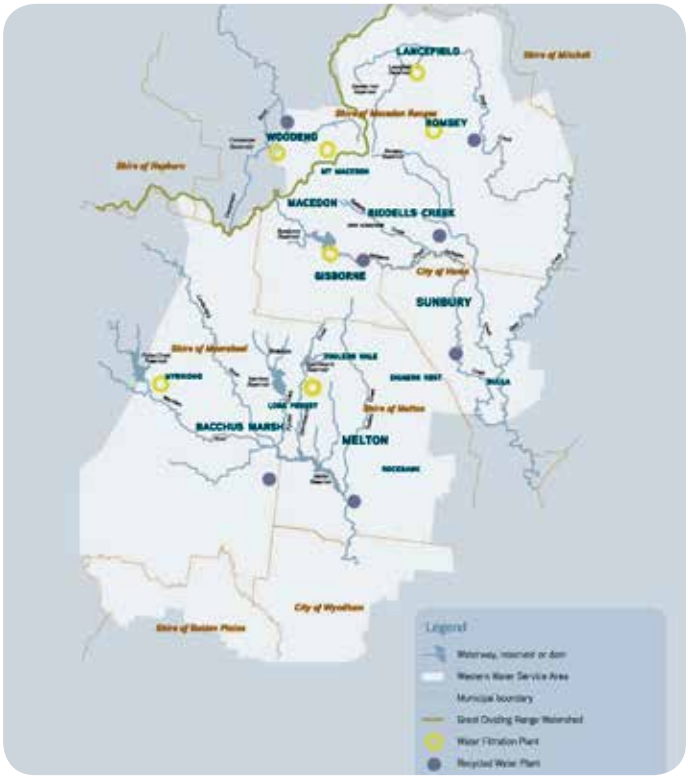
Western Water is governed by Victoria's *Safe Drinking Water Act 2003* and Safe Drinking Water Regulations 2005, which provide a comprehensive regulatory framework for the provision of drinking water to customers.

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 where applicable.

The DHHS Water Program in the Health Protection Branch is responsible for administering the regulatory framework, the key objectives of which are to ensure that:

- any water supplied as drinking water is safe to drink
- water quality information is available to consumers and open to public accountability
- any water that is not intended as drinking water cannot be mistaken for drinking water
- overseeing the management of incidents affecting drinking water quality, and
- ensuring compliance with the Australian Drinking Water Guidelines to ensure customer safety.

Service area map



2014/15 Highlights

- Safely delivered 13,100 million litres of drinking water to 58,500 properties
- 100% compliance with the *Safe Drinking Water Act 2003* and all parameters specified in the Safe Drinking Water Regulations 2005
- Continued independent certification of Western Water's Hazard Analysis and Critical Control Point system, passing an external audit in February 2015
- Resolved 185 water quality complaints, working with customers to understand the root cause and addressing issues identified
- Supplied an additional water source to Lancefield for the first time, to augment local supplies highly subject to impact from dry conditions, and
- Expanded engagement with customers on water quality changes and complaints via our Facebook social media platform.

Table 1: Drinking water statistics - 2013/14 vs 2014/15

	2013/14	2014/15
Connected water customers	56,930	58,477
- Residential	53,939	55,418
- Non-residential	2,991	3,059
Water consumption (ML)	12,648	13,101
- Residential	9,794	9,836
- Non-residential	1,716	1,795
- Water losses	1,138	1,470
Water mains (km)	1,955	1,924#
Water filtration plants	7	7
Chlorination plants	14	14

The 2014/15 figure is lower than last year due to data cleansing associated with removing abandoned mains. Total water mains (km) figure also includes Class A recycled water mains.

Foreword from the Managing Director

In the 20 years since Western Water began operations, we have developed a strong track record for delivering safe, quality and affordable water, sewerage and recycled water services and maintaining high levels of customer satisfaction.

During 2014/15, Western Water safely delivered 13,100 million litres of drinking water to a population of more than 161,000. Almost all (98%) the drinking water supplied was sourced from local catchments, compared to 74% in the prior year.

Aesthetics – particularly taste and odour – can differ greatly between local sources and Melbourne supplies and managing customer expectations around changes in supply source is a significant consideration for the business.

Securing water for the future

The major challenges facing Western Water as the region's water supplier are the combined impact of climate change and population growth.

Our service area is now in a return-to-dry scenario. This presents serious implications for water supply management. Lower than expected rainfall in the spring and summer of 2014/15 has already impacted on local water supplies. In March 2015, the new Romsey-Lancefield pipeline was utilised for the first time to augment both towns with additional water supplies from Rosslynne Reservoir.

Fortunately, the extensive program of network augmentation that took place during the Millennium Drought will stand the region in good stead for the coming dry periods. With the construction of the Romsey-Lancefield pipeline in 2014, almost all the towns in our service area now have access to both local and Melbourne water supplies.

To ensure sustainable management of our environment, Western Water needs to utilise its range of available water sources to meet the requirements of the growing region.

We anticipate annual population growth rates of 3-4% over the coming decade as new housing estates in and around Melton and Sunbury attract more people to the service area.

Western Water's Integrated Water Management Strategy will ensure we address the combined impact of climate change and population growth, within a framework of maintaining affordable services.

Committed to drinking water quality

Western Water is aware of the responsibility it bears to provide safe, affordable drinking water to the people living and working in our service region. This report reflects our commitment to meeting this responsibility by addressing the twelve elements of the Framework for Management of Drinking Water Quality.

I am pleased to report that all 19 water sampling localities in Western Water's region continued to comply with the *Safe Drinking Water Act 2003* and all parameters specified in the Safe Drinking Water Regulations 2005. In February 2015, Western Water passed an external hazards and critical control points (HACCP) audit for drinking water quality.

I would like to take this opportunity to thank all Western Water staff involved in the production and supply of our drinking water for their professional and committed approach over the past year. It is with pleasure that I submit Western Water's 2014/15 Water Quality Report to customers, stakeholders and regulators.

Neil Brennan, Managing Director

October 2015

1. Commitment to drinking water management

Western Water closely monitors the quality of drinking water supplies to ensure compliance with standards set out in the Safe Drinking Water Regulations 2005. We also adopt other industry guidelines associated with health and aesthetics of drinking water including the Australian Drinking Water Guidelines 2011 (ADWG). Together, these are used to set the physical, chemical 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 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 and Critical Control Points (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. It is displayed on noticeboards in the Sunbury office and at all water filtration plants, and is included in inductions for new staff.

Implementation

Western Water implements this policy through:

- Application of the DWQMS
- Delivery of Water Plan 2013-2018 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, and
- Undertaking regulatory audits, certification audits and internal audits.

Regulatory and formal requirements

Western Water maintains a register of regulatory and other formal requirements for the delivery of drinking water through its 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.

Western Water ensures responsibilities in relation to drinking water are understood by referencing these 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. The HACCP system received independent certification again in the reporting period, validating our multi-barrier approach to protecting drinking water quality.

Engaging stakeholders

Ensuring Western Water has sustainable, resilient water services systems requires a consultative, collaborative approach with all stakeholders, engaging customers, the community and others in our integrated water cycle management philosophy, and encouraging all to make the most of local resources as much as possible.

Community and stakeholder engagement

Western Water is committed to building positive, cooperative relationships with all stakeholders that have the potential to either affect or be affected by our operations. These are included in the emergency contact list which is updated regularly.

Recognising that we must embrace customer-friendly channels, Western Water's customer advisory network now includes over 8,000 online panel members. They are kept well informed of water quality issues and changes and, when required, facilitate consultation.

Major external stakeholders include regulatory bodies such as the EPA, DELWP, DSE and the ESC as well as suppliers, Melbourne Water and Southern Rural Water (SRW). These organisations are actively engaged through regular meetings and/or reporting. 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 are 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 addresses multiple challenges to provide our customers with quality drinking water. One of the most significant challenges we have faced in the past 20 years 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.

Once again this year, sufficient levels of storage in local reservoirs meant we could supply the service region with almost 100% local water supply.

While our Integrated Water Management Strategy will ensure long term sustainability of water supplies in the region, the region's connection to the Melbourne supply system will remain critical for supply security.

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 these 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 six water supply systems in the Western Water region:

- Rosslynne/Sunbury
- Merrimu
- Romsey
- Lancefield
- Woodend, and
- Myrniong.

For water quality monitoring, these supply systems are divided into 19 water sampling localities, formally published by DHHS in the Government Gazette.

Each locality is determined by the origin of the water, the location of treatment and storage facilities, and associated delivery system. These localities form the basis of our water sampling program.

Table 2: Residential population by water sampling locality and town - 2013/14 vs 2014/15

Water sampling locality	Towns	2013/14	2014/15
Bulla	Bulla, Oaklands Junction	760	760
Darley	Darley, Pentland Hills	9,000	8,730
Diggers Rest	Diggers Rest	2,720	2,980
Eynesbury	Eynesbury	2,640	2,500
Gisborne	Gisborne, New Gisborne, Bullengarook	10,850	11,000
Lancefield	Lancefield	2,270	2,240
Lerderderg	Bacchus Marsh, Merrimu, Coimadai	8,720	8,790
Macedon	Macedon	1,840	1,810
Maddingley	Maddingley, Parwan	3,590	3,680
Melton South	Melton, Melton South, Brookfield, Hopetoun Park, Toolern, Mount Cottrell, Plumpton	32,490	32,620
Merrimu	Melton West, Kurunjang, Long Forest	27,970	28,430
Mount Macedon	Mount Macedon	1,560	1,570
Myrniong	Myrniong	300	300
Riddells Creek	Riddells Creek	3,700	3,740
Rockbank	Rockbank	1,440	1,390
Romsey	Romsey, Kerrie, Monegeetta	4,690	4,720
Sunbury	Sunbury, Clarkefield, Wildwood	39,240	40,110
Toolern Vale	Toolern Vale	490	490
Woodend	Woodend	5,530	5,590
Total		159,800	161,450

** 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. Changes to the multiplier this year - which is applied to all towns in the service region - resulted in declines in some towns where property growth has been lower.*

Drinking water sources

Most of Western Water's service region is supplied by two major local reservoirs – Rosslynne and Merrimu. Having recovered capacity significantly in recent years, these local water sources are used for drinking water supply whenever possible.

In 2014/15, 98% of all drinking water supplied was sourced from local catchments, compared to 74% the year before.

However, the combined local reservoir storage levels dropped over the year from 68% to 33% capacity as inflows were much lower than demand. Without significant rainfall, Western Water anticipates returning some towns to Melbourne water supplies in the coming year. Table 3 illustrates the variability in the capacity of Western Water's major reservoirs over the past 10 years.

To assure future water supply security, it remains critical that the Western Water region is connected to Melbourne supplies.

Melbourne water supplies

Western Water has a bulk entitlement with Melbourne Water to access water from the Melbourne Headworks system. This entitlement is critical during 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 to the Greenvale Reservoir. 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 at all times. 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

The towns of Woodend, Myrniong, Romsey and Lancefield have their own supply systems - with additional water supplemented from bulk entitlements in nearby systems. In times of drought, the bulk entitlement from Melbourne can also supplement these local supplies.

Woodend

Woodend receives treated water from two local sources: Campaspe Reservoir via the Marriages Water Filtration Plant, and the Macedon Ranges via Reservoir C Water Filtration Plant. During 2014/15, 287ML was taken from Campaspe Reservoir. The Woodend supply was supplemented by an additional 247ML from the Macedon bulk entitlement.

Myrniong

Myrniong receives its water supply from Pykes Creek Reservoir after treatment from the Myrniong Water Filtration Plant. A total of 44.9ML was taken from the storage during the reporting period in compliance with its bulk entitlement.

Romsey

Romsey receives treated water from the Romsey Water Filtration Plant, which is supplied with raw water from Kerrie Reservoir, which in turn receives supplementary water from Wright Reservoir. During the reporting period, 437ML was taken from the local storage. Of this, 237ML of this was from a transfer from the Riddells Creek and Maribyrnong BEs. A total of 39ML was also used from the Romsey Bore to supplement supply during the reporting period.

Lancefield

The Lancefield Water Filtration Plant can receive and treat surface water, bore water or a mixture of both. There were times during drought when all water supplied in Lancefield was from the bore. During 2014/15, 79ML of water was taken from Garden Hut Reservoir at Lancefield with another 46ML taken from Lancefield's bore water supplies. A new transfer allowing water to be transferred via the Romsey supply system from the wider supply network was operated during the year and supplied 72ML to supplement Lancefield's local sources.

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

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Rosslynne Reservoir	7%	4%	3%	3%	5%	66%	72%	85%	76%	44%
Merrimu Reservoir	17%	13%	13%	10%	9%	85%	78%	76%	63%	29%

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 and Upper Yarra Catchment
	Merrimu Reservoir	Lerderderg River, Goodman Creek, Pyrites Creek Catchments
	Djerriwarrh Reservoir	Djerriwarrh Catchment
Gisborne, New Gisborne, Gisborne South, Bullengarook, Mount Macedon, Macedon and Riddells Creek	Greenvale Reservoir	Yan Yean and Upper Yarra Catchment
	Rosslynne Reservoir	Jacksons Creek Catchment
Sunbury, Goonawarra, Jacksons Hill, Clarkefield, Bulla, Oaklands Junction and Diggers Rest	Greenvale Reservoir	Yan Yean and Upper Yarra Catchment
Woodend	Graham Brock Reservoir and Reservoir C	Falls/Smokers Creek and Graham Brock Reservoir and Reservoir C Catchments
	Campaspe Reservoir	Campaspe River Catchment
	Greenvale Reservoir	Yan Yean and Upper Yarra Catchment
Myrniong	Pykes Creek Reservoir	Werribee River and Pykes Creek Catchment
	Greenvale Reservoir	Yan Yean and Upper Yarra Catchment
Romsey, Kerrie, Monegeetta	Kerrie Reservoir	Upper Bolinda Creek
	Romsey Bore	Local aquifer
	Greenvale Reservoir	Yan Yean and Upper Yarra 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 and Upper Yarra Catchment

Assessment of water quality data

Western Water collects extensive history of water quality at water sources, treatment plants and customer taps. Samples are 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 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. Western Water uses water quality data obtained from the database to monitor trends and data from our Supervisory Control and Data Acquisition (SCADA) technology to review trends of water systems on an as-needs basis.

Hazard identification and risk management

Western Water uses an established risk criteria based upon AS/NZ 4360:1999 Risk Management Standards for water quality hazards and risk assessment.

In accordance with the regulatory framework, Western Water has implemented a DWQMS, including HACCP plans, for drinking water supply.

3. Preventative measures for drinking water supply

Western Water operates its drinking water supply systems under the Victorian *Safe Drinking Water Act 2003*, administered by the DHHS. Western Water is required to manage health risks associated with drinking water, effectively monitor the water and undergo 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 last independent external audit by DHHS took place in April 2014 and confirmed Western Water is fully compliant with the *Safe Drinking Water Act 2003* requirements. The next audit will take place in early 2016.

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 is 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 DSE Guidelines 2012
- operation of water treatment and disinfection systems in order 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, and
- delivery of training and competence assessment of operators through registered training organisations.

Catchment protection

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

Protected reservoirs and storage tanks

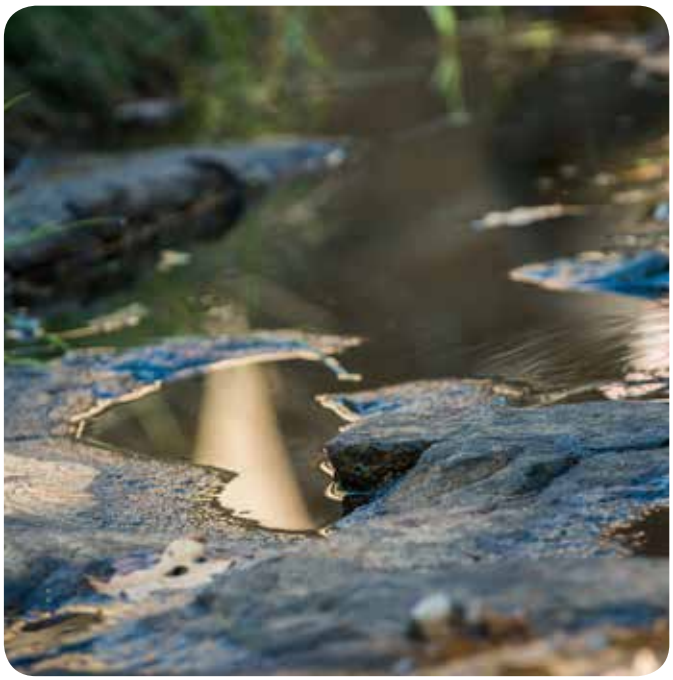
The amount of time water is held in surface water supply reservoirs is a key element to maintaining good water quality as longer detention time allows sediment to settle. This improves water clarity and enables longer exposure to solar radiation which aids in the disinfection process.

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

A total of 54 water storage tanks are used to supply water to customers throughout the water reticulation system. These tanks are typically constructed of concrete or metal and are fully enclosed. They 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. In the case of Myrniong, this access would involve carting water.



Water treatment practices

Drinking water sourced from unprotected catchments - such as the local raw 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 supply 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 and Western Water booster chlorinates the water as it enters the local network.

Filtration

Western Water operates seven water filtration plants (WFPs) and an additional 15 water treatment facilities which booster chlorinate the water. Five WFPs employ dissolved air flotation filtration (DAFF) while Merrimu WFP uses the traditional sedimentation-filtration process and Romsey 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 PCU.

Chemical treatment and disinfection

Western Water uses both chlorination and chloramination 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. At Rosslynne WFP, Powder Activated Carbon is also utilised to combat taste and odours produced by high concentrations of naturally occurring organic carbon.

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 pH of water should be maintained within the ADWG specified range of 6.5-8.5 pH units for aesthetic purposes.

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. This is considered the optimal level for temperate climates such as Victoria.

Western Water supplies fluoridated local water from both Merrimu and Rosslynne water filtration plants. However, none of Western Water's smaller water filtration plants currently add fluoride to their water supply.

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

The table below lists the towns which receive a fluoridated supply. Supplies to Lancefield, Myrniong, Romsey and Woodend are only fluoridated when local supplies are supplemented or replaced with water from external sources.

Table 5: Fluoridated and non-fluoridated water supply by town

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

**These towns received a small proportion of fluoridated water during 2014/15 when Rosslynne Reservoir water was mixed with local water supplies to ensure supply security.*

Preventative measures for drinking water supply cont.

Table 6: Water treatment chemicals and processes by sampling locality

Locality	Population supplied	System	Treatment process	Added substances	Comments
Melton South, Lerderderg, Maddingley, Darley, Merrimu, Rockbank, Toolern Vale, Eynesbury	86,630	Merrimu system (Merrimu Reservoir via Merrimu Water Filtration Plant)	Coagulation, Clarification/ filtration, pH correction, Fluoridation, Chlorination, Additional chlorination by booster chlorinators along reticulation system as required.	Aluminium Sulphate, Polyelectrolyte, Lime, Chlorine gas, Sodium Silicofluoride, Sodium Hypochlorite[3]	The locality returned to mainly Merrimu supply in July 2013. However, the water source may vary between Melbourne water and a blend with Merrimu Reservoir. Booster chlorinators exist in 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[1], Chlorine gas[1], Sodium Hypochlorite[2 3]	
Gisborne, Macedon, Mount Macedon, Riddells Creek	18,120	Rosslynne system (Rosslynne Reservoir via Rosslynne Water Filtration Plant)	Oxidation, Adsorption, Coagulation, pH correction, Dissolved Air Flotation Filtration, Fluoridation, Chlorination, Additional chlorination.	Aluminium Sulphate, Potassium Permanganate (as required), Powdered Activated Carbon, Polyelectrolyte, Lime[2], Carbon Dioxide[2], Fluorosilicic Acid, Chlorine Gas, Sodium Hypochlorite[3]	Rosslynne Water Filtration Plant has provided full production of drinking water into the Sunbury system since March 2014. At times water source can vary between Rosslynne supplies and a Rosslynne Reservoir/ Melbourne Water blend to ensure that Rosslynne Water Filtration Plant and associated infrastructure are maintained. This supply is further chlorinated at Macedon, Mount Macedon and Riddells Creek.
			Fluoridation and primary chlorination by Melbourne Water. Secondary disinfection (Chloramination) at Loemans Rd Pump Station. Additional chlorination by booster chlorinators along reticulation system as required.	Sodium Hexafluorosilicate[1], Chlorine Gas[1], Lime[2], Carbon Dioxide[2], Sodium Hypochlorite[2 3], Aqueous Ammonia[2]	
Sunbury, Bulla, Diggers Rest	43,850	Sunbury system (since March 2014, the majority of customers were returned to Rosslynne Reservoir and Rosslynne WTP supply)	Fluoridation and Primary chlorination by Melbourne Water or at Rosslynne WTP. Secondary disinfection (Chloramination) at Loemans Rd Pump Station/ Riddell Rd tank.	Sodium Hexafluorosilicate[1], Lime, Carbon Dioxide, Sodium Hypochlorite[2], Aqueous Ammonia	
Woodend	5,590	Woodend system (Campaspe Reservoir via Marriages Water Filtration Plant and Graham Brock Reservoir, Reservoir C & Greenvale Reservoir via Reservoir C Water Filtration Plant)	Coagulation, pH Correction, Dissolved Air Flotation Filtration, Chlorination, Fluoridation by Melbourne Water[4].	Powdered Activated Carbon (as required at Marriages Water Filtration Plant), Aluminium Sulphate, Polyelectrolyte, Sodium Carbonate (Soda Ash), Sodium Hypochlorite.	Supply is fully treated at the Marriages Water Filtration Plant and Reservoir C Water Filtration Plant. Drinking water is supplied from two ends of the system - the Marriages Basin and Reservoir C contact tank.
Romsey	4,720	Romsey system (Kerrie Reservoir, Romsey Bore & Greenvale Reservoir via Romsey Water Filtration Plant)	Microfiltration, Chloramination, Fluoridation by Melbourne Water[4].	Poly Aluminium Chlorohydrate (as required), Sodium Hypochlorite, Sodium Hydroxide, Aqueous Ammonia.	Changes to the disinfection mode in this locality are planned for 2016.
Lancefield	2,240	Lancefield system (Garden Hut Reservoir, Lancefield Basin and groundwater)	Coagulation, pH Correction, Filtration, Dissolved Air Flotation Filtration, Chlorination, Fluoridation by Melbourne Water[4].	Aluminium Chlorohydrate (as required), Sodium Hydroxide (Caustic Soda), Potassium Permanganate, Powdered Activated Carbon, Sodium Hypochlorite.	The Lancefield system is now connected to Romsey via a raw water pipeline which allows the transfer of water from Kerrie Reservoir into Lancefield Basin when required.
Myrniong	300	Pykes Creek Reservoir	Coagulation, Oxidation, pH Correction, Dissolved Air Flotation Filtration, Chlorination, Fluoridation by Melbourne Water[4].	Powdered Activated Carbon (as required), Potassium Permanganate, Aluminium Sulphate, Polyelectrolyte, Sodium Carbonate (Soda Ash), Chlorine Gas, Sodium Hexafluorosilicate [5].	Due to an improvement in water storage levels in Pykes Creek Reservoir, no water carting from Bacchus Marsh has been required in over 12 months.

1 Chemicals may be added by Melbourne Water for treatment and chlorination.
2 Chemicals added by Western Water for additional disinfection at entry point from Melbourne Water mains.
3 Chemicals added by Western Water throughout the distribution system to increase chlorine residual levels.
4 When receiving water from the Mount Macedon system, and that water has been supplemented with Melbourne Water or Rosslynne Reservoir.
5 When receiving water from Melbourne Water or Rosslynne system through transfer to Wright Reservoir.
6. When receiving water for the Romsey/Lancefield pipeline, and that water has been supplemented with Melbourne Water supply or Rosslynne system water supply via Wright Reservoir.
7 When receiving water from Melbourne Water through water carting from Bacchus Marsh (Merrimu System).

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 2014/15, Western Water supplied 58,477 connected properties with drinking water through 1,856 km of water mains. The extensive reticulation system is maintained through renewals, repairs and operational actions such as valve exercising, mains flushing, 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 2014/15 was the lowest experienced in the region in many years.

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

	2010/11	2011/12	2012/13	2013/14	2014/15
Bursts per 100km of water main	14.0	18.0	18.8	14.0	12.1

Storage tank integrity and cleaning

Western Water has 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 tank. 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

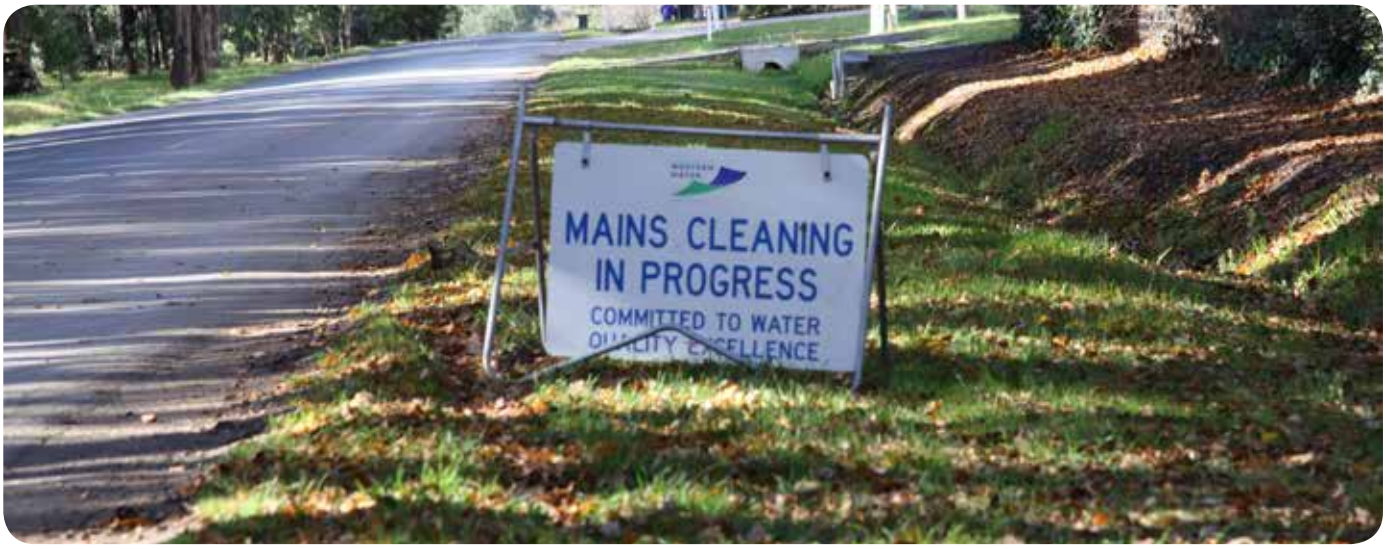
A dedicated backflow prevention officer helps target and reduce the likelihood of backflow occurrences in the system. This backflow role is part of Western Water's HACCP team and potential detections are assessed by a risk based process within the HACCP system. Backflow auditing is continuing in partnership with Casey Inspections.

Critical control points

Western Water utilises HACCP, an internationally recognised food industry standard based on risk prevention and management in food processing applications.

The HACCP system is used to manage significant risks at key points in harvesting, treatment and distribution of drinking water, using the developed Victorian legislative Risk Management Plans (RMPs) and Quality Management Plan (QMP) as supporting tools.

Western Water's HACCP system provides 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 HACCP certificate from February 2015 is included in Appendix 3.



4. Operational procedures and process control

Operational procedures

Western Water understands that 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 are reviewed and updated in line with risk management requirements.

Current procedures and work instructions available at Western Water 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
- Laboratory Test Work Instructions
- Internal Auditing Procedure and Scheduling, and
- Non Conformance Procedures.

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

Operational monitoring and process control

Operational monitoring is conducted at all water filtration plants across the region. Section 5 details the results of microbiological water quality monitoring in 2014/15.

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

Alert and critical limits obtained from HACCP plans are 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 Drinking Water Regulatory Unit at DHHS regulates the safety of drinking water supplied by all Victorian water corporations. No undertakings, exemptions or variations apply to Western Water's drinking water supply in 2014/15.

Drinking water quality monitoring

Western Water closely monitors the quality of drinking water to ensure compliance with the Safe Drinking Water Regulations 2005. In addition to meeting standards for the key water quality parameters highlighted in the Safe Drinking Water legislation, Western Water also aims to ensure that the water provided to customers meets the ADWG. These guidelines provide a benchmark for a large range of biological, physical and chemical parameters and also detail the use and development of Western Water's Drinking Water RMP.

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, validating compliance with the Safe Drinking Water legislation. Water samples are collected in each of our 19 water sampling localities - at reservoirs, WFPs and various points throughout the supply system including water storage tanks 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 NATA.

In addition to testing methods being NATA accredited, the parameters listed in the table in Schedule 2 of the Safe Drinking Water Regulations 2005 are analysed by DHHS approved drinking water analysts.

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 within specifications throughout the treatment process.

Drinking water quality compliance

During 2014/15, all 19 water sampling localities complied with the microbiological requirement that at least 98% of the drinking water samples collected in a 12 month period must have zero *Escherichia coli (E.coli)* organisms per 100 millilitres, as determined by the Safe Drinking Water Regulations 2005 and the ADWG.

Table 8 provides a snapshot of Western Water's compliance on key health and aesthetic parameters for drinking water quality. *E.coli* and turbidity are core indicators of drinking water health. Turbidity, pH level and true colour are core indicators of drinking water aesthetics.

Table 8: Drinking water quality compliance

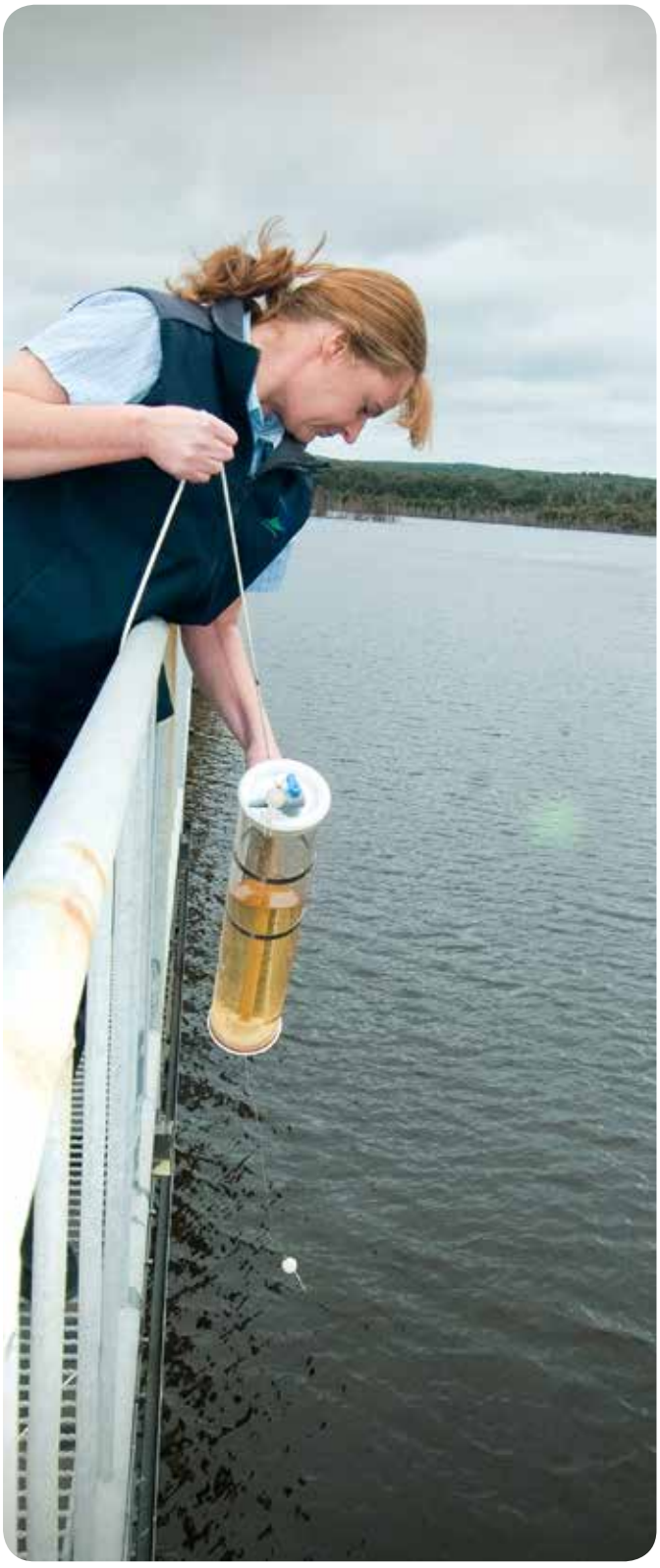
	2010/11	2011/12	2012/13	2013/14	2014/15
E.coli	99.9%	100.0%	99.1%	100.0%	100.0%
Turbidity	94.8%	100.0%	100.0%	100.0%	100.0%
pH level	91.0%	89.5%	100.0%	89.5%	100.0%
Colour, true	99.0%	100.0%	100.0%	100.0%	100.0%

In 2014, Western Water successfully passed its third Regulatory Audit by DHHS (previously DH) for its Drinking Water RMP under the *Safe Drinking Water Act 2003*. The next audit is scheduled for 2016.

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

- *Escherichia coli (E. coli)*
- Chlorine-based disinfection by-product chemicals
  - Trihalomethanes
  - Chloroacetic acid
  - Dichloroacetic acid
  - Trichloroacetic acid
- Other parameters
  - Aluminium
  - Turbidity
  - Fluoride
- Other chemicals not specified in the standards but which may pose a risk to human health: manganese, lead, copper, arsenic, chlorine dioxide, nickel, total chlorine, chromium, cyanide, mercury, nitrate, nitrite, selenium, carbon tetrachloride, and cadmium.

Verification of drinking water quality cont.



Drinking water aesthetics

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 hot water services.

Routine measurement parameters for drinking water aesthetics include pH level, iron, hardness, calcium, magnesium, ammonia, true colour, sodium, total dissolved solids, and sulphate.

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

Further descriptions of the aesthetic parameters can be found in Appendix 4. The majority of drinking water aesthetics parameters were compliant during 2014/15.

Raw water monitoring

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

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

Through an independent NATA accredited laboratory, a comprehensive raw water monitoring program was undertaken during 2014/15.

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 enclosed in Appendix 4.

Microbiological monitoring

In addition to the raw water monitoring conducted by an independent NATA accredited laboratory, raw 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 raw water sources.

General observations provided by these assessments in relation to any water discolouration, the levels of detritus and the presence of any odour in the raw water provided valuable information in assessing the quality of the raw water at various times during 2014/15.

This information allows Western Water to monitor the changes in conditions of raw 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 their water storage manager SRW with regular results on BGA numbers in the three reservoirs provided to Western Water, allowing 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 are provided by Melbourne Water for Greenvale Reservoir. These include 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.

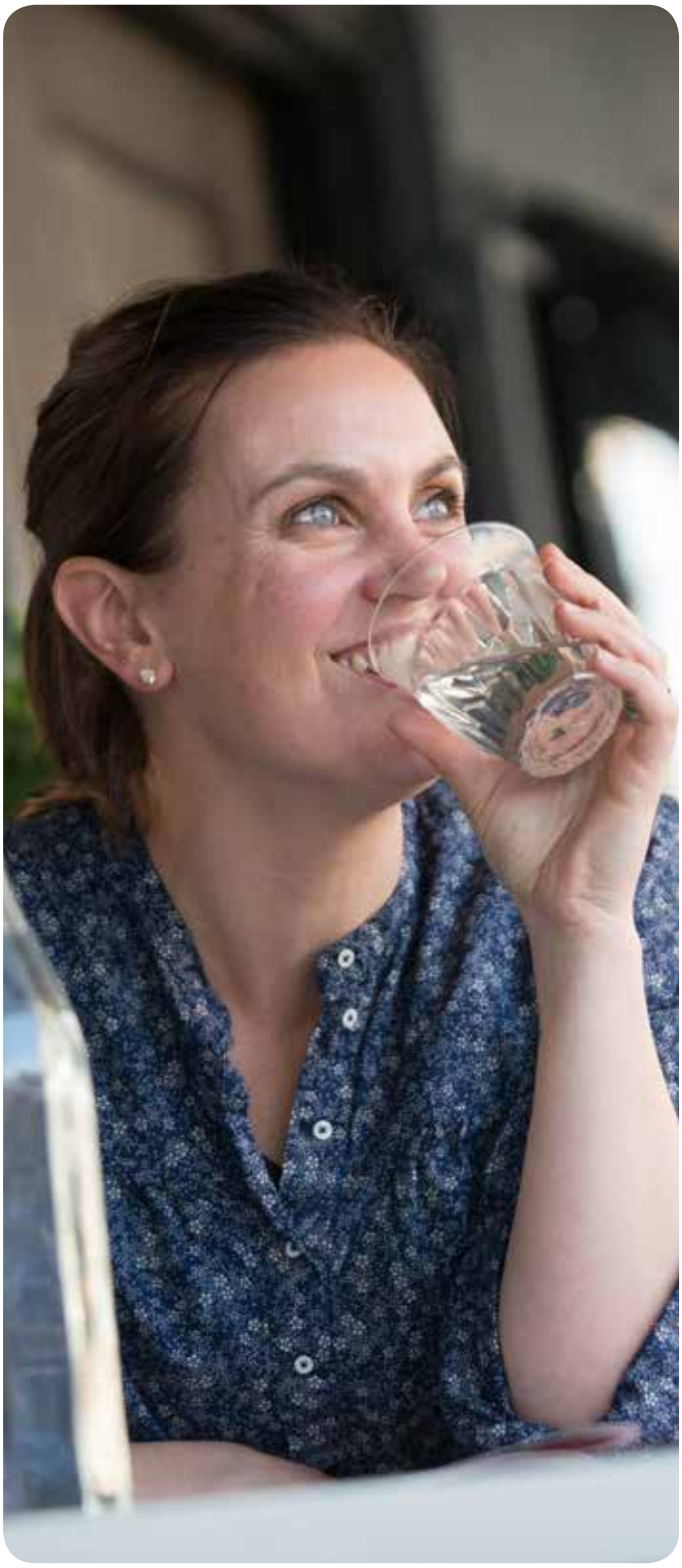
Western Water did not report any BGA reports from SRW as a section 22 notification to DHHS in 2014/15.

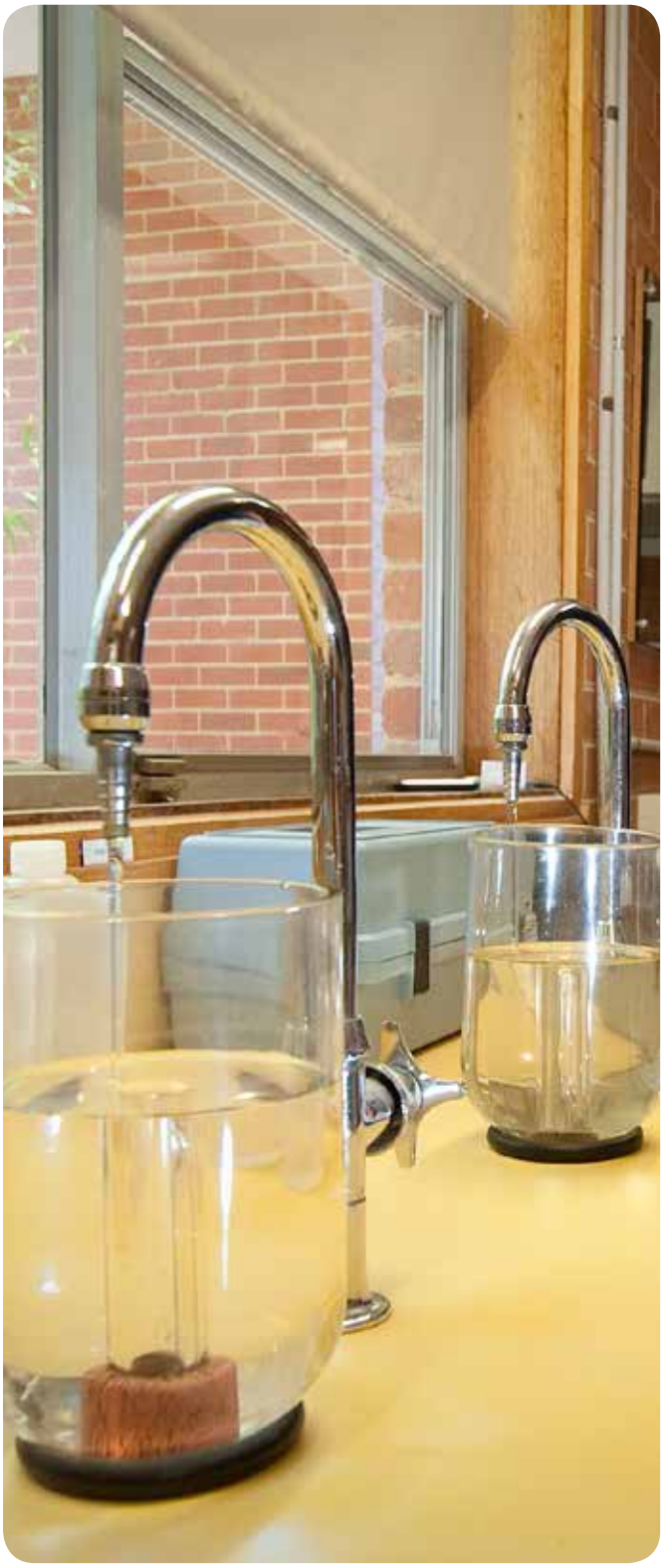
Customer satisfaction

Western Water undertakes a major customer satisfaction survey in May. The research consistently finds that water quality is a major driver of customer satisfaction.

In 2015, at 8.2 out of 10, overall satisfaction with Western Water's services remains relatively high and stable. However, satisfaction with water quality – particularly taste - has fallen this year with an average score of 7.5 out of 10. This was mainly driven by customers in the Melton, Bacchus Marsh and Sunbury areas who have had issues with the taste and odour of water sourced from local reservoirs after switching back from the Melbourne water supply.

Customers in Lancefield continue to be the least satisfied with all aspects of water quality but their level of satisfaction has significantly improved since 2013 (up to 7.2 out of 10 from 5.7). This is strongly aligned with the town's reduced reliance on bore water supplies made possible by the opening of the Lancefield-Romsey pipeline.





Water quality complaints

Western Water's holistic approach ensures any complaint is managed from receipt to resolution, ensuring fast and effective resolution and minimal adverse customer impact. Action is taken on all water quality related complaints. This action can include 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 4 complaints per 1000 customer properties. This benchmark was met again in 2014/15 with Western Water receiving 3.16 complaints per 1000 customer properties (or 0.316 complaints per 100 customer properties as per DHHS reporting requirements).

During 2014/15, overall customer complaints reduced by 12% compared to the prior year as Sunbury customers adjusted to the return to local water supplies and the different taste and odour profiles.

Water quality complaints by locality

In 2014/15, seven localities recorded 10 or more complaints. The highest level of complaints per 100 customers was recorded in Mount Macedon due to trapped air and sediment. This issue was resolved by flushing.

The Sunbury and Bulla localities rated second highest for water quality complaints. This was largely due to the reinstatement of Rosslynne-produced water into the Sunbury system, which generated additional taste and odour complaints from these localities.

Table 9: Water quality complaints per 100 customers - 5 years

	2010/11	2011/12	2012/13	2013/14	2014/15
Complaints per 100 customers	0.348	0.307	0.325	0.368	0.316

**Western Water measures compliance of complaints according to the ADWG, which measures complaints per 100 customers. For this reporting format, a customer is one customer property. Complaints are tracked through internal business performance reporting.*

Table 10: Customer complaints FY14 vs FY15

Complaint category	2013/14	2014/15
Water quality	210	185
Other complaints	44	37
Total	254	222

Table 11: Water quality complaints by locality

Locality	Complaints	Complaints per 100 customer properties[1]
Bulla	2	0.73
Darley	10	0.32
Diggers Rest	6	0.56
Eynesbury	4	0.44
Gisborne	15	0.38
Lancefield	2	0.25
Lerderderg	7	0.22
Macedon	2	0.31
Maddingley	26	0.22
Melton South	44	0.43
Merrimu	3	0.53
Mount Macedon	10	0.74
Myrniong	2	0.40
Riddells Creek	3	0.18
Rockbank	41	0.28
Romsey	8	0.40
Sunbury	2	0.73
Toolern Vale	10	0.32
Woodend	6	0.56

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

Table 12: Water quality complaints by type and locality

Complaint type	Complaints	Complaints per 100 customer properties	Localities by highest number of complaints		
			1st	2nd	3rd
Taste/odour	61	0.100	Sunbury	Merrimu	Melton South
Dirty/discoloured	100	0.170	Merrimu	Melton South	Riddells Creek
White water	1	0.030	Diggers Rest	n/a	n/a
Illness	4	0.007	Sunbury	Melton South	n/a
Other	20	0.002	Merrimu	Sunbury	Eynesbury
Total	185	0.316			

6. Incident management and emergency response

Communication protocols

Western Water's incident response procedures describe 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.

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.

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 any repeat. This process is particularly vital for large scale incidents that present major risks and/or that can offer useful learnings.

Incidents reported under section 22 Safe Drinking Water Act 2003

a. Shepherds Lane Tank, 20 August 2014 (Sunbury)

Issue - Routine sampling at the tank resulted in detection of 1org/100mL of *E.coli* in the presence of 0.03mg/L monochloramine and 0.05mg/L total chlorine.

Actions - The tank was isolated from supply and spot-dosed with chlorine to return a residual of 1.4 mg/L free chlorine and 1.6mg/L total chlorine. The freshly chlorinated water was pumped into the reticulation system via pump station.

Resampling was conducted for three consecutive days with all results clear of *E.coli*. The tank was inspected and some ingress was detected at the inspection hatch, which was repaired. This ingress is believed to be the root cause of the detection.

Subsequently, in July 2015, major works to the roof were undertaken as a trial of new technology to provide a substantially more effective barrier to future potential rainwater ingress. The solution involves use of advanced polymers to seal between each sheet on the roof.

b. Reticulation system, 28 August 2014 (Romsey)

Issue - Routine sampling at the tank resulted in detection of 4org/100mL of *E.coli* in the presence of good chlorine residuals throughout the reticulation system.

Actions - There were no issues observed on SCADA for the treatment plant during this incident. Flushing of the main at the affected sentinel sampling site was performed, and resampling was conducted for three consecutive days with all results clear of *E.coli.* A root cause was not able to be established.

c. Romsey Tank A, 26 October 2014 (Romsey)

Issue - Routine sampling at the tank resulted in detection of 9org/100mL of *E.coli* in the presence of 0.65mg/L monochloramine and 0.88mg/L total chlorine.

Actions - The tank was isolated from supply and resampled on three consecutive days to confirm clean samples prior to return to supply. The chloramination contact time was examined and found to be adequate for disinfection purposes. The tank integrity was assessed and some ingress was detected after a recent wet weather event.

The root cause was suspected to be either an issue with the integrity of the sample collected (false-positive) or minor ingress of rainwater through the roof. Works to improve tank roof integrity - following the trial of new technology discussed earlier - is planned to commence across tanks in 2015/16.

d. Shepherds Lane Tank, 12 November 2014 (Sunbury)

Issue - Routine sampling at the tank resulted in detection of 2org/100mL of *E.coli* in the presence of 0.14mg/L monochloramine and 0.22mg/L total chlorine.

Actions - The tank was isolated from supply and partly drained for spot-dosing with chlorine to return a residual of 0.32mg/L monochlorine and 0.6mg/L total chlorine. The freshly chlorinated water was pumped into the reticulation system via pump station.

The sample tap was disinfected and flushed, and the tank was inspected which showed no signs of entry by contaminates. Resampling was conducted for three consecutive days with all results clear of *E.coli*.

The root cause was believed to be rainwater ingress through the roof. Subsequently, in July 2015, major works to the roof were undertaken trialling new technology to provide a substantially more effective barrier to future potential rainwater ingress. The solution involves use of advanced polymers to seal between each sheet on the roof.

e. South Gisborne Tank, 10 December 2015 (Gisborne)

Issue - Routine sampling at the tank resulted in detection of 1org/100mL of *E.coli* in the presence of <0.05mg/L free chlorine and 0.17mg/L total chlorine.

Actions - The tank was isolated from supply and spot-dosed with chlorine to return a residual of 0.8mg/L free chlorine and 1.1mg/L total chlorine. The reticulation system was

flushed to then draw freshly chlorinated water from the tank via pump station.

Resampling was conducted for three consecutive days with all results clear of *E.coli.* The root cause was suspected to be an issue with the integrity of the sample collected (false-positive) as it was collected during a wet weather event. A possible alternative root cause is minor ingress of rainwater through the roof. Works to improve tank roof integrity following the trial of new technology is planned to commence across tanks in 2015/16.

f. Dodemaide Circuit Tank,12 January 2015 (Melton South)

Issue - Routine sampling at the tank resulted in detection of 1org/100mL of *E.coli* in the presence of <0.05mg/L free chlorine and 0.08mg/L total chlorine.

Actions - The tank was isolated from supply and spot-dosed with chlorine to return a residual of 1.2mg/L free chlorine and 1.4mg/L total chlorine. The reticulation system was flushed to then draw freshly chlorinated water from the tank via pump station.

The root cause is suspected to be minor ingress of rainwater into the tank around the inspection hatch. Subsequent works were undertaken to improve the sealing of the hatch. Resampling was conducted for three consecutive days with all results clear of *E.coli.* This tank will also be included in 2015/16 works to improve tank roof integrity following the trial of new technology.

g. McDonalds Tank, 20 February 2015 (Mt Macedon)

Issue - Routine sampling at the tank resulted in detection of 2org/100mL of *E.coli* in the presence of 0.15mg/L free chlorine and 0.18mg/L total chlorine.

Actions - The tank was isolated from supply and spot-dosed with chlorine to return a residual of 0.8mg/L free chlorine. The reticulation system was flushed to then draw freshly chlorinated water from the tank via pump station. Resampling was conducted for three consecutive days with all results clear of *E.coli.*

Inspection of the tank was conducted and a point of potential ingress identified near the inspection hatch. The potential source of contamination was at the sampling point, due to overgrowth of weeds. Repair works were made to the inspection hatch and vegetation was cleared near the sample point. This tank will also be included in 2015/16 works to improve tank roof integrity following the trial of new technology.

Incidents not reported under section 22 Safe Drinking Water Act 2003

a. Lancefield supply issue, 2 September 2014 (Lancefield)

Issue - Routine operations detected a processor failure in the Remote Telemetry Unit (RTU) resulting in a telemetry failure. The hypochlorite pumps had failed and water produced was briefly unchlorinated.

Actions - The plant was isolated and the telemetry fault resolved. The clear water storage tank was monitored by a secondary chlorine monitor and found to have maintained greater than 1mg/L total chlorine and adequate mixing. This confirmed only adequately chlorinated water had entered the reticulation system and thus water remained safe throughout. A programming change was made to ensure the alarm from the processor would be received remotely.

b. Minns Road Tank B, 16 January 2015 (Melton)

Issue - Routine sampling at the tank resulted in detection of 1org/100mL of *E.coli* in the presence of <0.05mg/L free chlorine and 0.07mg/L total chlorine.

Actions - Both Minns Road's Tank A and Tank C were clear of any detects. In discussions with the Department of Health and Human Services, it was determined that there was no threat to public health at the time of detection in Tank B. As a precaution, the tank was isolated from supply and resampling was conducted for three consecutive days with all results clear of *E.coli* in the tank.

The root cause was suspected to be related to sample integrity, as the nature of the welded steel tank prevented rainwater ingress from the roof.

Excursions not reported under Section 22 Safe Drinking Water Act 2003

a. Merrimu Water Filtration Plant, 20 September 2014 (Melton)

The fluoride dosing system at the filtration plant ceased due to control valve fault. As a result, the plant continued to produce treated water without fluoridation. The control valve was repaired. Notification to DHHS was not required as the outage of the fluoridation plant was less than 36 hours in duration.

Blue green algae (BGA)

During 2014/15, there were no blue green algae notifications that impacted drinking water quality at Rosslynne or Merrimu Reservoirs.

Notifications of surface water blooms were received from Southern Rural Water. However, numbers detected at the surface were not representative of the water fed to the drinking water treatment plants via the submerged off-take points. This was confirmed by both Western Water's independent biological monitoring and online monitoring at the treatment plants.

7. Employee awareness and training

Western Water's water quality team are 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 2014/15, the water quality team consisted of ten staff with two based in the Sunbury office, five based at Rosslynne Water Filtration Plant and another three based at Merrimu Water Filtration Plant.

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

Water quality team members undertake training each year with some attending the Water Industry Training Centre (WITC) in Geelong. 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.

Western Water's water quality team members attended over 40 different training opportunities during 2014/15.

Courses covered a range of specialised water treatment and general workplace training including:

- Foundation workplace skills
- Sedimentation/clarification (WITC)
- DAFF (WITC)
- TechOne purchase order training
- Financial acumen (Finance for non-finance people)
- Fire extinguisher training, and
- Confined Space Entry refresher with CPR.

Water industry operations

Western Water strongly encourages 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 salary band progression opportunities. Four employees from the water quality and outdoor teams were enrolled in Certificate III Water Operations in 2014/15.

Western Water continues its commitment to employee learning and development through a range of training advisory bodies, including:

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

8. Community involvement and awareness

Community involvement

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

Western Water is committed to improving the biodiversity value of its properties and enhancing the environment across the region. Long standing partnerships with Pinkerton Landcare and Environment Group, Deep Creek Landcare and Friends of Toolern Creek are testimony to this commitment.

Consultation

Western Water's customer advisory network has expanded to include our online customer panel which provides a significant additional resource for community consultation and totals more than 8,000 members. During the reporting period, two short water quality surveys were sent out to the online panel to help management understand customer issues.

In December 2014, 200 customers provided their feedback on drinking water quality with 72% stating tap water was their main source of drinking water. After drinking the water from the tap that day, almost a quarter were not satisfied with the taste citing chlorine and earthy/mouldy taste as issues.

In June 2015, some of the questions were repeated following a series of telephone and social media complaints about Sunbury water. Responses came from 170 customers with only 63% stating tap water was their main source and 22% rating the water quality as low or very low. Almost half the respondents felt they had some concerns with the water quality – particularly those in Melton and Bacchus Marsh. Again chlorine was an issue.

The results of these online panel surveys were fed back to Western Water's Executive and senior management teams to assist in determining the necessary steps to ensure the best quality water supply for the region.

An important facet of delivering Western Water's capital investment program is consultation with our community. Consultation processes are carefully designed to engage, establish the issues and ensure the optimum community outcome with consideration to a triple bottom line approach.

Education

Western Water recognises 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 are offered at the preschool, prep, primary and secondary school levels. During the year, more than 7,500 students from across the region attended Western Water primary school education presentations.

Tours and presentations

Western Water offers free tours and presentations to schools and community groups. Free guided tours are offered at our largest treatment plants at Gisborne, Sunbury and Melton. In 2014/15, educational tours and community presentations were conducted for a range of groups including primary, secondary, tertiary and community groups.

Sponsorship and grants

Western Water builds and strengthens local community relations through sponsorships and offering grants across the service region.

We also take the H2O Water Café to community events to offer tap water to attendees and to promote the health benefits and quality of our drinking water.

In addition, our mobile water tanks are made available free of charge to various community activities across the region.

We are also strongly supporting the Choose Tap program through local cafés, businesses, sporting groups and by gifting drinking water fountains to councils for installation in public places.

Publications

In addition to the annual Drinking Water Quality Report, Western Water's current water treatment publications include the following factsheets:

- Bore water for drinking
- Drinking water for health
- Rosslynne WFP treatment
- Water by agreement
- Melton's water supply
- Sunbury's water supply.

Community awareness and communications

To ensure the community fully comprehends our issues and actions, Western Water produces a range of planned and reactive communication materials including the newsletter, *H2Info*, factsheets, brochures, media stories and customer letters.

Typically these are delivered through mail or the media but, when required, communications are supported through direct contact either by phone or in person. In addition, copies of all publications are located on our website.

Western Water's social media communication channels and online consultation panel have increased our means of communicating with customers about critical water quality issues and go beyond traditional channels by offering very timely, direct, two way communication.

Facebook has become a significant communication channel for Western Water – particularly when customers have issues with their water quality or supply. Our Facebook page has 3,300 friends and the message reach capability is far greater when updates are shared.

9. Research and development

Western Water is committed to improving understanding and delivery of quality drinking water. To this end, we have invested in a number of new technologies specifically aimed at better water quality monitoring and delivery.

In addition, we maintain a link with WSAA and the American Water Research Foundation to access best practice water industry research on both a national and international scale.

Research

Intelligent Water Networks

Western Water has taken a lead role in the Intelligent Water Networks (IWN) program, a partnership between VicWater, the 19 water corporations and DELWP.

The IWN program is part of a new era of innovation in the Victorian water industry focusing on increased collaboration and information-sharing across the industry.

The program is investigating new technologies and innovations to meet common challenges such as population growth, ageing infrastructure and climate variability.

Several projects are now underway as part of the IWN program, designed to drive efficiency and system-wide cost reductions.

Industry knowledge

In addition to the IWN program, Western Water maintains 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.

As part of Western Water's membership of WSAA, we actively support their research program, including international collaborative research with the American Water Research Foundation.

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 actively participate in key industry associations with committee representation in the AWA Victoria Branch Committee and the IWA. Western Water staff also attend seminars and conferences to access up to date industry knowledge. This includes those run by the AWA, Water Quality Research Australia (WQRA), IWA, VicWater and WIOA.

Western Water also participates in the state-wide Drinking Water Quality Network and the metropolitan retailers' network. These foster good working relationships across the industry.

Western Water has a small library of 170 core reference texts and research papers on water quality and other matters.

10. Documentation and reporting

Management of documentation

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

HACCP documents reviewed and/or rewritten in 2014/15 include:

- Hillside Booster HACCP plan
- Loemans/Shepherds HACCP plan
- Rosslynne WFP HACCP plan
- Riddell Road Tank Booster HACCP plan
- Lancefield WFP HACCP plan, and
- Product Specification.

An annual review of the following sites was carried out:

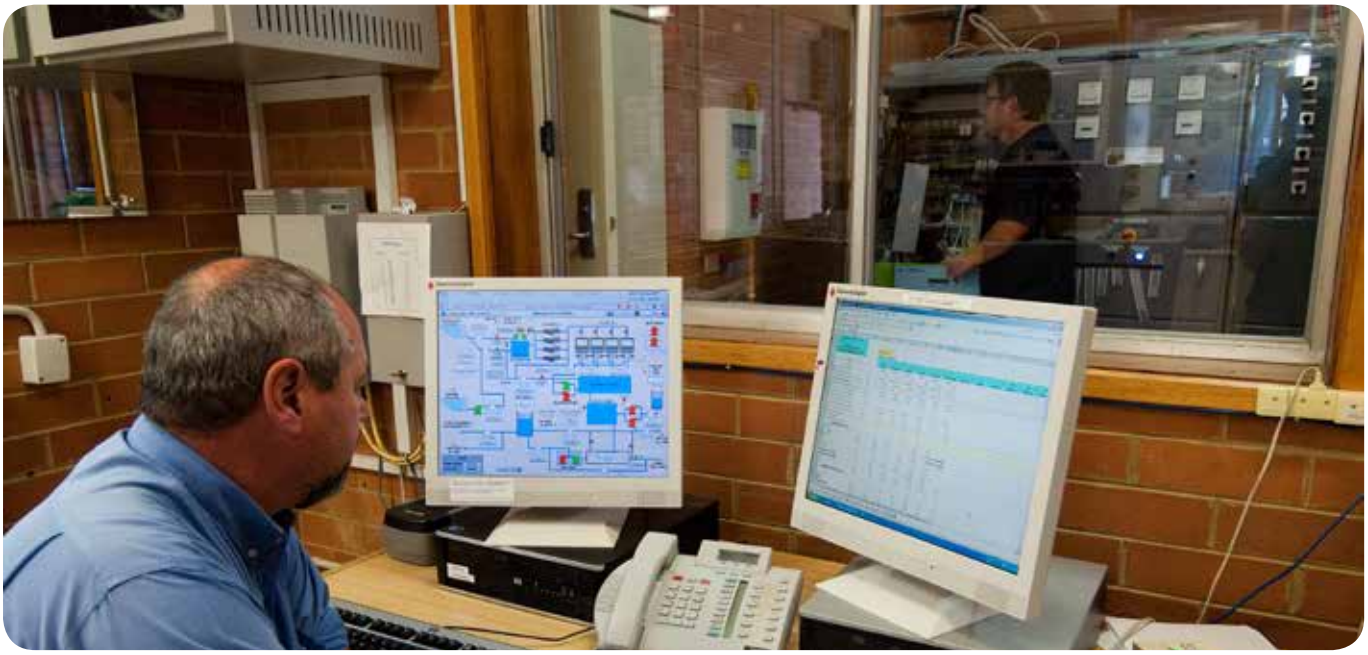
- Swans Rd Booster Chlorinator
- Darley High Chlorinator
- Gisborne Rd Chlorinator
- Underbank Chlorinator
- Settlement Rd Booster Chlorinator
- Sandy Creek Booster Chlorinator
- Merrimu Water Filtration Plant
- Lancefield Water Filtration Plant
- Romsey Water Filtration Plant
- Loemans Rd Entry Point
- Norton Rd Booster Chlorinator
- Salisbury Rd Booster Chlorinator
- Hillside Entry Point
- Marriages Water Filtration Plant, and
- Reservoir C Water Filtration Plant.

Water quality excursions/non-conformances and incidents are reviewed by the HACCP team on a monthly basis, and are 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 uses the Balanced Scorecard (BSC) to manage and report on strategic business performance and ensure the business is progressing toward its mission: "to provide safe secure, healthy and reliable water and sewerage services to meet the current and future needs of our community, and to do so in an efficient and sustainable manner".

Through BSC reporting, key objectives, actions and system performance are monitored by the Board and Executive on a monthly basis. 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 over 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 identify 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 2015, achieving confirmation of the ongoing HACCP certification.

In 2014/15, 20 internal audits on the Drinking Water HACCP system were undertaken by members of Western Water's HACCP team.

The internal 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.

DHHS Regulatory Audit

Western Water successfully passed its fourth Regulatory Audit for Drinking Water Risk in April 2014.

This result confirms Western Water's commitment to delivering quality and safe drinking water to customers.

The audit was based directly on the ADWG and the *Safe Drinking Water Act 2003*.

The next DHHS audit is scheduled for early 2016.

12. Review and continual improvement

Management reviews

Water quality is viewed as a vital performance issue for Western Water at the most senior level. The performance of the DWQMS is reviewed monthly by the Executive which includes the Managing Director and four 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 (EWOV).

Drinking water quality management improvement plan

Western Water already has in place an extensive DWQMS. It is framed around the twelve elements of the Australian Drinking Water Guidelines.

This assessment ensures continual improvement measures are identified, and strengths and weaknesses in water quality risk management are well understood, by the Board, Executive and staff.

Water supply – capital works improvement

The following is an overview of water supply works undertaken by Western Water in 2014/15:

Orde Hill Reservoir upgrade, Mount Macedon

The Orde Hill Reservoir, located on Willimigongon Creek, has a capacity of 250 million litres. It is used to harvest and store water before it is transferred to Rosslynne Reservoir (near Gisborne) and/or the Graham Brock Reservoir (in Woodend), where it is treated and distributed to customers as drinking water.

The $0.7 million upgrade involved improvements to the internal and external drainage along the embankment, seepage collection points and vehicle access points.

The upgrade ensures Orde Hill Reservoir meets Australian National Committee on Large Dams (ANCOLD) guidelines as well as Western Water's Statement of Obligations for dam safety.

Ongoing mains replacements and renewals

Western Water continues to identify and replace ageing water reticulation systems across the region. The program is helping to reduce water losses through leakage as well as helping maintain water quality. A total of $3.5 million has been allocated to water mains renewals over the five year Water Plan period with $0.7 million spent on water main replacements across 2014/15.

In the coming financial year, Western Water has a number of water supply projects planned including:

Leakes Road trunk water main, Rockbank

Western Water plans to construct a trunk water main along Leakes Road to provide water to the new housing developments in Rockbank from the Merrimu supply system. Total project cost is estimated at $6.0 million. This project is likely to commence and be completed in 2015/16.

Avenue of Honour water main upgrade, Bacchus Marsh

The Avenue of Honour in Bacchus Marsh has an ageing water main that has experienced a significant number of breaks over the years. Each break is a major exercise to repair due to the proximity of the road and the significant trees along the Avenue, as well as the nature of the work. The main has also become too small to meet demand from the customers supplied.

Western Water has commenced planning the upgrade of almost 2km of water main along the Avenue of Honour in Bacchus Marsh. This project will increase the size and capacity of the main to improve water supply to customers on the Avenue.

A key aspect of the project is preservation of the trees along the Avenue as well as ensuring minimal disruption to the businesses that are likely to be impacted by works. Detailed consultation with customers and stakeholders is underway with construction likely to occur in late 2015.

An additional project for 2015/16 includes upgrading the membranes at Romsey Water Filtration Plant.

Non-potable supply

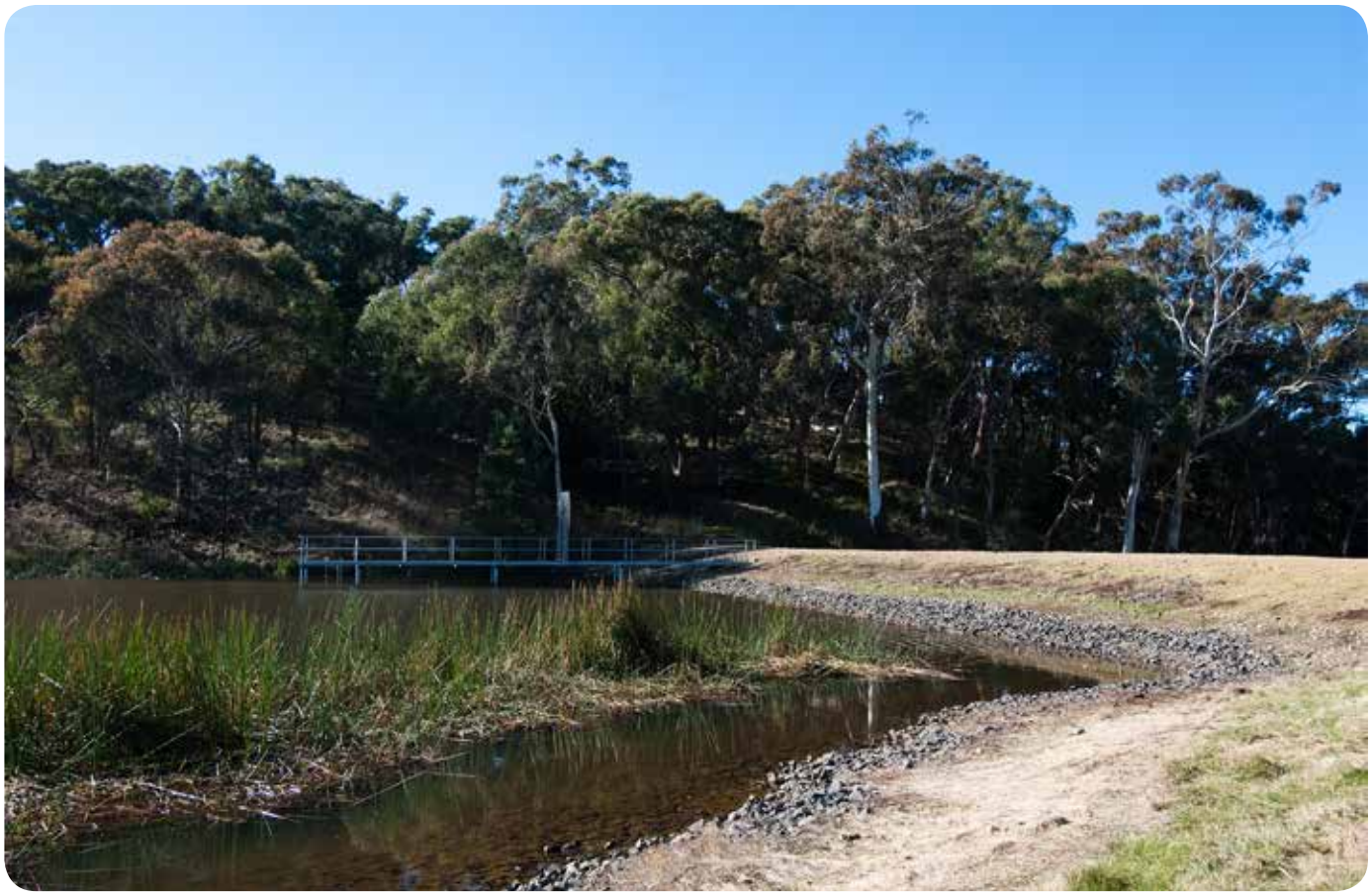
Non-potable water is water that has not been treated to the standards considered acceptable for drinking water under the *Safe Drinking Water Act 2003*.

It can include raw (untreated) water direct from reservoirs as well as partially treated water. There are no regulated water declarations regarding the non-potable water supply customers of Western Water.

Western Water manages the supply of non-potable water through water by agreement contracts with individual customers.

During 2014/15, Western Water had 14 non-potable water by agreement customers located across our system. Typically, they are customers who have made special arrangements for connection to Western Water's system between untreated source water and the treatment plant.

Western Water advises that this water is not suitable for either drinking or food preparation through the individual contracts, as well as ongoing notification on all applicable customer bills, in accordance with Section 25 of the Act.



Appendices

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 the Western Water Customer Service Charter.

Customers will be provided with safe (biologically, chemically and physically), cost effective and reliable drinking water and associated services throughout our area of operations. 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). The DWQMS is based on sound risk management principles of AS4360.

Certification of its 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.

Supply by Agreement customers will regularly be provided with advisory notices in order to ensure customers understand the fit-for-purpose implications.

Western Water will enhance the sustainability of drinking water supply through initiatives outlined in the Victorian Government's strategy.

Western Water supports Government policy regarding the introduction to 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.

Western Water will communicate with customers to support the maintaining of public confidence in the safety of drinking water supply. This includes information on the impact of drought on water sources, water quality and water system maintenance.

Appendix 2 – Regulatory and formal requirements for drinking water

Related legislation, policies, systems and procedures include:

- *Safe Drinking Water Act 2003*
- *Health (Fluoridation) Act 1973*
- *Food Act 1984*
- *Essential Services Commission Act 2001*
- *Environmental Protection Act 1970*
- *Water Efficiency Labelling and Standards Act 2005*
- Safe Drinking Water Regulations 2005
- Dangerous Goods (Storage and Handling) Regulations 2000
- NHMRC/ARMCANZ Australian Drinking Water Guidelines 2011
- Risk Management (AS4360)
- Relevant State Environment Protection Policies (SEPPs)
- Environmental Management System - ISO 14001
- Quality Management System – ISO 9001
- Occupational Health and Safety Management System - AS 4801
- Drinking Water Quality Management System
- HACCP Principles and Systems Procedures
- Integrated Management System procedures, and
- All relevant policies contained in the Policy Manual.

Appendix 3 - HACCP certification

CERTIFICATE

DQS CERTIFICATION AUSNZ PTY LTD

hereby certifies that the company

WESTERN WATER

36 Macedon Street
Sunbury VIC 3429
Australia

has implemented and maintains a **HACCP System**

Scope:

Storage, treatment and distribution of drinking water.

Through an audit, documented in report, it was verified that the management system fulfills the requirements of:

GENERAL PRINCIPLES OF FOOD HYGIENE AND GUIDELINES FOR THE APPLICATION OF THE HACCP SYSTEM CAC/RCP 1 - 1969, REV. 4 - 2003
Relevant Food Safety Act requirements.

ANZSIC Code	3701
Certificate registration no.	2123
Date of issue	09-APR-2015
Valid until	16-MAY-2018

Director Certification Programs

DQS CERTIFICATION AUSNZ PTY LTD
BUILDING 2, LEVEL 2, 630 MITCHAM ROAD, MITCHAM, VIC 3132, AUSTRALIA

Appendix 4 - Water quality compliance results

The following section reports on 2014/15 compliance with the water quality standards outlined below, in table A1.

Table A1: Drinking water quality standards

Parameter	Sampling frequency	Water quality standard
Escherichia coli	Weekly	At least 98% of all samples collected in any 12 month period to contain no *Escherichia coli* per 100mL
Chloroacetic acid	Monthly	Must not exceed 0.15 mg/L
Dichloroacetic acid	Monthly	Must not exceed 0.1 mg/L
Trichloroacetic acid	Monthly	Must not exceed 0.1 mg/L
Trihalomethanes	Monthly	Must not exceed 0.25 mg/L
Bromate	Monthly	Must not exceed 0.02 mg/L
Formaldehyde	Monthly	Must not exceed 0.5 mg/L
Aluminium	Monthly	Must not exceed 0.2 mg/L
Turbidity	Weekly	95% upper confidence limit of the mean of drinking water samples collected in the preceding 12 months must be less than or equal to 5.0 Nephelometric Turbidity Units (NTU)

A5.1 *Escherichia 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 A2: Escherichia coli *results*

Water sampling locality	Sampling frequency*	No. of samples	No. of samples containing *E.coli*	Max. result (orgs/mL)	% Samples with no *E.coli*	Complying (Yes/No)
Bulla	Weekly	54	0	0	100%	Yes
Darley	Weekly	52	0	0	100%	Yes
Diggers Rest	Weekly	52	0	0	100%	Yes
Eynesbury	Weekly	53	0	0	100%	Yes
Gisborne	64/year	64	0	0	100%	Yes
Lancefield	Weekly	52	0	0	100%	Yes
Lerderderg	64/year	64	0	0	100%	Yes
Macedon	Weekly	53	0	0	100%	Yes
Maddingley	Weekly	52	0	0	100%	Yes
Melton South	112/year	112	0	0	100%	Yes
Merrimu	64/year	66	0	0	100%	Yes
Mount Macedon	Weekly	56	0	0	100%	Yes
Myrniong	Weekly	53	0	0	100%	Yes
Riddells Creek	Weekly	52	0	0	100%	Yes
Rockbank	Weekly	52	0	0	100%	Yes
Romsey	Weekly	61	0	0	100%	Yes
Sunbury	112/year	112	0	0	100%	Yes
Toolern Vale	Weekly	53	0	0	100%	Yes
Woodend	64/year	64	0	0	100%	Yes

** Some localities received extra sampling for* E.coli *in response to localised water quality issues in the reporting period.*

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 2005 include total trihalomethanes, chloroacetic acid, dichloroacetic acid and trichloroacetic acid. The following section reports the results for the 2014/15 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.

Table A3: Trihalomethanes results

Water sampling locality	Sampling frequency	No. of samples	No. of non-complying samples	Max. (mg/L)	Min. (mg/L)	Complying (Yes/No)*
Bulla	Monthly	12	0	0.120	0.070	Yes
Darley	Monthly	12	0	0.150	0.097	Yes
Diggers Rest	Monthly	12	0	0.120	0.076	Yes
Eynesbury	Monthly	12	0	0.140	0.073	Yes
Gisborne	Monthly	12	0	0.160	0.079	Yes
Lancefield	Monthly	12	0	0.120	0.046	Yes
Lerderderg	Monthly	12	0	0.120	0.075	Yes
Macedon	Monthly	12	0	0.170	0.100	Yes
Maddingley	Monthly	12	0	0.150	0.088	Yes
Melton South	Monthly	12	0	0.140	0.072	Yes
Merrimu	Monthly	12	0	0.120	0.084	Yes
Mount Macedon	Monthly	12	0	0.170	0.110	Yes
Myrniong	Monthly	12	0	0.110	0.031	Yes
Riddells Creek	Monthly	12	0	0.180	0.085	Yes
Rockbank	Monthly	12	0	0.140	0.025	Yes
Romsey	Monthly	12	0	0.010	0.002	Yes
Sunbury	Monthly	12	0	0.120	0.076	Yes
Toolern Vale	Monthly	12	0	0.120	0.075	Yes
Woodend	Monthly	12	0	0.060	0.026	Yes

** Compliance as measured against the guideline values set out in ADWG for total trihalomethanes in drinking water based on health considerations should not exceed 0.25mg/L.*

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 A4: Chloroacetic acid results

Water sampling locality	Frequency of sampling	No. of samples	No. of non-complying samples	Max. (mg/L)	Min. (mg/L)	Complying (Yes/No)*
Bulla	Monthly	12	0	0.002	0.002	Yes
Darley	Monthly	12	0	0.002	0.002	Yes
Diggers Rest	Monthly	12	0	0.003	0.002	Yes
Eynesbury	Monthly	12	0	0.002	0.002	Yes
Gisborne	Monthly	12	0	0.002	0.002	Yes
Lancefield	Monthly	12	0	0.002	0.002	Yes
Lerderderg	Monthly	12	0	0.002	0.002	Yes
Macedon	Monthly	12	0	0.002	0.002	Yes
Maddingley	Monthly	12	0	0.002	0.002	Yes
Melton South	Monthly	12	0	0.002	0.002	Yes
Merrimu	Monthly	12	0	0.003	0.002	Yes
Mount Macedon	Monthly	12	0	0.002	0.002	Yes
Myrniong	Monthly	12	0	0.002	0.002	Yes
Riddells Creek	Monthly	12	0	0.002	0.002	Yes
Rockbank**	Monthly	13	0	0.002	0.002	Yes
Romsey	Monthly	12	0	0.002	0.002	Yes
Sunbury	Monthly	12	0	0.003	0.002	Yes
Toolern Vale	Monthly	12	0	0.002	0.002	Yes
Woodend	Monthly	12	0	0.002	0.002	Yes

** 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.*

***This locality received extra sampling for total chloroacetic acid in response to localised water quality issues in the reporting period.*

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 A5: Dichloroacetic acid results

Water sampling locality	Frequency of sampling	No. of samples	No. of non-complying samples	Max. (mg/L)	Min. (mg/L)#	Complying* (Yes/No)
Bulla	Monthly	12	0	0.005	0.002	Yes
Darley	Monthly	12	0	0.010	0.002	Yes
Diggers Rest	Monthly	12	0	0.014	0.002	Yes
Eynesbury	Monthly	12	0	0.003	0.002	Yes
Gisborne	Monthly	12	0	0.017	0.002	Yes
Lancefield	Monthly	12	0	0.012	0.002	Yes
Lerderderg	Monthly	12	0	0.009	0.002	Yes
Macedon	Monthly	12	0	0.010	0.003	Yes
Maddingley	Monthly	12	0	0.007	0.003	Yes
Melton South	Monthly	12	0	0.009	0.002	Yes
Merrimu	Monthly	12	0	0.011	0.002	Yes
Mount Macedon	Monthly	12	0	0.010	0.003	Yes
Myrniong	Monthly	12	0	0.003	0.002	Yes
Riddells Creek	Monthly	12	0	0.010	0.004	Yes
Rockbank**	Monthly	13	0	0.004	0.002	Yes
Romsey	Monthly	12	0	0.006	0.002	Yes
Sunbury	Monthly	12	0	0.019	0.003	Yes
Toolern Vale	Monthly	12	0	0.010	0.002	Yes
Woodend	Monthly	12	0	0.014	0.004	Yes

** 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*

 # A result of <0.005 mg/L is a result less than the detection limit for total dichloroacetic acid.

*** This locality received extra sampling for total dichlorooacetic acid in response to localised water quality issues in the reporting period.*

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 A6: Trichloroacetic acid results

Water sampling locality	Frequency of sampling	No. of samples	No. of non-complying samples	Max. (mg/L)	Min. (mg/L)#	Complying* (Yes/No)
Bulla	Monthly	12	0	0.010	0.002	Yes
Darley	Monthly	12	0	0.013	0.007	Yes
Diggers Rest	Monthly	12	0	0.016	0.002	Yes
Eynesbury	Monthly	12	0	0.005	0.002	Yes
Gisborne	Monthly	12	0	0.015	0.002	Yes
Lancefield	Monthly	12	0	0.007	0.002	Yes
Lerderderg	Monthly	12	0	0.008	0.002	Yes
Macedon	Monthly	12	0	0.038	0.002	Yes
Maddingley	Monthly	12	0	0.013	0.002	Yes
Melton South	Monthly	12	0	0.010	0.002	Yes
Merrimu	Monthly	12	0	0.007	0.002	Yes
Mount Macedon	Monthly	12	0	0.022	0.002	Yes
Myrniong	Monthly	12	0	0.002	0.002	Yes
Riddells Creek	Monthly	12	0	0.024	0.006	Yes
Rockbank**	Monthly	13	0	0.011	0.002	Yes
Romsey	Monthly	12	0	0.002	0.002	Yes
Sunbury	Monthly	12	0	0.120	0.076	Yes
Toolern Vale	Monthly	12	0	0.010	0.003	Yes
Woodend	Monthly	12	0	0.012	0.003	Yes

** 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*

*** This locality received extra sampling for total trichlorooacetic acid in response to localised water quality issues in the reporting period.*

 # A result of <0.005 mg/L is a result less than the detection limit for total trichloroacetic acid.

A4.3 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 2014/15 reporting period.

A4.4 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 monthly at customer taps at all 19 localities whether or not aluminium is added as a coagulant as part of the water treatment process. If the result for total aluminium exceeds 0.2 mg/L, an automatic retest of sampling is conducted by our contracted NATA-accredited laboratory. Where aluminium is not used in the treatment process, any detection of aluminium will likely be due to naturally-occurring microscopic clay particles.

Table A7: Total aluminium results

Water sampling locality	Frequency of sampling	No. of samples	No. of non-complying samples	Max. (mg/L)	Min. (mg/L)#	Complying* (Yes/No)
Bulla	Monthly	12	0	0.05	0.01	Yes
Darley^	Monthly	12	0	0.03	0.02	Yes
Diggers Rest**	Monthly	13	0	0.14	0.04	Yes
Eynesbury^	Monthly	12	0	0.07	0.02	Yes
Gisborne	Monthly	12	0	0.05	0.03	Yes
Lancefield^	Monthly	12	0	0.02	0.01	Yes
Lerderderg^	Monthly	12	0	0.07	0.04	Yes
Macedon	Monthly	12	0	0.07	0.02	Yes
Maddingley^	Monthly	12	0	0.06	0.04	Yes
Melton South^	Monthly	12	0	0.04	0.02	Yes
Merrimu^	Monthly	12	0	0.05	0.02	Yes
Mount Macedon	Monthly	12	0	0.06	0.03	Yes
Myrniong^	Monthly	12	0	0.04	0.02	Yes
Riddells Creek	Monthly	12	0	0.06	0.02	Yes
Rockbank	Monthly	12	0	0.09	0.01	Yes
Romsey	Monthly	12	0	0.04	0.03	Yes
Sunbury	Monthly	12	0	0.07	0.03	Yes
Toolern Vale^	Monthly	12	0	0.03	0.02	Yes
Woodend^	Monthly	12	0	0.02	0.01	Yes

** Compliance as measured against the guideline values set out in ADWG for acid soluble aluminium in drinking water based on health considerations should not exceed 0.2mg/L. The values in this table are for total aluminium. DHHS rounding policy means that results of 0.24mg/L or below are compliant.*

 # A result of <0.01 mg/L is a result less than the detection limit for total aluminium.

^ Alum is added to these supplies.

*** This locality received extra sampling for aluminium in response to localised water quality issues in the reporting period.*

A4.5 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.

A summary of the turbidity results for samples taken at customer taps in 2014/15 is listed below. It includes the statistical measure of the 95% upper confidence limit (UCL) of the mean for samples taken for turbidity over the 12 month period.

Table A8: Turbidity results

Water sampling locality	Frequency of sampling	No. of samples	Max. NTU	Min. NTU	95% UCL of mean	Complying (Yes/ No)
Bulla*	Min. Weekly	54	0.9	0.1	0.8	Yes
Darley	Min. Weekly	52	0.4	0.1	0.3	Yes
Diggers Rest	Min. Weekly	52	0.9	0.1	0.8	Yes
Eynesbury	Min. Weekly	53	1.8	0.3	1.4	Yes
Gisborne	Min. Weekly	52	0.3	0.1	0.3	Yes
Lancefield	Min. Weekly	52	0.4	0.1	0.2	Yes
Lerderderg*	Min. Weekly	52	0.8	0.2	0.6	Yes
Macedon	Min. Weekly	53	1.1	0.1	0.5	Yes
Maddingley	Min. Weekly	52	0.7	0.2	0.6	Yes
Melton South	Min. Weekly	52	4.4	0.1	0.3	Yes
Merrimu	Min. Weekly	53	0.9	0.2	0.4	Yes
Mount Macedon	Min. Weekly	56	1.1	0.2	0.6	Yes
Myrniong	Min. Weekly	53	1.3	0.2	0.6	Yes
Riddells Creek	Min. Weekly	52	1.2	0.1	0.4	Yes
Rockbank	Min. Weekly	52	1.2	0.1	0.7	Yes
Romsey	Min. Weekly	55	1.0	0.1	0.6	Yes
Sunbury*	Min. Weekly	52	0.8	0.1	0.4	Yes
Toolern Vale	Min. Weekly	53	0.5	0.1	0.3	Yes
Woodend	Min. Weekly	53	0.4	0.1	0.3	Yes

** Several localities received extra sampling for turbidity in response to localised water quality issues in the reporting period. Hence these have more than 52 samples.*

A4.6 Fluoride

Both the *Health (Fluoridation) Act 1973* and DHHS require that the annual average fluoride in fluoridated drinking water supplied by Western Water must not exceed a level of 1.0 mg/L. In addition. fluoride levels in any individual sample from drinking water supplied must not exceed 1.5 mg/L.

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 DHHS's website for water fluoridation http://www.health.vic.gov.au/environment/fluoridation.

Table A9: Fluoride results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Average (mg/L)	Complying (Yes/No)
Bulla	Fortnightly	28	0.99	0.76	0.83	Yes
Darley	Fortnightly	27	0.94	0.68	0.83	Yes
Diggers Rest	Fortnightly	32	0.87	0.74	0.81	Yes
Eynesbury	Fortnightly	33	0.96	0.69	0.82	Yes
Gisborne	Fortnightly	27	0.90	0.76	0.82	Yes
Lancefield*	Quarterly	4	0.17	0.06	0.11	Yes
Lerderderg	Fortnightly	30	0.97	0.70	0.84	Yes
Macedon	Fortnightly	30	0.92	0.75	0.82	Yes
Maddingley	Fortnightly	33	0.96	0.43	0.82	Yes
Melton South	Fortnightly	26	0.93	0.70	0.82	Yes
Merrimu	Fortnightly	29	0.97	0.69	0.82	Yes
Mount Macedon	Fortnightly	27	0.88	0.74	0.81	Yes
Myrniong*	Quarterly	4	0.15	0.05	0.09	Yes
Riddells Creek	Fortnightly	27	0.88	0.75	0.81	Yes
Rockbank	Fortnightly	26	1.20	0.70	0.84	Yes
Romsey*	Quarterly	12	0.89	0.32	0.52	Yes
Sunbury	Fortnightly	37	0.87	0.74	0.81	Yes
Toolern Vale	Fortnightly	26	0.93	0.70	0.82	Yes
Woodend*	Quarterly	4	0.05	0.05	0.05	Yes

** No fluoridation dosing system at the local treatment plant. However, the system may receive fluoridated water from Western Water's expanded water supply network in response to local water supply storage conditions.*
N.B. Several localities received extra sampling for fluoride in response to localised water quality issues in the reporting period.

A4.7 Other chemicals not specified in the Standards but which may pose a risk to human health

Besides those parameters tested under the Safe Drinking Water Regulations 2005, Western Water also tests for other substances that may pose a risk to human health. These results are measured in accordance with the ADWG to ensure compliance with recommended industry standards. All results presented in this report are available to customers on request. Any further explanation on any parameters of concern will be provided as required.

The following reports 2014/15 compliance against the health-related guideline values set out in ADWG 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.

Manganese

Table A10: Manganese (total as Mn) results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Eynesbury	Quarterly	12	0.007	0.002	0.0035	Yes
Lancefield	Quarterly	12	0.007	0.001	0.0020	Yes
Lerderderg	Quarterly	12	0.004	0.002	0.0020	Yes
Maddingley	Quarterly	12	0.002	0.001	0.0020	Yes
Merrimu	Quarterly	12	0.002	0.001	0.0010	Yes
Myrniong	Quarterly	12	0.013	0.001	0.0030	Yes
Romsey	Quarterly	12	0.009	0.002	0.0050	Yes
Sunbury	Quarterly	8	0.004	0.001	0.0020	Yes

** 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.*

Lead

Table A11: Lead (total as Pb) results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (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	4	0.001	0.001	Yes
Gisborne	Quarterly	4	0.001	0.001	Yes
Lancefield	Quarterly	4	0.002	0.001	Yes
Lerderderg	Quarterly	4	0.001	0.001	Yes
Macedon	Quarterly	4	0.001	0.001	Yes
Maddingley	Quarterly	4	0.001	0.001	Yes
Melton South	Quarterly	4	0.001	0.001	Yes
Merrimu	Quarterly	4	0.001	0.001	Yes
Mount Macedon	Quarterly	4	0.001	0.001	Yes
Myrniong	Quarterly	4	0.001	0.001	Yes
Riddells Creek	Quarterly	4	0.001	0.001	Yes
Rockbank	Quarterly	4	0.001	0.001	Yes
Romsey	Quarterly	4	0.001	0.001	Yes
Sunbury	Quarterly	4	0.001	0.001	Yes
Toolern Vale	Quarterly	4	0.001	0.001	Yes
Woodend	Quarterly	4	0.001	0.001	Yes

** 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.*

Copper

Table A12: Copper (total as Cu) results

Water sampling locality	Frequency of sampling	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (Yes/No)
Bulla	Quarterly	4	0.014	0.001	Yes
Darley	Quarterly	4	0.004	0.003	Yes
Diggers Rest	Quarterly	4	0.004	0.002	Yes
Eynesbury	Quarterly	4	0.012	0.005	Yes
Gisborne	Quarterly	4	0.006	0.001	Yes
Lancefield	Quarterly	4	0.006	0.002	Yes
Lerderderg	Quarterly	4	0.007	0.004	Yes
Macedon	Quarterly	4	0.002	0.001	Yes
Maddingley	Quarterly	4	0.005	0.002	Yes
Melton South	Quarterly	4	0.012	0.002	Yes
Merrimu	Quarterly	4	0.018	0.003	Yes
Mount Macedon	Quarterly	4	0.004	0.001	Yes
Myrniong	Quarterly	4	0.029	0.006	Yes
Riddells Creek	Quarterly	4	0.006	0.002	Yes
Rockbank	Quarterly	4	0.027	0.003	Yes
Romsey	Quarterly	4	0.014	0.002	Yes
Sunbury	Quarterly	4	0.011	0.004	Yes
Toolern Vale	Quarterly	4	0.004	0.002	Yes
Woodend	Quarterly	4	0.002	0.001	Yes

** 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.*

Arsenic

Table A13: Arsenic results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (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	1	0.001	0.001	Yes
Romsey	Annually	1	0.001	0.001	Yes
Sunbury	Annually	1	0.001	0.001	Yes
Toolern Vale	Annually	1	0.001	0.001	Yes
Woodend	Annually	1	0.001	0.001	Yes

** 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.*

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, chlorite 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 2014/15.

Monochloramine

Table A14: Monochloramine result

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (Yes/No)
Bulla	Weekly	54	0.09	0.01	Yes
Diggers Rest	Weekly	52	0.80	0.01	Yes
Romsey	Weekly	58	0.93	0.05	Yes
Sunbury	110 per year	112	0.88	0.03	Yes

** Compliance as measured against the health related guideline value set out in ADWG for monochloramine in drinking water should not exceed 3 mg/L*
N.B. Several localities received extra sampling for monochloramine in response to localised water quality issues in the reporting period. Hence these have more than 52 samples.

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.

Nickel

Table A15: Nickel (total as Ni) result

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (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	0.002	0.002	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	1	0.001	0.001	Yes
Romsey	Annually	1	0.001	0.001	Yes
Sunbury	Annually	1	0.001	0.001	Yes
Toolern Vale	Annually	1	0.001	0.001	Yes
Woodend	Annually	1	0.001	0.001	Yes

** 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.*

Chlorine

Table A16: Total chlorine result

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (Yes/No)
Bulla	Weekly	54	0.19	0.02	Yes
Darley	Weekly	52	1.38	0.22	Yes
Diggers Rest	Weekly	52	0.78	0.04	Yes
Eynesbury	Weekly	53	0.66	0.04	Yes
Gisborne	64/year	64	1.10	0.05	Yes
Lancefield	Weekly	52	1.20	0.23	Yes
Lerderderg	64/year	64	0.99	0.06	Yes
Macedon	Weekly	53	0.84	0.07	Yes
Maddingley	Weekly	52	1.40	0.08	Yes
Melton South	112/year	112	0.95	0.07	Yes
Merrimu	64/year	66	1.20	0.02	Yes
Mount Macedon	Weekly	56	0.81	0.05	Yes
Myrniong	Weekly	53	0.40	0.01	Yes
Riddells Creek	Weekly	52	0.99	0.16	Yes
Rockbank	Weekly	52	0.46	0.04	Yes
Romsey	Weekly	61	1.20	0.08	Yes
Sunbury	112/year	112	1.10	0.05	Yes
Toolern Vale	Weekly	53	1.40	0.06	Yes
Woodend	64/year	64	1.20	0.28	Yes

** 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 1.10 mg/L for total chlorine at its customer taps.*

Chromium

Table A17: Chromium (total as Cr) result

Water sampling locality	Sampling frequency	No. of Samples	Max. (mg/L)	Min. (mg/L)	Complying* (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	0.002	0.001	Yes
Myrniong	Annually	1	0.001	0.001	Yes
Riddells Creek	Annually	1	0.001	0.001	Yes
Rockbank	Annually	1	0.001	0.001	Yes
Romsey	Annually	1	0.001	0.001	Yes
Sunbury	Annually	1	0.001	0.001	Yes
Toolern Vale	Annually	1	0.001	0.001	Yes
Woodend	Annually	1	0.001	0.001	Yes

** 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.*

Cyanide

Table A18: Cyanide result

Water sampling locality	Sampling frequency	No. of Samples	Max. (mg/L)	Min. (mg/L)	Complying* (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	1	0.005	0.005	Yes
Romsey	Annually	1	0.005	0.005	Yes
Sunbury	Annually	1	0.005	0.005	Yes
Toolern Vale	Annually	1	0.005	0.005	Yes
Woodend	Annually	1	0.005	0.005	Yes

** 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.*

Mercury

Table A19: Mercury result

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

** 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.*

Nitrate

Table A20: Nitrate result

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (Yes/No)
Bulla	Monthly	12	0.56	0.32	Yes
Darley	Monthly	12	0.08	0.02	Yes
Diggers Rest	Monthly	12	0.57	0.21	Yes
Eynesbury	Monthly	12	0.09	0.03	Yes
Gisborne#	Annually	1	0.17	0.17	Yes
Lancefield	Monthly	12	0.23	0.02	Yes
Lerderderg	Monthly	12	0.07	0.02	Yes
Macedon#	Annually	1	0.18	0.18	Yes
Maddingley	Monthly	12	0.07	0.02	Yes
Melton South	Monthly	12	0.10	0.01	Yes
Merrimu	Monthly	12	0.07	0.02	Yes
Mount Macedon#	Annually	1	0.20	0.20	Yes
Myrniong	Monthly	12	0.19	0.03	Yes
Riddells Creek#	Annually	1	0.17	0.17	Yes
Rockbank	Monthly	12	0.14	0.02	Yes
Romsey	Monthly	12	0.20	0.04	Yes
Sunbury	Monthly	12	0.49	0.17	Yes
Toolern Vale	Monthly	12	0.07	0.02	Yes
Woodend	Monthly	12	0.25	0.00	Yes

** Compliance as measured against the health related guideline value set out in ADWG for nitrate in drinking water should not exceed 50 mg/L.*
 # Disinfection mode changes from chloramination to chlorination meant that sampling for nitrate in these localities was reduced.

Nitrite

Table A21: Nitrite result

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (Yes/No)
Bulla	Monthly	12	0.029	0.002	Yes
Darley	Monthly	12	0.002	0.002	Yes
Diggers Rest	Monthly	12	0.140	0.002	Yes
Eynesbury	Monthly	12	0.002	0.002	Yes
Gisborne#	Annually	1	0.002	0.002	Yes
Lancefield	Monthly	12	0.004	0.004	Yes
Lerderderg	Monthly	12	0.002	0.002	Yes
Macedon#	Annually	1	0.002	0.002	Yes
Maddingley	Monthly	12	0.002	0.002	Yes
Melton South	Monthly	12	0.002	0.002	Yes
Merrimu	Monthly	12	0.002	0.002	Yes
Mount Macedon#	Annually	1	0.002	0.002	Yes
Myrniong	Monthly	12	0.002	0.002	Yes
Riddells Creek#	Annually	1	0.002	0.002	Yes
Rockbank	Monthly	12	0.002	0.002	Yes
Romsey	Monthly	12	0.140	0.002	Yes
Sunbury	Monthly	12	0.130	0.002	Yes
Toolern Vale	Monthly	12	0.004	0.002	Yes
Woodend	Monthly	12	0.002	0.002	Yes

** Compliance as measured against the health related guideline value set out in ADWG for nitrite in drinking water should not exceed 3 mg/L.*
 # Disinfection mode changes from chloramination to chlorination meant that sampling for nitrite in these localities was reduced.

Selenium

Table A22: Selenium result

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Complying* (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	1	0.001	0.001	Yes
Romsey	Annually	1	0.001	0.001	Yes
Sunbury	Annually	1	0.001	0.001	Yes
Toolern Vale	Annually	1	0.001	0.001	Yes
Woodend	Annually	1	0.001	0.001	Yes

** 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.*

Cadmium

Table A23: Cadmium result

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

** 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.*

A4.8 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. Compliance calculations hereafter are based on mean results for samples taken throughout the year, as outlined in ADWG.

pH

Table A24: pH results

Water sampling locality	Sampling frequency	No. of Samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Bulla	Weekly	52	9.4	7.5	8.0	Yes
Darley	Weekly	52	7.6	7.3	7.5	Yes
Diggers Rest	Weekly	52	7.8	7.1	7.4	Yes
Eynesbury	Weekly	53	7.6	7.2	7.4	Yes
Gisborne	Weekly	52	9.1	7.2	7.7	Yes
Lancefield	Weekly	52	8.4	7.4	7.9	Yes
Lerderderg	Weekly	52	7.6	7.2	7.4	Yes
Macedon#	Weekly	53	9.3	7.6	8.2	Yes
Maddingley	Weekly	52	7.7	7.1	7.4	Yes
Melton South	Weekly	52	7.4	7.0	7.2	Yes
Merrimu	Weekly	53	8.4	7.0	7.6	Yes
Mount Macedon#	Weekly	56	9.1	7.9	8.4	Yes
Myrniong	Weekly	53	7.8	7.2	7.4	Yes
Riddells Creek	Weekly	52	8.5	7.2	7.6	Yes
Rockbank	Weekly	52	7.7	7.1	7.3	Yes
Romsey	Weekly	55	8.5	7.3	7.7	Yes
Sunbury	Weekly	52	8.9	7.3	7.6	Yes
Toolern Vale	Weekly	53	7.7	7.0	7.3	Yes
Woodend	Weekly	53	7.6	7.2	7.3	Yes

** 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.*

 # Several localities received extra sampling for pH in response to localised water quality issues in the reporting period.

Iron

Table A25: Iron results

Water sampling locality	Sampling frequency#	No. of Samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Bulla	Quarterly	4	0.02	0.01	0.02	Yes
Darley	Quarterly	4	0.02	0.01	0.02	Yes
Diggers Rest	Quarterly	13	0.02	0.01	0.01	Yes
Eynesbury	Quarterly	12	0.13	0.01	0.05	Yes
Gisborne	Quarterly	4	0.02	0.01	0.01	Yes
Lancefield	Quarterly	4	0.01	0.01	0.01	Yes
Lerderderg	Quarterly	12	0.04	0.01	0.02	Yes
Macedon	Quarterly	4	0.02	0.01	0.01	Yes
Maddingley	Quarterly	12	0.03	0.01	0.01	Yes
Melton South	Quarterly	4	0.02	0.01	0.01	Yes
Merrimu	Quarterly	12	0.02	0.01	0.01	Yes
Mount Macedon	Quarterly	4	0.09	0.03	0.06	Yes
Myrniong	Quarterly	12	0.05	0.01	0.02	Yes
Riddells Creek	Quarterly	4	0.02	0.01	0.01	Yes
Rockbank	Quarterly	4	0.02	0.01	0.01	Yes
Romsey	Quarterly	12	0.04	0.01	0.01	Yes
Sunbury	Quarterly	4	0.03	0.01	0.02	Yes
Toolern Vale	Quarterly	4	0.03	0.01	0.02	Yes
Woodend	Quarterly	4	0.01	0.01	0.01	Yes

** 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.*

 # Scheduled for monthly sampling during review of monitoring program in January 2013. Subsequent review conducted in February 2014 reduced sampling frequency to quarterly.

Total hardness

Table A26: Total hardness (as calcium carbonate) results

Water sampling locality	Sampling frequency#	No. of samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Bulla	Quarterly	12	110	69	89	Yes
Darley	Quarterly	4	130	110	118	Yes
Diggers Rest	Quarterly	12	110	79	92	Yes
Eynesbury	Quarterly	4	140	110	128	Yes
Gisborne	Quarterly	4	100	84	92	Yes
Lancefield	Quarterly	4	120	59	83	Yes
Lerderderg	Quarterly	4	120	110	118	Yes
Macedon	Quarterly	4	110	88	97	Yes
Maddingley	Quarterly	4	140	110	120	Yes
Melton South	Quarterly	4	130	94	114	Yes
Merrimu	Quarterly	4	140	110	128	Yes
Mount Macedon	Quarterly	4	110	94	101	Yes
Myrniong	Quarterly	4	160	130	143	Yes
Riddells Creek	Quarterly	4	110	88	97	Yes
Rockbank	Quarterly	4	130	99	115	Yes
Romsey	Quarterly	4	93	52	76	Yes
Sunbury	Quarterly	12	110	75	92	Yes
Toolern Vale	Quarterly	4	140	110	128	Yes
Woodend	Quarterly	4	40	22	31	Yes

** 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 2014/15. 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.*

 # Scheduled for monthly sampling during review of monitoring program in January 2013. Subsequent review conducted in February 2014 reduced sampling frequency to quarterly.

Calcium

Table A27: Total calcium (as Ca) results

Water sampling locality	Sampling frequency#	No. of Samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)*
Bulla	Quarterly	12	32.0	15.0	21.9
Darley	Quarterly	4	19.0	17.0	17.5
Diggers Rest	Quarterly	12	24.0	16.0	20.4
Eynesbury	Quarterly	4	22.0	16.0	19.0
Gisborne	Quarterly	4	23.0	18.0	20.3
Lancefield	Quarterly	4	14.0	8.3	10.8
Lerderderg	Quarterly	4	18.0	16.0	17.5
Macedon	Quarterly	4	27.0	20.0	22.3
Maddingley	Quarterly	4	20.0	17.0	17.8
Melton South	Quarterly	4	18.0	13.0	16.0
Merrimu	Quarterly	4	22.0	18.0	20.5
Mount Macedon	Quarterly	4	29.0	22.0	25.5
Myrniong	Quarterly	4	25.0	18.0	21.3
Riddells Creek	Quarterly	4	24.0	20.0	21.8
Rockbank	Quarterly	4	20.0	15.0	17.0
Romsey	Quarterly	4	18.0	12.0	15.3
Sunbury	Quarterly	12	26.0	13.0	20.5
Toolern Vale	Quarterly	4	23.0	18.0	20.5
Woodend	Quarterly	4	5.7	2.6	3.9

**There is currently no recommended guideline value set out for the concentration of calcium in drinking water.*
 # Scheduled for monthly sampling during review of monitoring program in January 2013, subsequent review conducted in February 2014 reduced sampling frequency to quarterly.

Magnesium

Table A28: Total magnesium (as Mg) results

Water sampling locality	Sampling frequency#	No. of samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)*
Bulla	Quarterly	12	10.0	5.6	8.6
Darley	Quarterly	4	21.0	17.0	18.5
Diggers Rest	Quarterly	12	12.0	9.5	10.2
Eynesbury	Quarterly	4	21.0	16.0	18.8
Gisborne	Quarterly	4	12.0	9.4	10.6
Lancefield	Quarterly	4	20.0	8.0	13.3
Lerderderg	Quarterly	4	19.0	17.0	17.8
Macedon	Quarterly	4	10.0	9.3	9.8
Maddingley	Quarterly	4	21.0	17.0	18.3
Melton South	Quarterly	4	21.0	15.0	18.0
Merrimu	Quarterly	4	21.0	16.0	18.8
Mount Macedon	Quarterly	4	9.8	8.2	9.2
Myrniong	Quarterly	4	24.0	20.0	22.3
Riddells Creek	Quarterly	4	12.0	9.5	10.6
Rockbank	Quarterly	4	20.0	15.0	17.8
Romsey	Quarterly	4	11.0	5.3	9.1
Sunbury	Quarterly	12	10.0	8.6	9.7
Toolern Vale	Quarterly	4	21.0	16.0	18.8
Woodend	Quarterly	4	6.2	3.8	5.0

** There is currently no recommended guideline value set out for the concentration of magnesium in drinking water.*
 # Scheduled for monthly sampling during review of monitoring program in January 2013. Subsequent review conducted in February 2014 reduced sampling frequency to quarterly.

Ammonia

Table A29: Ammonia results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Bulla	Monthly	12	0.019	0.002	0.007	Yes
Darley	Monthly	12	0.003	0.002	0.002	Yes
Diggers Rest	Monthly	12	0.120	0.002	0.045	Yes
Eynesbury	Monthly	12	0.005	0.002	0.003	Yes
Gisborne	Annually#	1	0.007	0.007	0.007	Yes
Lancefield	Monthly	12	0.033	0.004	0.007	Yes
Lerderderg	Monthly	12	0.008	0.002	0.004	Yes
Macedon	Annually#	1	0.003	0.003	0.003	Yes
Maddingley	Monthly	12	0.006	0.002	0.003	Yes
Melton South	Monthly	12	0.007	0.002	0.004	Yes
Merrimu	Monthly	12	0.009	0.002	0.004	Yes
Mount Macedon	Annually#	1	0.002	0.002	0.002	Yes
Myrniong	Monthly	12	0.008	0.002	0.005	Yes
Riddells Creek	Annually#	1	0.009	0.009	0.009	Yes
Rockbank	Monthly	12	0.014	0.003	0.008	Yes
Romsey	Monthly	12	0.250	0.031	0.161	Yes
Sunbury	Monthly	12	0.260	0.003	0.091	Yes
Toolern Vale	Monthly	12	0.007	0.002	0.004	Yes
Woodend	Monthly	12	0.003	0.002	0.002	Yes

** 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.*

 # Sampling for ammonia in these localities was reduced due to the change in disinfection method from chloramination to chlorination over twelve months ago.

True colour

Table A30: True colour results

Water sampling locality	Sampling frequency	No. of samples#	Max. (TCU)	Min. (TCU)	Mean (TCU)	Complying* (Yes/No)
Bulla	Weekly	54	4	2	2	Yes
Darley	Weekly	52	4	2	2	Yes
Diggers Rest	Weekly	52	6	2	2	Yes
Eynesbury	Weekly	53	6	2	2	Yes
Gisborne	Weekly	52	6	2	2	Yes
Lancefield	Weekly	52	8	2	2	Yes
Lerderderg	Weekly	52	5	2	2	Yes
Macedon	Weekly	53	4	2	2	Yes
Maddingley	Weekly	52	8	4	4	Yes
Melton South	Weekly	52	4	2	2	Yes
Merrimu	Weekly	53	8	2	2	Yes
Mount Macedon	Weekly	56	4	2	2	Yes
Myrniong	Weekly	53	6	2	2	Yes
Riddells Creek	Weekly	52	6	2	2	Yes
Rockbank	Weekly	52	4	2	2	Yes
Romsey	Weekly	55	12	2	3	Yes
Sunbury	Weekly	52	8	2	2	Yes
Toolern Vale	Weekly	53	8	2	2	Yes
Woodend	Weekly	53	6	2	2	Yes

** 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).*

 # Several localities received extra sampling for true colour in response to localised water quality issues in the reporting period.

Sodium

Table A31: Sodium (as Na) results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Bulla	Annually	1	33	33	33	Yes
Darley	Annually	1	31	31	31	Yes
Diggers Rest	Annually	1	32	32	32	Yes
Eynesbury	Annually	1	51	51	51	Yes
Gisborne	Annually	1	34	34	34	Yes
Lancefield	Annually	1	39	39	39	Yes
Lerderderg	Annually	1	28	28	28	Yes
Macedon	Annually	1	32	32	32	Yes
Maddingley	Annually	1	28	28	28	Yes
Melton South	Annually	1	29	29	29	Yes
Merrimu	Annually	1	50	50	50	Yes
Mount Macedon	Annually	1	34	34	34	Yes
Myrniong	Annually	1	57	57	57	Yes
Riddells Creek	Annually	1	31	31	31	Yes
Rockbank	Annually	1	36	36	36	Yes
Romsey	Annually	1	26	26	26	Yes
Sunbury	Annually	1	33	33	33	Yes
Toolern Vale	Annually	1	51	51	51	Yes
Woodend	Annually	1	45	45	45	Yes

** 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: people who suffer from severe hypertension or congestive heart failure need to be aware the sodium concentration in their drinking water should not exceed 20 mg/L).*

Zinc

Table A32: Zinc (total as Zn) results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Bulla	Quarterly	4	0.004	0.001	0.002	Yes
Darley	Quarterly	4	0.003	0.002	0.003	Yes
Diggers Rest	Quarterly	4	0.004	0.001	0.003	Yes
Eynesbury	Quarterly	4	0.010	0.002	0.005	Yes
Gisborne	Quarterly	4	0.003	0.001	0.002	Yes
Lancefield	Quarterly	4	0.009	0.005	0.007	Yes
Lerderderg	Quarterly	4	0.006	0.003	0.005	Yes
Macedon	Quarterly	4	0.006	0.001	0.003	Yes
Maddingley	Quarterly	4	0.005	0.002	0.003	Yes
Melton South	Quarterly	4	0.008	0.003	0.005	Yes
Merrimu	Quarterly	4	0.004	0.001	0.002	Yes
Mount Macedon	Quarterly	4	0.004	0.001	0.002	Yes
Myrniong	Quarterly	4	0.005	0.001	0.002	Yes
Riddells Creek	Quarterly	4	0.006	0.001	0.003	Yes
Rockbank	Quarterly	4	0.005	0.003	0.004	Yes
Romsey	Quarterly	4	0.007	0.002	0.004	Yes
Sunbury	Quarterly	4	0.007	0.001	0.003	Yes
Toolern Vale	Quarterly	4	0.003	0.001	0.002	Yes
Woodend	Quarterly	4	0.004	0.001	0.002	Yes

** 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 was set for zinc.*

Sulfate

Table A33: Sulfate (as SO_4) results

Water sampling locality	Sampling frequency	No. of samples	Max. (mg/L)	Min. (mg/L)	Mean (mg/L)	Complying* (Yes/No)
Bulla	Annually	1	50	50	50	Yes
Darley	Annually	1	71	71	71	Yes
Diggers Rest	Annually	1	51	51	51	Yes
Eynesbury	Annually	1	66	66	66	Yes
Gisborne	Annually	1	52	52	52	Yes
Lancefield	Annually	1	6	5	5	Yes
Lerderderg	Annually	1	66	66	66	Yes
Macedon	Annually	1	54	54	54	Yes
Maddingley	Annually	1	97	97	97	Yes
Melton South	Annually	1	72	72	72	Yes
Merrimu	Annually	1	68	68	68	Yes
Mount Macedon	Annually	1	54	54	54	Yes
Myrniong	Annually	1	42	42	42	Yes
Riddells Creek	Annually	1	52	52	52	Yes
Rockbank	Annually	1	72	72	72	Yes
Romsey	Annually	1	14	14	14	Yes
Sunbury	Annually	1	51	51	51	Yes
Toolern Vale	Annually	1	67	67	67	Yes
Woodend	Annually	1	39	39	39	Yes

** 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.*

Appendix 5 - Raw water monitoring

Western Water uses the principles of the 12 elements of the ADWG framework for the management of its drinking water quality. This framework is incorporated within Western Water's DWRMP, and is 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 is the extensive raw water monitoring program aimed at increasing the understanding of raw water quality in the reservoirs, bores and basins.

It involves the monitoring and identification of hazards, sources and events which could compromise drinking water quality in a catchment-to-consumer multiple barrier approach.

The raw water monitoring program for 2014/15 allows for the assessment of raw 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 raw water quality enables Western Water to conduct historical trending analysis, review individual system risk assessment plans, identify new hazards and review risk at each raw water source. This information better positions 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 raw water monitoring program at reservoirs, bores and final raw water entry points to water filtration plants was undertaken during 2014/15.

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. The table opposite is a list of all parameters monitored during 2014/15.

In addition to the raw water monitoring conducted by a contracted, independent NATA-accredited laboratory, raw 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 raw 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 raw water provided valuable information in assessing the quality of the raw water.

This information allows Western Water to monitor changes in conditions of raw 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 offtake entry point to Western Water's region was monitored by Melbourne Water during 2014/15. 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 A34: List of all raw water parameters monitored during 2014/15

Parameter		Parameter	
Type		Type	
Chemical organics	1,1-Dichloroethane	Physical	Alkalinity, total as $CaCO_3$
	1,2-Dichloroethane		Colour, true
	Benzene		Dissolved oxygen
	Dissolved organic carbon		Electrical conductivity @ 25°C
	Heptachlor		Hardness, as $CaCO_3$
	Heptachlor epoxide		pH
	Hexachlorobenzene		Total dissolved solids
	Methoxychor		Turbidity
	Pentachlorophenol		
	Tetrachloroethene	Metals	
	Trichloroethene		Aluminium, filtered
Chemical inorganics	Ammonia		Aluminium, filtered
	Arsenic		Iron, filtered
	Calcium*		Iron, total as Fe
	Chloride*		Magnesium, as Mg
	Cyanide		Manganese, filtered
	Fluoride*		Manganese, total as Mn
	Nitrate		Mercury, as Hg
	Nitrite		
	Phosphorus, reactive as P	Microbiological	Amoebae, total
	Selenium		Coliforms, total
	Silica, total as SiO_2*		Cryptosporidium spp.
	Silicon*		*Escherichia coli*
	Silica, total as SiO_2*		Giardia spp.
	Silicon*		Heterotrophic plate count, 37°C
Pesticides	2,4 D		Naegleria Fowleri
	4,4' – DDT		Faecal streptococci*
	Aldrin		Helminth (Ascaris ova)*
	Atrazine		Helminth (Taenia ova)*
	BHC (gamma)		
	Chlordane, total	Radiological	Gross alpha activity
	Dieldrin		Gross beta activity

** These parameters were only measured at some of the sampling locations where appropriate.*

Glossary

Algae	Simple types of plant with no root, stems of 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 (NH_3)	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 2004
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 (NH_2Cl), 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.
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.
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 Merrimum 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).
Raw water	Water that has not been treated in any way.
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
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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