City West Water™

Drinking Water Quality
Report 2015

Glossary of terms

ADWG 2011	Australian Drinking Water Guidelines 2011. Published by the National Health & Medical Research Council of Australia.
DHHS	Victorian Department of Health and Human Services
E. coli	*Escherichia coli*, a bacterium which is considered to indicate the presence of faecal contamination and therefore, health risk.
HACCP	Hazard Analysis and Critical Control Points certification for protecting drinking water quality.
mg/L	Milligrams per litre
MWC	Melbourne Water Corporation
NTU	Nephelometric Turbidity Units
orgs/100mL	Organisms per 100 millilitres
UCL	Upper confidence limit
Regulations (2005)	Safe Water Drinking Regulations (2005) Victoria
<	'less than' symbol
>	'greater than' symbol

Table of contents

From our Managing Director

Each year, City West Water produces an Annual Drinking Water Quality Report that details the quality of drinking water that we have been providing to our customers throughout our service area. On this occasion I am pleased to present this 2015 Report that addresses the 12 month period between July 2014 and June 2015.

Our service area which encompasses the inner and western suburbs of Melbourne, as well as Melbourne's central business district, is supplied with water via an extensive, largely underground network of over 4,700 km of water mains as well associated valves, holding tanks, pumping stations and disinfection plants. Our priority is to manage and operate this network so that our customers continue to reliably receive the high quality, safe drinking water for which Melbourne has long been renowned. Endorsement of our water quality management processes is supported by our uninterrupted history of successfully retaining drinking water HACCP certification and continuing compliance of our Water Quality Risk Management Plan with requirements of Victoria's Safe Drinking Water Act 2003.

In addition to having appropriate management systems in place, we arrange for comprehensive water quality monitoring throughout the year to check the quality of the drinking water supplied and verify it in terms of regulated standards considered in the Safe Drinking Water Act 2003 and associated Regulations (2005). In this regard, during 2014-15 we tested some 4,000 water samples, almost all of which were obtained from the point of supply to customers' premises using special tap fittings adjacent to property water meters. I am pleased to report that the independent testing of a broad range of chemical and microbiological parameters has demonstrated that the quality of our drinking water supply has been consistently above that of the regulated quality standards. Details of the testing undertaken and results obtained, together with an analysis of spatial and temporal trends, form the bulk of this report.

Further to directly sampling and testing the supplied water quality, we also rely upon feedback from customers to advise of local issues that may arise. Such feedback is recorded as water quality related customer complaints which, during 2014-15, were at a low level of 0.06 complaints per 100 customers.

We recognise that reliably providing high quality and safe drinking water quality is the key priority for City West Water and its customers, and we have a strong commitment to continuing our efforts in this regard.

Anne Barker
Managing Director

1. Introduction

City West Water is one of three metropolitan water retailers established under section 85(1A) of the Water Act 1989 (Vic). Our Board of Directors is appointed by the Victorian Government and is responsible for setting and overseeing the implementation of the policies, objectives and strategies of the business. We provide drinking water, trade waste, recycled water, stormwater and sewerage services to approximately 414,000 residential and non-residential customers in Melbourne's inner and western suburbs and central business district.

Melbourne Water provides City West Water with a bulk water supply and a waste water treatment service. Melbourne Water manages the water catchments and dams, as well as a network of large water mains that interconnect with our own water supply network. This interconnection means that risks associated with water supply are shared between the wholesaler (Melbourne Water) and retailer (City West Water). To manage these risks and to clearly assign the rights and obligations of both parties, we have a contractual arrangement (the Bulk Water Supply Agreement) with Melbourne Water, as well as cross business contingency plans and operational arrangements.

Our management of the water supply system and drinking water quality is given the highest priority to reflect public health considerations and community expectations. Our management of the drinking water supply closely follows the risk management principles outlined in Victoria's Safe Drinking Water Act 2003. This commitment to safeguarding drinking water quality has continued to be independently recognised through consistent retention of our internationally recognised Hazard Analysis and Critical Control Points (HACCP) certification.

1.1 Characterisation of the system

We distribute water to over 800,000 people and to businesses at some 414,000 properties. The water is distributed through an extensive network of over 4,700 kilometres of water mains, 10 pumping stations, eight service reservoirs and tanks and four secondary chlorination plants. This network encompasses central and western Melbourne, including inner suburbs such as Fitzroy, Collingwood, Richmond and the central business district, to outer western suburbs as far west as Little River. The network is fully enclosed, protecting the water from possible contamination during its delivery to customers.

Figure 1.1 shows our 714 square kilometre service area. Contained within the service area are 15 water sampling localities based on sources of water supply and similar pressure.

1.1.1 Source of water

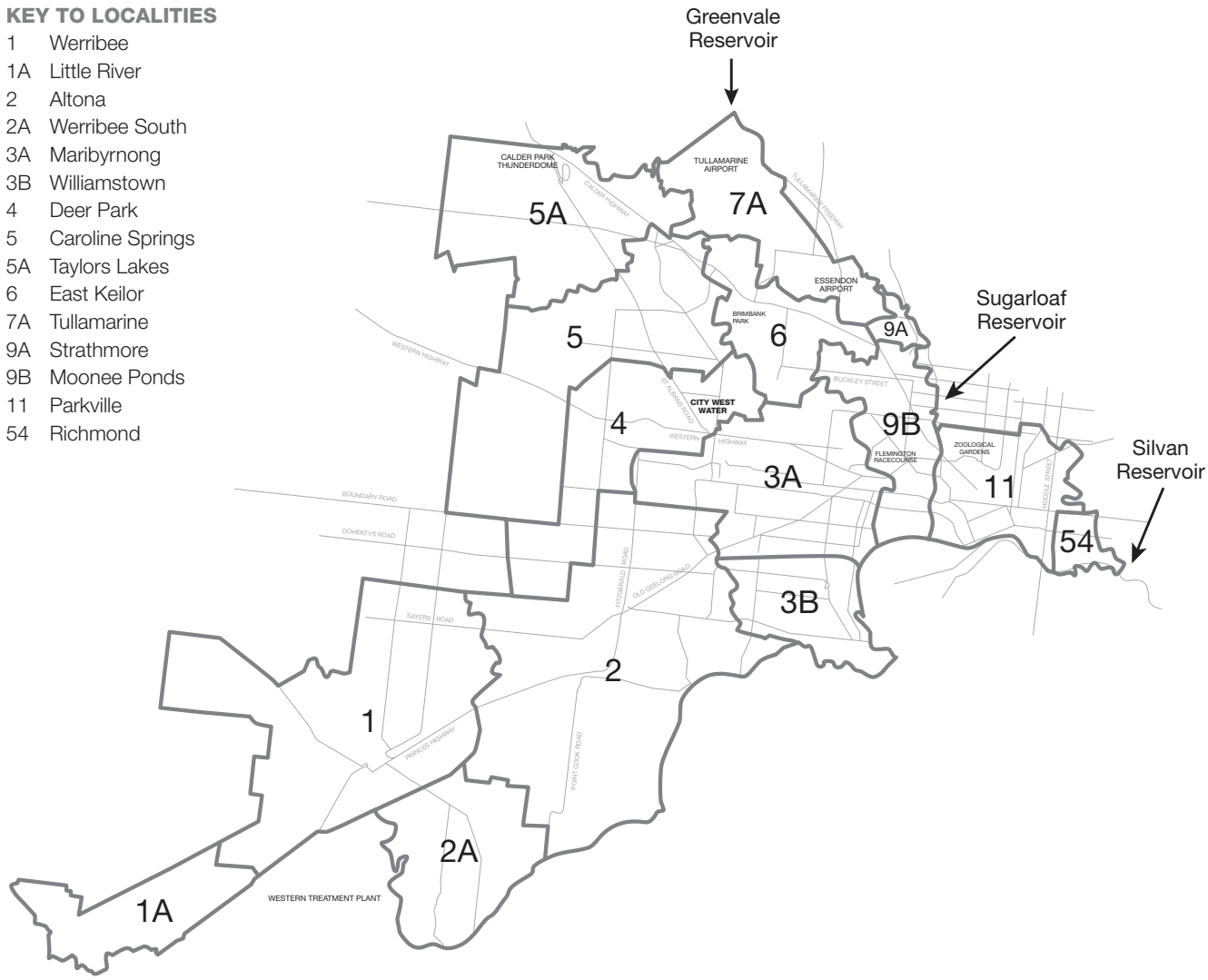
The water supply originates from Melbourne's well established water supply catchment and reservoir system, which has provided the city with a reliable, high quality water supply for many years. This extensive system, managed by Melbourne Water, lies mainly to the east of Melbourne and extends as far as Thomson Reservoir, approximately 120 kilometres from our service area.

More specifically, water is supplied to City West Water from three major storages within the system. Two of the storages, Silvan Reservoir (near Mount Dandenong) and Sugarloaf Reservoir (near Yarra Glen), are east of Melbourne. The third, Greenvale Reservoir, is to the north, near Somerton. We have traditionally sourced, on average, about 40 per cent of our bulk supply from Silvan, 30 per cent from Greenvale and 30 per cent from Sugarloaf. However, with the decade of below average rainfall that began in the late 1990s and the need to rebalance storage levels, Sugarloaf Reservoir became the major source of water supplied to City West Water. As storages have trended back to historical levels, 2014-15 has seen a continuing return towards our traditional source proportions.

	Supply source to City West Water (%)		
Period	Silvan	Greenvale	Sugarloaf
Prior to drought impact	40	30	30
2007-12	14	16	70
2012-13	9	13	78
2013-14	20	22	58
2014-15	26	21	53

The supply from Silvan Reservoir originates from protected, natural catchments (including the Thomson and Upper Yarra catchments) where activities such as industry, farming, urbanisation and tourism (which could pollute the water supply) are highly restricted. Greenvale Reservoir which does not have a catchment receives its water supply from Silvan Reservoir. Long storage periods (ranging between months and years) in these pristine reservoirs enhance water quality. As a result, the only active water treatment process that is applied to this water is chlorination (gas) and pH correction with lime.

Figure 1.1 City West Water's water district area showing its 15 water sampling localities and sources of bulk water supply.



Sugarloaf Reservoir draws most of its water from the middle reaches of the Yarra River where the catchment is unprotected, containing urban areas, light industry and agricultural activities. A smaller proportion also comes from Maroondah Reservoir via the Maroondah Aqueduct. On average, the source waters pumped into Sugarloaf Reservoir are stored for months before being treated (via aluminium-based coagulation and flocculation, sand filtration, gas chlorination and pH correction with lime) at Melbourne Water's Winneke water treatment plant.

Melbourne Water adds fluoride to all of City West Water's bulk water in line with the requirements of the *Victorian Health (Fluoridation) Act (1973)*. This is in the form of sodium fluorosilicate to the Silvan Reservoir supply and fluorosilicic acid at the Winneke water treatment plant.

The supply source(s) for each of our 15 water sampling localities are listed in Table 1.1

Table 1.1 2014-15 supply sources for our water sampling localities

Water sampling locality	Source water	Treatment plant	Population serviced (2011 census)
Altona	Yarra River; Maroondah, Silvan and Greenvale Reservoirs	Winneke, Silvan, Greenvale	97,611
Caroline Springs	Yarra River; Maroondah and Greenvale Reservoirs	Winneke, Greenvale	87,947
Deer Park	Yarra River; Maroondah, Silvan and Greenvale Reservoirs	Winneke, Silvan, Greenvale	53,687
East Keilor	Yarra River; Maroondah, Silvan and Greenvale Reservoirs	Winneke, Silvan, Greenvale	38,063
Little River	Yarra River; Maroondah, Silvan and Greenvale Reservoirs	Winneke, Silvan, Greenvale	625
Maribyrnong	Yarra River; Maroondah and Silvan Reservoirs	Winneke, Silvan	101,272
Moonee Ponds	Yarra River; Maroondah and Silvan Reservoirs	Winneke, Silvan	68,395
Parkville	Yarra River; Maroondah and Silvan Reservoirs	Winneke, Silvan	111,305
Richmond	Yarra River; Maroondah and Silvan Reservoirs	Winneke, Silvan	20,646
Strathmore	Yarra River; Maroondah, Silvan and Greenvale Reservoirs	Winneke, Silvan, Greenvale	8,917
Taylors Lakes	Yarra River; Maroondah and Greenvale Reservoirs	Winneke, Greenvale	63,394
Tullamarine	Yarra River; Maroondah and Greenvale Reservoirs	Winneke, Greenvale	9,833
Werribee	Yarra River; Maroondah, Silvan and Greenvale Reservoirs	Winneke, Silvan, Greenvale	124,833
Werribee South	Yarra River; Maroondah, Silvan and Greenvale Reservoirs	Winneke, Silvan, Greenvale	807
Williamstown	Yarra River; Maroondah and Silvan Reservoirs	Winneke, Silvan	35,996

The quality of the bulk water supply is monitored by Melbourne Water before it enters City West Water's distribution system.

The overall water supply system and water delivery arrangements during the past year have continued unchanged from preceding years.

2. Water treatment and quality management system

2.1 Water treatment

The water quality treatment processes used for City West Water's source or bulk water supply are outlined in Section 1.1.1.

Notwithstanding Melbourne Water's source or bulk water disinfection by chlorination, additional secondary chlorination (using liquid sodium hypochlorite) is undertaken within our water district by:

- Melbourne Water, with four secondary chlorination plants servicing the water sampling localities of Werribee, Deer Park, Caroline Springs and Altona
- City West Water, with a further four secondary chlorination plants servicing the water sampling localities of Little River, Werribee South, East Keilor and Richmond.

In addition, the local water supply at Little River is dosed with gaseous carbon dioxide in order to assist with maintaining neutral pH levels.

2.2 Issues

No adverse issues took place with regard to water treatment during 2014-15.

3. Quality of drinking water for **2014-15**

A significant part of our water supply activities involves monitoring the quality of the water being supplied to customers. There is day to day water sampling and testing from many locations throughout the distribution network of 15 water sampling localities, including some 450 purpose built sampling fittings (referred to as 'customer taps') located at properties across our service area. In addition, Melbourne Water monitors the quality of bulk water supplies at points upstream of delivery points to City West Water. The results of all these tests are scrutinised under the Bulk Water Supply Agreement between the two corporations.

Between July 2014 and June 2015, we collected and tested approximately 3,000 microbiological and 900 physical/chemical water samples from customer taps. This was undertaken under contract by a government approved, specialised and quality certified laboratory. The extent of this monitoring was based on requirements of the *Safe Drinking Water Regulations 2005*, as well as guidance of the *Australian Drinking Water Guidelines 2011* (ADWG 2011), including consideration of locality population numbers for bacterial monitoring.

As well as guiding the design of monitoring programs, ADWG 2011 provides a basis for assessing the quality of drinking water. Microbiological assessment is based principally on the bacterium Escherichia coli (E. coli), which is considered to definitively indicate the presence of faecal contamination and, therefore, health risk.

Physical/chemical assessment and monitoring is based on a combination of parameters that indicate physical/aesthetic characteristics, such as pH, colour and turbidity (the clarity of the water), as well as the chemical quality of the water (i.e. levels of chlorine, iron, fluoride, dissolved salts, aluminium, copper and other heavy metals). Contact information for obtaining further details of all water quality testing outlined in this report is provided in the Further Information section on page 29.

Since 1 July 2004, the management of drinking water in Victoria has been governed by the *Safe Drinking Water Act 2003*. Under this Act, *Safe Drinking Water Regulations 2005* specifies water quality standards for a number of water quality parameters. The standards are as follows:

Water quality parameter	Standard
Escherichia coli (E. coli)	at least 98% of samples collected in any 12 month period to contain no *E. coli* per 100mL
Chloroacetic acid	must not exceed 0.15 mg/L
Dichloroacetic acid	must not exceed 0.1 mg/L
Trichloroacetic acid	must not exceed 0.1 mg/L
Trihalomethanes	must not exceed 0.25 mg/L
Bromate	must not exceed 0.02 mg/L
Formaldehyde	must not exceed 0.5 mg/L
Aluminium (acid soluble)	must not exceed 0.2 mg/L
Turbidity	95 per cent upper confidence limit of mean of drinking water samples collected in the preceding 12 month period must not exceed 5.0 Nephelometric Turbidity Units (NTU)

Further to monitoring water quality for compliance against these standards, we monitor additional parameters that provide a more comprehensive characterisation of the water, as well as assisting the needs of customers (e.g. industry, students and researchers). Detailed summary data for these parameters are provided in Appendices A and B.

The tables in sections 3.1 to 3.5 report the 2014-15 compliance of water quality standard parameters against the water quality standards specified in Victoria's *Safe Drinking Water Regulations 2005*.

3.1 *Escherichia coli (E. coli)*

3.1.1 Results

Table 3.1 ***E. coli* summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015**

Water sampling locality (locality number)	No. of samples	Sampling frequency	No. of samples containing *E. coli*	Max. result (orgs/100mL)	% Samples with no *E. coli*	Complying (yes / no)
Altona (2)	301	>weekly	0	<1	100	yes
Caroline Springs (5)	275	>weekly	0	<1	100	yes
Deer Park (4)	182	>weekly	0	<1	100	yes
East Keilor (6)	145	>weekly	0	<1	100	yes
Little River (1A)	67	>weekly	0	<1	100	yes
Maribyrnong (3A)	354	>weekly	0	<1	100	yes
Moonee Ponds (9B)	223	>weekly	0	<1	100	yes
Parkville (11)	368	>weekly	0	<1	100	yes
Richmond (54)	106	>weekly	0	<1	100	yes
Strathmore (9A)	79	>weekly	0	<1	100	yes
Taylors Lakes (5A)	208	>weekly	0	<1	100	yes
Tullamarine (7A)	78	>weekly	0	<1	100	yes
Werribee (1)	394	>weekly	0	<1	100	yes
Werribee South (2A)	65	>weekly	0	<1	100	yes
Williamstown (3B)	144	>weekly	0	<1	100	yes
Total	**2989**	**-**	**0**	**<1**	**100**	**yes**

E. coli data demonstrate compliance with the standard (at least 98% samples with no E. coli) in each of City West Water's 15 water sampling localities.

Sampling frequencies in each locality exceeded that prescribed by the Safe Drinking Water Regulations 2005 (i.e. one sample per week in each locality). This was done in order to meet the more intense surveillance of internationally recognised population based frequencies, as advocated in ADWG 2011.

3.1.2 Actions in relation to non compliance

With 100 per cent compliance, no actions were necessary.

3.2 Chlorine based disinfection by-product chemicals

3.2.1 Results

In order to facilitate laboratory sample collections, monitoring for chlorine based disinfection by-product chemicals is scheduled on the basis of four week intervals. This strategy also aims to assist in ensuring that no less than 12 monthly samples are obtained for testing from each locality, as per the *Safe Drinking Water Regulations 2005*.

Chloroacetic acid

Table 3.2a Chloroacetic acid summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015

Water sampling locality (locality number)	Sampling frequency (minimum)	No. of samples	No. of non complying samples	Max. mg/L	Complying (yes / no)
Altona (2)	monthly	13	0	<0.005	yes
Caroline Springs (5)	monthly	13	0	<0.005	yes
Deer Park (4)	monthly	13	0	<0.005	yes
East Keilor (6)	monthly	13	0	<0.005	yes
Little River (1A)	monthly	13	0	<0.005	yes
Maribyrnong (3A)	monthly	13	0	<0.005	yes
Moonee Ponds (9B)	monthly	13	0	<0.005	yes
Parkville (11)	monthly	13	0	<0.005	yes
Richmond (54)	monthly	13	0	<0.005	yes
Strathmore (9A)	monthly	13	0	<0.005	yes
Taylors Lakes (5A)	monthly	13	0	<0.005	yes
Tullamarine (7A)	monthly	13	0	<0.005	yes
Werribee (1)	monthly	24	0	<0.005	yes
Werribee South (2A)	monthly	13	0	<0.005	yes
Williamstown (3B)	monthly	13	0	<0.005	yes
Total	-	**206**	**0**	**<0.005**	**yes**

Chloroacetic acid data demonstrate compliance with the standard (0.15 mg/L) in each of City West Water's 15 water sampling localities.

Dichloroacetic acid

Table 3.2b Dichloroacetic acid summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015

Water sampling locality (locality number)	Sampling frequency (minimum)	No. of samples	No. of non complying samples	Max. mg/L	Complying (yes / no)
Altona (2)	monthly	13	0	0.005	yes
Caroline Springs (5)	monthly	13	0	<0.005	yes
Deer Park (4)	monthly	13	0	0.007	yes
East Keilor (6)	monthly	13	0	0.008	yes
Little River (1A)	monthly	13	0	0.009	yes
Maribyrnong (3A)	monthly	13	0	0.007	yes
Moonee Ponds (9B)	monthly	13	0	0.007	yes
Parkville (11)	monthly	13	0	0.008	yes
Richmond (54)	monthly	13	0	0.007	yes
Strathmore (9A)	monthly	13	0	0.007	yes
Taylors Lakes (5A)	monthly	13	0	0.008	yes
Tullamarine (7A)	monthly	13	0	0.012	yes
Werribee (1)	monthly	24	0	0.006	yes
Werribee South (2A)	monthly	13	0	0.008	yes
Williamstown (3B)	monthly	13	0	0.006	yes
Total	-	**206**	**0**	**0.012**	**yes**

Dichloroacetic acid data demonstrate compliance with the standard (0.1 mg/L) in each of City West Water's 15 water sampling localities.

Trichloroacetic acid

Table 3.2c Trichloroacetic acid summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015

Water sampling locality (locality number)	Sampling frequency (minimum)	No. of samples	No. of non complying samples	Max. mg/L	Complying (yes / no)
Altona (2)	monthly	13	0	0.038	yes
Caroline Springs (5)	monthly	13	0	0.014	yes
Deer Park (4)	monthly	13	0	0.015	yes
East Keilor (6)	monthly	13	0	0.009	yes
Little River (1A)	monthly	13	0	0.043	yes
Maribyrnong (3A)	monthly	13	0	0.035	yes
Moonee Ponds (9B)	monthly	13	0	0.039	yes
Parkville (11)	monthly	13	0	0.036	yes
Richmond (54)	monthly	13	0	0.058	yes
Strathmore (9A)	monthly	13	0	0.034	yes
Taylors Lakes (5A)	monthly	13	0	0.012	yes
Tullamarine (7A)	monthly	13	0	0.011	yes
Werribee (1)	monthly	24	0	0.036	yes
Werribee South (2A)	monthly	13	0	0.038	yes
Williamstown (3B)	monthly	13	0	0.035	yes
Total	-	**206**	**0**	**0.058**	**yes**

Trichloroacetic acid data demonstrate compliance with the standard (0.1 mg/L) in each of City West Water's 15 water sampling localities.

Total trihalomethanes

Table 3.2d Trihalomethanes summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015

Water sampling locality (locality number)	Sampling frequency (minimum)	No. of samples	No. of non complying samples	Max. mg/L	Complying (yes / no)
Altona (2)	monthly	13	0	0.073	yes
Caroline Springs (5)	monthly	13	0	0.039	yes
Deer Park (4)	monthly	13	0	0.045	yes
East Keilor (6)	monthly	13	0	0.046	yes
Little River (1A)	monthly	13	0	0.095	yes
Maribyrnong (3A)	monthly	13	0	0.090	yes
Moonee Ponds (9B)	monthly	13	0	0.082	yes
Parkville (11)	monthly	13	0	0.094	yes
Richmond (54)	monthly	13	0	0.101	yes
Strathmore (9A)	monthly	13	0	0.090	yes
Taylors Lakes (5A)	monthly	13	0	0.040	yes
Tullamarine (7A)	monthly	13	0	0.042	yes
Werribee (1)	monthly	24	0	0.082	yes
Werribee South (2A)	monthly	13	0	0.078	yes
Williamstown (3B)	monthly	13	0	0.073	yes
Total	**-**	**206**	**0**	**0.101**	**yes**

Total trihalomethanes data demonstrate compliance with the standard (0.25 mg/L) in each of City West Water's 15 water sampling localities.

3.2.2 Actions in relation to non compliance

With 100 per cent compliance, no actions were necessary.

3.3 Ozone based disinfection by-product chemicals

3.3.1 Results

Safe Drinking Water Regulations 2005 refers to two ozone based disinfection by-product chemicals - bromate and formaldehyde. However, these two chemicals were not monitored on a regular basis for compliance purposes as our water supply is not treated with ozone (refer Section 2.1). Nevertheless, an annual customer tap water sample from each of the 15 water sampling localities was tested during May/June 2015. All 15 results for both bromate and formaldehyde showed levels lower than the respective standards of 0.02 mg/L and 0.5 mg/L (refer Appendix A).

3.3.2 Actions in relation to non compliance

As all 15 results for both bromate and formaldehyde showed levels lower than the respective standards of 0.02 mg/L and 0.5 mg/L, no actions were necessary.

3.4 Aluminium

3.4.1 Results

In order to facilitate laboratory sampling schedules, monitoring for aluminium was generally undertaken on at least a fortnightly basis as part of a suite of other physical/chemical parameters such as pH, colour, iron and manganese. This also assisted in ensuring that no less than the 12 monthly samples were obtained, as per the *Safe Drinking Water Regulations 2005*.

Table 3.3 Aluminium (acid soluble) summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015

Water sampling locality (locality number)	Sampling frequency (minimum)	No. of samples	No. of non complying samples	Max. mg/L	Complying (yes / no)
Altona (2)	fortnightly	26	0	0.04	yes
Caroline Springs (5)	fortnightly	26	0	0.03	yes
Deer Park (4)	fortnightly	26	0	0.03	yes
East Keilor (6)	fortnightly	26	0	0.02	yes
Little River (1A)	fortnightly	26	0	0.04	yes
Maribyrnong (3A)	fortnightly	26	0	0.04	yes
Moonee Ponds (9B)	fortnightly	26	0	0.04	yes
Parkville (11)	fortnightly	26	0	0.04	yes
Richmond (54)	fortnightly	26	0	0.05	yes
Strathmore (9A)	fortnightly	26	0	0.05	yes
Taylors Lakes (5A)	fortnightly	26	0	0.03	yes
Tullamarine (7A)	fortnightly	26	0	0.03	yes
Werribee (1)	fortnightly	37	0	0.04	yes
Werribee South (2A)	fortnightly	26	0	0.03	yes
Williamstown (3B)	fortnightly	26	0	0.04	yes
Total	-	**401**	**0**	**0.05**	**yes**

Acid soluble aluminium data demonstrate compliance with the standard (0.2 mg/L) in each of City West Water's 15 water sampling localities.

3.4.2 Actions in relation to non compliance

With 100 per cent compliance, no actions were necessary.

3.5 Turbidity

3.5.1 Results

Table 3.4 Turbidity summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015

Water sampling locality (locality number)	Sampling frequency	No. of samples	Max. NTU	95% UCL of mean	Complying (yes / no)
Altona (2)	weekly	52	3.0	0.7	yes
Caroline Springs (5)	weekly	52	1.4	1.0	yes
Deer Park (4)	weekly	52	1.5	0.9	yes
East Keilor (6)	weekly	53	1.2	0.8	yes
Little River (1A)	weekly	53	1.0	0.7	yes
Maribyrnong (3A)	weekly	52	1.0	0.6	yes
Moonee Ponds (9B)	weekly	53	6.1*	1.0	yes
Parkville (11)	weekly	52	1.2	0.7	yes
Richmond (54)	weekly	53	1.8	0.9	yes
Strathmore (9A)	weekly	53	1.1	0.8	yes
Taylors Lakes (5A)	weekly	52	1.7	1.2	yes
Tullamarine (7A)	weekly	52	1.4	1.0	yes
Werribee (1)	weekly	63	1.4	0.7	yes
Werribee South (2A)	weekly	52	1.4	0.7	yes
Williamstown (3B)	weekly	52	2.4	0.7	yes
Total	-	**796**	**6.1**	**0.8**	**yes**

Turbidity data demonstrate compliance with the standard in each of City West Water's 15 water sampling localities.

**An individual result of 6.1 did not prevent the statistically based standard of 5 NTU being achieved.*

3.5.2 Actions in relation to non compliance

With 100 per cent compliance against the standard, no remedial water quality actions were necessary.

3.6 Fluoride

3.6.1 Results

Table 3.5 Fluoride summary results in drinking water samples obtained from customer taps tested between 1 July 2014 and 30 June 2015

Water sampling locality (locality number)	Sampling frequency (minimum)	No. of samples	Max. mg/L	Min. mg/L	Average mg/L	Complying (yes / no)
Altona (2)	fortnightly	27	0.95	0.82	0.89	yes
Caroline Springs (5)	fortnightly	28	0.96	0.85	0.92	yes
Deer Park (4)	fortnightly	28	0.96	0.85	0.92	yes
East Keilor (6)	fortnightly	28	0.94	0.81	0.94	yes
Little River (1A)	fortnightly	27	1.1	0.73	0.89	yes
Maribyrnong (3A)	fortnightly	28	0.95	0.83	0.89	yes
Moonee Ponds (9B)	fortnightly	28	0.98	0.78	0.89	yes
Parkville (11)	fortnightly	28	0.96	0.74	0.89	yes
Richmond (54)	fortnightly	28	0.95	0.83	0.89	yes
Strathmore (9A)	fortnightly	28	0.99	0.76	0.89	yes
Taylors Lakes (5A)	fortnightly	28	1.2	0.89	0.94	yes
Tullamarine (7A)	fortnightly	28	0.97	0.74	0.91	yes
Werribee (1)	fortnightly	38	0.94	0.84	0.90	yes
Werribee South (2A)	fortnightly	27	0.96	0.86	0.90	yes
Williamstown (3B)	fortnightly	28	0.94	0.75	0.89	yes
Total	-	**427**	**1.2**	**0.73**	**0.90**	**yes**

For fluoridated supplies, compliance means that all individual sample results are less than or equal to 1.5 mg/L and that the annual average does not exceed 1.0 mg/L. Fluoride data demonstrate compliance in each of City West Water's 15 water sampling localities.

3.6.2 Actions in relation to non compliance

With 100 per cent fluoride compliance, no remedial water quality actions were necessary.

3.7 Other algae, pathogen, chemical or substance not specified above that may pose a risk to human health

3.7.1 Results

In addition to the water quality parameters designated as scheduled standards by the *Safe Drinking Water Regulations 2005,* we also monitor a range of other microbiological and chemical parameters that provide further information on the overall quality of our drinking water supply. Among such other parameters that were monitored in 2014-15, those for which there is a health-related *ADWG 2011* guideline and that could potentially represent a health risk (if present above the *ADWG 2011* guideline level) are listed in Table 3.6.

Table 3.6 Potential health risk water quality parameters monitored during 2014-15

Parameter	Frequency of testing	Results
Microbiological		
Vibrio spp. *Shigella* spp. *Yersinia* spp. *Salmonella* spp. *Campylobacter* spp. *Giardia* spp. *Cryptosporidium* spp. *Enterococci* *Coliphage*	3 to 4 samples per month (3 samples per locality per year)	None detected (therefore, consistent with ADWG 2011 which states that these parameters should not be present in drinking water)
Chemical*		
Arsenic	annually per locality	within guideline (not detected)
Cadmium	annually per locality	within guideline (not detected)
Chromium	annually per locality	within guideline (not detected)
Copper	annually per locality	within guideline
Cyanide	annually per locality	within guideline (not detected)
Fluoride	fortnightly per locality	within guideline
Lead	annually per locality	within guideline (not detected)
Manganese	fortnightly per locality	within guideline
Mercury	annually per locality	within guideline (not detected)
Nitrate	annually per locality	within guideline
Sulphate	annually per locality	within guideline
Zinc	annually per locality	within guideline (not detected)

**ADWG 2011 health-related guidelines are shown in Appendix A tables.*

Further details of monitoring results for manganese, lead, copper and arsenic are contained in Table 3.7.

Table 3.7 Detailed monitoring results for manganese, lead, copper and arsenic during 2014-15

Water sampling locality (locality number)	Parameter	Sampling frequency	No. of samples	No. of non complying results*	Maximum (mg/L)	Complying* (yes / no)
Altona (2)	Manganese	fortnightly	26	0	0.004	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	<0.001	yes
	Arsenic	annually	1	0	<0.001	yes
Caroline Springs (5)	Manganese	fortnightly	26	0	0.006	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	0.009	yes
	Arsenic	annually	1	0	<0.001	yes
Deer Park (4)	Manganese	fortnightly	26	0	0.006	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	<0.01	yes
	Arsenic	annually	1	0	<0.001	yes
East Keilor (6)	Manganese	fortnightly	26	0	0.006	yes
	Lead	annually	1	0	<0.01	yes
	Copper	annually	1	0	<0.01	yes
	Arsenic	annually	1	0	<0.01	yes
Little River (1A)	Manganese	fortnightly	26	0	0.004	yes
	Lead	annually	1	0	<0.01	yes
	Copper	annually	1	0	0.03	yes
	Arsenic	annually	1	0	<0.01	yes
Maribyrnong (3A)	Manganese	fortnightly	26	0	0.007	yes
	Lead	annually	1	0	<0.01	yes
	Copper	annually	1	0	<0.01	yes
	Arsenic	annually	1	0	<0.01	yes
Moonee Ponds (9B)	Manganese	fortnightly	26	0	0.007	yes
	Lead	annually	1	0	<0.01	yes
	Copper	annually	1	0	0.01	yes
	Arsenic	annually	1	0	<0.01	yes
Parkville (11)	Manganese	fortnightly	26	0	0.007	yes
	Lead	annually	1	0	<0.01	yes
	Copper	annually	1	0	<0.01	yes
	Arsenic	annually	1	0	<0.01	yes
Richmond (54)	Manganese	fortnightly	26	0	0.008	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	0.011	yes
	Arsenic	annually	1	0	<0.001	yes

Table 3.7 Detailed monitoring results for manganese, lead, copper and arsenic during 2014-15 (cont'd)

Water sampling locality (locality number)	Parameter	Sampling frequency	No. of samples	No. of non complying results*	Maximum (mg/L)	Complying* (yes / no)
Strathmore (9A)	Manganese	fortnightly	26	0	0.007	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	0.003	yes
	Arsenic	annually	1	0	<0.001	yes
Taylors Lakes (5A)	Manganese	fortnightly	26	0	0.007	yes
	Lead	annually	1	0	<0.01	yes
	Copper	annually	1	0	<0.01	yes
	Arsenic	annually	1	0	<0.01	yes
Tullamarine (7A)	Manganese	fortnightly	26	0	0.006	yes
	Lead	annually	1	0	<0.01	yes
	Copper	annually	1	0	<0.01	yes
	Arsenic	annually	1	0	<0.01	yes
Werribee (1)	Manganese	fortnightly	37	0	0.005	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	<0.001	yes
	Arsenic	annually	1	0	<0.001	yes
Werribee South (2A)	Manganese	fortnightly	26	0	0.004	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	0.003	yes
	Arsenic	annually	1	0	<0.001	yes
Williamstown (3B)	Manganese	fortnightly	26	0	0.004	yes
	Lead	annually	1	0	<0.001	yes
	Copper	annually	1	0	0.006	yes
	Arsenic	annually	1	0	<0.001	yes

** as defined in the health-related guideline values in ADWG 2011.*

3.7.2 Actions in relation to non compliance

Since levels of all health related parameters tested satisfied *ADWG 2011* guideline values at customer taps sites, no related remedial water quality actions were necessary.

As our water supply distribution network is completely enclosed, any monitoring for organic industrial chemicals, pesticides and radioactivity focuses on locations upstream of this network. Melbourne Water tests for these substances with respect to its major storage reservoirs such as Silvan and Sugarloaf, where the potential for contamination is greater. Results of this monitoring are provided to City West Water.

No significant detections (with respect to *ADWG 2011* guidelines) in the bulk water supply took place in 2014-15.

A comprehensive outline of our monitoring data for individual localities, together with monitoring frequencies, Victorian standards and *ADWG 2011* guidelines for both health related and aesthetic water quality data, is contained in Appendix A tables. Contact information for obtaining further details of all water quality testing outlined in this report is provided in the *Further Information* section on page 29.

3.8 Aesthetics

3.8.1 Results

Monitoring results for the aesthetic water quality parameters comprising pH, colour, hardness, alkalinity and iron are shown in Table 3.8. Note that our colour tests are undertaken as apparent colour while the *ADWG 2011* guideline of 15 platinum cobalt units (PCU) refers to true colour. Due to the omission of a filtering step in the test for apparent colour, the subsequent result values are at least equal to, but not less than, the equivalent true colour values. As a result, true colour compliance with respect to the *ADWG 2011* guideline is assured in all cases where apparent colour levels are within the guideline. Past investigations have shown that for Melbourne's water supply, an apparent colour level of 25 PCU is equivalent to a true colour level of 15 PCU.

Table 3.8 Detailed monitoring results for pH, apparent colour, hardness and iron during 2014-15

Water sampling locality (locality number)	Parameter	Sampling frequency	No. of samples	Max*	Min*	Average*
Altona (2)	pH	fortnightly	26	9.0	7.1	7.4
	apparent colour	fortnightly	26	8	<2	4
	hardness	annually	1	22	22	22
	alkalinity	annually	1	11	11	11
	iron	fortnightly	26	0.06	0.02	0.04
Caroline Springs (5)	pH	fortnightly	26	7.5	7.0	7.2
	apparent colour	fortnightly	26	8	<2	4
	hardness	annually	1	18	18	18
	alkalinity	annually	1	12	12	12
	iron	fortnightly	26	0.11	0.01	0.07
Deer Park (4)	pH	fortnightly	26	8.6	6.9	7.2
	apparent colour	fortnightly	26	8	<2	4
	hardness	annually	1	22	22	22
	alkalinity	annually	1	10	10	10
	iron	fortnightly	26	0.10	<0.01	0.06
East Keilor (6)	pH	fortnightly	26	8.1	6.9	7.3
	apparent colour	fortnightly	26	6	<2	4
	hardness	annually	1	25	25	25
	alkalinity	annually	1	10	10	10
	iron	fortnightly	26	0.10	0.01	0.06
Little River (1A)	pH	fortnightly	26	8.4	6.5	7.2
	apparent colour	fortnightly	26	8	<2	4
	hardness	annually	1	34	34	34
	alkalinity	annually	1	24	24	24
	iron	fortnightly	26	0.12	0.02	0.06
Maribyrnong (3A)	pH	fortnightly	26	8.3	7.1	7.3
	apparent colour	fortnightly	26	10	<2	5
	hardness	annually	1	21	21	21
	alkalinity	annually	1	11	11	11
	iron	fortnightly	26	0.07	0.02	0.04

Table 3.8 Detailed monitoring results for pH, apparent colour, hardness and iron during 2013-14 (cont'd)

Water sampling locality (locality number)	Parameter	Sampling frequency	No. of samples	Max*	Min*	Average*
Moonee Ponds (9B)	pH	fortnightly	26	7.6	7.1	7.3
	apparent colour	fortnightly	26	10	<2	6
	hardness	annually	1	20	20	20
	alkalinity	annually	1	12	12	12
	iron	fortnightly	26	0.08	0.03	0.05
Parkville (11)	pH	fortnightly	26	7.4	7.0	7.2
	apparent colour	fortnightly	26	12	<2	5
	hardness	annually	1	22	22	22
	alkalinity	annually	1	10	10	10
	iron	fortnightly	26	0.09	0.02	0.04
Richmond (54)	pH	fortnightly	26	7.6	7.1	7.3
	apparent colour	fortnightly	26	10	2	7
	hardness	annually	1	16	16	16
	alkalinity	annually	1	12	12	12
	iron	fortnightly	26	0.09	0.03	0.07
Strathmore (9A)	pH	fortnightly	26	8.6	7.2	7.6
	apparent colour	fortnightly	26	12	<2	6
	hardness	annually	1	16	16	16
	alkalinity	annually	1	16	16	16
	iron	fortnightly	26	0.08	<0.01	0.06
Taylors Lakes (5A)	pH	fortnightly	26	7.4	7.0	7.1
	apparent colour	fortnightly	26	12	2	5
	hardness	annually	1	20	20	20
	alkalinity	annually	1	17	17	17
	iron	fortnightly	26	0.12	0.05	0.09
Tullamarine (7A)	pH	fortnightly	26	9.0	6.8	7.3
	apparent colour	fortnightly	26	8	<2	4
	hardness	annually	1	20	20	20
	alkalinity	annually	1	13	13	13
	iron	fortnightly	26	0.10	0.01	0.05
Werribee (1)	pH	fortnightly	37	9.1	7.1	7.6
	apparent colour	fortnightly	37	10	<2	4
	hardness	annually	1	25	25	25
	alkalinity	annually	1	14	14	14
	iron	fortnightly	37	0.08	0.02	0.05
Werribee South (2A)	pH	fortnightly	26	8.3	7.3	7.7
	apparent colour	fortnightly	26	6	<2	4
	hardness	annually	1	24	24	24
	alkalinity	annually	1	12	12	12
	iron	fortnightly	26	0.09	0.02	0.05
Williamstown (3B)	pH	fortnightly	26	7.9	7.0	7.3
	apparent colour	fortnightly	26	12	<2	4
	hardness	annually	1	21	21	21
	alkalinity	annually	1	12	12	12
	iron	fortnightly	26	0.05	0.02	0.04

** Units: pH (units); apparent colour (platinum cobalt units); hardness (mg/L as calcium carbonate); alkalinity (mg/L as calcium carbonate); iron (mg/L).*

All 2014-15 water colour, hardness and iron monitoring data complied with the respective *ADWG 2011* guideline levels of 15 PCU, 200 mg/L and 0.3 mg/L. There is no guideline for alkalinity.

Of the 401 samples tested for pH, there were six instances where pH readings were not within the *ADWG 2011* guideline range of 6.5 to 8.5, in that they exceeded 8.5 (but not the tolerable upper value of 9.2). Such elevated pH occurs due to the presence of cement lined water mains, generally within more sparsely populated areas experiencing low water flows.

In association with water industry partners, we have investigated variations in pH throughout Melbourne's water supply system and their possible significance. A 1999-2000 Melbourne study concluded that widespread remedial treatment would be complex and would involve adding chemicals to Melbourne's water supply, with uncertain benefits. A joint water industry study by researchers at Melbourne's Alfred Hospital in 2000 concluded 'there was no indication of the health effects on skin for weakly buffered water, such as that found in Melbourne, over all pH ranges'. A 2003 joint study provided an updated review of the possible effects of elevated pH, weakly buffered (soft) drinking water on health, water supply assets and industrial processes. This study found that for such water there was:

- virtually an absence of published material indicating any adverse impact on human health, either from contact or ingestion;
- no apparent adverse impact on water industry assets;
- no evidence of deleterious effects on domestic appliances; and
- no apparent adverse impact on industrial users.

Nevertheless, we are continuing our practice of avoiding, where possible, the use of new water main materials that could impact upon water pH.

3.9 Analysis of results - trends

This section of the report examines:

(a) trends over time of water quality parameters tested that are designated as standards by *Safe Drinking Water Regulations 2005*.

(b) trends over time and between localities of parameters listed in Appendix A tables that have a corresponding Victorian standard or *ADWG 2011* guideline.

3.9.1 Historical compliance of standard parameters

Table 3.9 summarises trends over time (and extent of compliance) of water quality parameters designated as standards by *Safe Drinking Water Regulations 2005*.

Table 3.9 Compliance time trends of standard parameters

Parameter	Standard (2005 Regulations)	Localities compliant (% of customers supplied with compliant water)			
		2014-15	2013-14	2012-13	2011-12
E. coli	<1 per 100mL in 98% of samples	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Chloroacetic acid	0.15 mg/L	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Dichloroacetic acid	0.1 mg/L	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Trichloroacetic acid	0.1 mg/L	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Trihalomethanes	0.25 mg/L	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Bromate	0.02 mg/L	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Formaldehyde	0.5 mg/L	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Aluminium	0.2 mg/L	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)
Turbidity	95% UCL of mean <= 5.0 NTU*	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)	15 / 15 (100%)

** 95% upper confidence level of mean not to exceed 5.0 NTU*

3.9.2 Parameter trends over time and between localities

Parameter trends provide a three year overview of drinking water quality in our service area, in terms of trends over time and between localities. Parameters considered are those listed in Appendix A tables that have a corresponding Victorian standard or *ADWG 2011* guideline and have been monitored for at least the last two years. Graphical representations of trends are contained in Appendix B and briefly discussed below.

E. coli (refer Figure B.1 in Appendix B)

E. coli performance in our drinking water has consistently complied with the current Victorian standard (requiring "at least 98 per cent of samples collected in any 12 month period to contain no *E. coli* per 100mL") in all water sampling localities.

Free chlorine (refer Figure B.2 in Appendix B)

All of our drinking water supply is disinfected with chlorine. The more active form (free chlorine) is present in all water sampling localities, with levels well within the maximum *ADWG 2011* guideline of 5 mg/L. Nevertheless, average levels amongst individual localities can be markedly different; this being largely due to relative proximity to chlorine dosing points. For example, the Taylors Lakes and Tullamarine localities are situated close to primary chlorination at Greenvale Reservoir, while the Little River and Werribee South localities are served by secondary re-chlorination plants.

Aluminium (refer Figure B.3 in Appendix B)

Overall aluminium levels in the water supply are low. Apparent variations at these levels are considered to be related to natural variations in the catchments rather than from artificial treatment dosing. For example, aluminium is only used in water treatment at the Winneke Treatment Plant, yet the water sampling localities more likely to receive water from this source (Moonee Ponds, Parkville, Altona, Werribee) do not exhibit markedly higher aluminium levels as compared with other localities.

Arsenic, cadmium, chromium, cyanide, lead, mercury, zinc

These substances have been monitored on an annual basis. As shown in the Appendix A tables, test results have consistently been either within guideline levels or below analytical detection limits.

Chloride (refer Figure B.4 in Appendix B)

Chloride levels are quite low and relatively consistent amongst the water sampling localities.

Colour (refer Figure B.5 in Appendix B)

ADWG 2011 refers to' true colour' of water; however we have continued the historical practice of measuring the more conservative 'apparent colour', which gives higher readings. Nevertheless, our average apparent colour levels have been within the *ADWG 2011* True Colour guideline of 15 PCU. Higher colour levels in the Richmond locality are associated with its traditional bulk supply source from Silvan Reservoir.

Copper (refer Figure B.6 in Appendix B)

Copper levels in the water supply are low and consistently well within the *ADWG 2011* health and aesthetic guidelines.

Electrical conductivity (EC) – (refer Figure B.7 in Appendix B)

We measure EC as a surrogate for total dissolved solids (TDS). *ADWG 2011* advises that its TDS guideline level of 600 mg/L can be substituted by an EC level of approximately 900 µs/cm. EC levels are quite low and relatively consistent within each water sampling locality. A relatively overall decrease in EC in the last two years is a reflection of increased supply of sources of water other than Sugarloaf/Winneke (as discussed in Section 1.1.1).

Fluoride (refer Figure B.8 in Appendix B)

Fluoride levels in the water supply are the result of fluoridation of the bulk supply. Dosing is controlled such that levels are generally maintained between approximately 0.9 and 1.0 mg/L.

Hardness (refer Figure B.9 in Appendix B)

Water hardness levels are quite low and relatively consistent within each water sampling locality.

Iron (refer Figure B.10 in Appendix B)

Overall, slightly higher iron levels in the Caroline Springs, Taylors Lakes and Richmond water sampling localities are consistent with their source water comprising more of the relatively greater iron containing water from Silvan and Greenvale reservoirs.

Manganese (refer Figure B.11 in Appendix B)

Manganese levels in the water supply are low and consistently well within the guidelines.

Nitrate (refer Figure B.12 in Appendix B)

Nitrate levels in the water supply are low and consistently well within the guidelines.

pH (refer Figure B.13 in Appendix B)

Average pH levels in all localities are between 7 and 8.

Sodium (refer Figure B.14 in Appendix B)

Sodium levels are quite low and relatively consistent among the water sampling localities.

Turbidity (refer Figure B.15 in Appendix B)

Turbidity levels in all localities continue to be less than the standard. Variations between individual water sampling localities are a reflection of their source waters. For example, localities with lower turbidity tend to be supplied more from Sugarloaf/Winneke, while higher turbidity localities tend to be supplied to a greater extent from Silvan and Greenvale reservoirs.

Sulphate (refer Figure B.16 in Appendix B)

Sulphate levels are quite low and relatively consistent within each water sampling locality. Lower sulphate (as well as sodium, hardness, conductivity and chloride – as per earlier Figures) levels in Caroline Springs, Richmond, Strathmore and Taylors Lakes localities are a reflection of the Silvan reservoir source. At the same time, higher turbidity, iron and colour in these localities also reflects Silvan as the source of the water.

Total trihalomethanes – (refer Figure B.17 in Appendix B)

Total trihalomethanes concentrations are relatively low (in comparison with the Victorian standard) and consistent among water sampling localities. Highest levels in Little River and Richmond reflect their remoteness from primary chlorination.

Chloroacetic acids

The readings in the water supply are low and consistently well within the Victorian standards (refer Section 3.2.1).

4. Emergency and incident management

This section outlines events involving actual or potential adverse changes in water supply quality during 2014-15, including those that were reported to Victoria's Department of Health and Human Services in line with Section 22 of the *Safe Drinking Water Act 2003*.

- Despite full compliance with the *E. coli* standard at customer tap supplies throughout 2014-15, a City West Water internal, non-regulatory sampling at a customer tap site on 1 December 2014 resulted in an apparent detection of *E. coli* (one organism per 100 mL) in the Caroline Springs locality. A re-sample the following day revealed absence of total bacteria, total coliform bacteria and *E. coli*. The cause of the *E. coli* detection was concluded to most likely have been due to inadequate aseptic sampling methodology rather than faecal contamination, as indicated by the original result of one *E. coli* per 100mL and the subsequent totally 'clear' resample.
- Inspection and maintenance works on a distribution main in Nicholson Street Carlton resulted in a long-closed valve being inadvertently opened at approximately 01:00 on 14 April 2015. This caused a sudden change in water flow regime in the main to re-suspend naturally occurring sediments resulting in water discolouration in a section of northern Melbourne (Parkville locality). The valve in question was closed later that morning and immediately followed by extensive hydrant flushing to clear out the discoloured water from the local pipe network. A total of 81 complaints of discoloured water were received. The incident was considered to be an aesthetic rather than health related issue.

Both these instances and follow-up actions were reported to Victoria's Department of Health and Human Services as Section 22 notifications, in line with our water quality Risk Management Plan.

With respect to the bulk water supply, Melbourne Water reported that on 3 August 2014 an elevated turbidity reading of approximately nine minutes duration was recorded at the Winneke Water Treatment Plant. The individual filter involved was taken offline and a Section 22 notification was submitted by Melbourne Water. Subsequent manual samples taken from the filter indicated that the actual water turbidity was lower than the analyser reading and therefore no potential impact on public health had occurred. The turbidity reading was attributed to analyser disturbance. Filtration procedures were revised and changes made to the programming code controlling filter operation to prevent a further occurrence.

5. Complaints relating to water quality

In 2014-15, City West Water received 262 complaints related to water supply quality. The various categories of complaints were distributed as shown in Table 5.1.

Table 5.1 Water quality related customer complaints received in 2014-15

Complaint category	Number of complaints	No. of complaints per 100 customers supplied*
Discoloured water	215	0.052
Alleged illness	0	<0.001
Air in water	9	0.002
Blue-green water	0	<0.001
Taste/odour	37	0.009
Other	1	<0.001

** Number of customers (properties) at 30 June 2015 determined as 414,000.*

The number of complaints did not exceed 10 per 100 customers in any of the 15 localities.

A historical comparison of water quality related complaints received over the last five years is contained in Table 5.2.

Table 5.2 Water quality related customer complaints received over the last five years

Complaint category	Number received				
	2014-15	2013-14	2012-13	2011-12	2010-11
Discoloured water	215	102	204	159	155
Alleged illness	-	-	-	1	2
Air in water	9	6	10	5	7
Blue-green water	-	3	4	7	3
Taste/odour	37 (9 chlorine)*	67 (19 chlorine)*	49 (16 chlorine)*	92 (20 chlorine)*	51 (24 chlorine)*
Other	1 (blocked filter)	2 (blocked filter)	1 (staining)	3 (1 staining) (2 blocked filter)	2 (staining)
Total	**262**	**180**	**268**	**267**	**220**
No. of properties	414,000	403,000	389,000	379,000	368,000
Complaints per 100 properties	0.063	0.045	0.069	0.070	0.060

** Number of complaints received of chlorine taste or odour.*

Complaints and responses

We provide individual responses to water quality related complaints. These can range between verbal clarification of perceived issues, to onsite investigations and remedial action. In terms of the major complaint categories, our responses are as follows.

Discoloured (e.g. brown) water

Discoloured water is generally caused by the suspension of accumulated natural sediments in water mains. It can be triggered by the opening or closing of valves and reinstatement of mains into service following repairs. Discoloured water can also result from older, rusting internal galvanised iron pipes. Calls to City West Water are assessed by trained staff and, where the discoloured water is deemed to be originating from the water main, targeted mains flushing is generally undertaken.

Alleged illness

Complaints of water related illness are referred to our Water Quality Scientist for detailed discussion, analysis and investigation. Customers may be advised to seek medical advice.

White water (air in water)

White water (water with a cloudy appearance that clarifies within a few minutes) indicates the presence of tiny, harmless air bubbles. It tends to be associated with maintenance and repair works, when air can enter water pipes. As the aerated water is used by customers, its appearance returns to normal. In the past we often responded to customers' concerns with targeted mains flushing, however since the recent drought and water restrictions, greater emphasis is placed on better explaining the phenomenon and obtaining customer agreement to not flush water mains.

Blue-green water

On a seemingly random basis, customers at a small number of properties report blue-green water (water that has a cloudy to blue-green appearance, possibly containing blue-green particles, and having an unpleasant bitter taste). This is caused by accelerated corrosion of customers' internal copper water pipes and appears to be restricted to cold water pipes.

Blue-green water must not be consumed (by drinking or in the preparation of food) because it can cause vomiting. The prolonged consumption of water containing elevated copper levels can have adverse health effects.

As blue-green water originates from a property's internal copper pipes, customers can manage the problem by flushing their tap with fresh mains water. This means running their tap until the water becomes clear.

In certain cases, corrosion of copper pipes can lead to perforation and leakage.

Neither the cause of, nor solution to this international and Australia wide copper corrosion phenomenon are known (apart from replacement of corroding pipes).

We assist customers experiencing copper pipe corrosion by testing copper levels in their water and providing advice on how to best manage the issue of blue-green water. If customers are experiencing blue-green water or have other water quality concerns, they are asked to call us on 132 642 for further information and advice.

Taste or odour

A change in taste or odour of tap water can occur occasionally and is generally apparent as a chlorine-like or earthy, musty sensation. Fluctuations in chlorine levels (and hence, the perception of chlorine taste or odour) occur from time to time, largely due to changed water demands and flow rates. Our response to customers reporting chlorine taste/odour involves providing an explanation, as well as considering changes to chlorine dosing.

Other tastes/odours can result when water flows are slower and during flow reversals in large pipes. In such cases the cause is identified and, where appropriate, a combination of targeted flushing and/or changes to flow regimes are implemented.

6. Findings of the most recent risk management plan audit

Pursuant to the *Safe Drinking Water Act 2003*, we have a documented water quality Risk Management Plan that is subject to independent audit in terms of its content and implementation. Our plan was audited for the fourth time in March 2014 and again found to be compliant with all requirements. A copy of the audit certificate is in Appendix C.

Notwithstanding the plan's compliance with the Act, the audit identified several opportunities for improvement. An outline of these opportunities for improvement, together with actions to address these is contained in Appendix C.

Significant portions of the Risk Management Plan are based on our pre-existing HACCP plan which itself is audited internally on a quarterly basis, as well as annually by an external, independent auditor. The HACCP plan specifically addresses issues such as staff training and development, calibration of equipment and maintenance and inspections of assets. Each of these is examined during independent annual audits. The HACCP system is highly regarded and well known in the food industry for protecting the welfare and safety of consumers. It is based on the identification and management of risks (to quality) at key points within a production or product delivery process.

The HACCP certification demonstrates that we attend to those parts of our network and operations that have an impact on water quality. Maintenance of HACCP certification requires continual vigilance and improvements to our water quality management operations. City West Water aims to continue meeting the HACCP requirements.

7. Undertakings under Section 30 of the Act

City West Water has not entered into any undertakings with the Department of Health and Human Services, pursuant to section 30 of the *Safe Drinking Water Act 2003*.

8. Exemptions from water quality standards under Section 20 and conditions imposed under Section 21 of the Act

City West Water did not have any Section 20 or Section 21 exemptions in place.

9. Variation to aesthetic standards under Section 19 of the Act and conditions imposed under Section 21 of the Act

City West Water did not have any Section 19 variations.

10. Regulated water

Regulated water is water that is the subject of a declaration made by the Minister for Health concerning water that is not drinking water. We do not manage any water supplies that have been declared as 'regulated water'.

In certain cases however, we do supply water from our water distribution mains to customers with privately owned off-takes. Such supplies are provided under a private agreement between City West Water and the customer. The agreement does not guarantee the pressure or quality of the supply downstream of the off-take point, albeit that we endeavour to maintain these. City West Water has embarked on a program to reduce the number of such private supplies.

11. Further Information

For further information on the details of this report or on general water quality matters can be obtained by contacting our Water Quality Scientist, Georges Ruta directly on (03) 9313 8388 or email george.ruta@citywestwater.com.au. Written enquiries can be addressed to Mr Georges Ruta, City West Water, Locked Bag 350, Sunshine, Victoria, 3020.

Appendix A Water quality data by locality

Water Sampling Locality	Altona	Locality No.	2
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	97,611

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	85	>weekly	301	301	100%
Total Coliforms	orgs/100mL	N	<1	<1	54	>weekly	301	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	301	301	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.13	0.46	>weekly	301	301	100%
Total Chlorine	mg/L	5	0.02	0.21	0.55	>weekly	301	301	100%
Alkalinity (as $CaCO_3$)	mg/L	N	11	11	11	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.01	0.03	0.04	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	6.2	6.2	6.2	annually	1	-	-
Chloride	mg/L	250	13	13	13	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	8	fortnightly	26	26	100%
Conductivity	µS/cm	~900	73	80	90	fortnightly	26	26	100%
Copper	mg/L	1	<0.001	<0.001	<0.001	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.82	0.89	0.95	fortnightly	27	27	100%
Hardness (as $CaCO_3$)	mg/L	200	22	22	22	annually	1	1	100%
Iron	mg/L	0.3	0.02	0.04	0.06	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.6	1.6	1.6	annually	1	-	-
Manganese	mg/L	0.1	0.002	0.003	0.004	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.15	1.15	1.15	annually	1	1	100%
pH	units	6.5-8.5	7.1	7.4	9.0	fortnightly	26	25	96%
pH	units	6.5-9.2	7.1	7.4	9.0	fortnightly	26	26	100%
Potassium	mg/L	N	1.0	1.0	1.0	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.5	3.5	3.5	annually	1	1	100%
Sodium	mg/L	180	7.7	7.7	7.7	annually	1	1	100%
Sulphate	mg/L	250	7.1	7.1	7.1	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.2	1.2	1.2	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	45	45	45	annually	1	1	100%
Turbidity	NTU	5[1]	0.3	0.7[1]	3.0	weekly	52	-	within standard
Zinc	mg/L	3	<0.001	<0.001	<0.001	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.002	0.003	0.004	monthly	13	-	-
Dichlorobromomethane	mg/L	N	<0.001	0.012	0.015	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.034	0.049	0.057	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.049	0.064	0.073	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.005	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.012	0.025	0.038	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Caroline Springs	Locality No.	5
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	87,947

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	120	>weekly	275	275	100%
Total Coliforms	orgs/100mL	N	<1	<1	24	>weekly	275	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	275	275	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.25	0.66	>weekly	275	275	100%
Total Chlorine	mg/L	5	0.03	0.31	0.77	>weekly	275	275	100%
Alkalinity (as $CaCO_3$)	mg/L	N	12	12	12	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.01	0.02	0.03	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.0002	<0.0002	<0.0002	annually	1	1	100%
Calcium	mg/L	N	4.8	4.8	4.8	annually	1	-	-
Chloride	mg/L	250	10	10	10	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	8	fortnightly	26	26	100%
Conductivity	µS/cm	~900	62	73	100	fortnightly	26	26	100%
Copper	mg/L	1	0.009	0.009	0.009	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.85	0.92	0.96	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	18	18	18	annually	1	1	100%
Iron	mg/L	0.3	0.01	0.07	0.11	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.4	1.4	1.4	annually	1	-	-
Manganese	mg/L	0.1	<0.001	0.002	0.006	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	0.62	0.62	0.62	annually	1	1	100%
pH	units	6.5-8.5	7.0	7.2	7.5	fortnightly	26	26	100%
pH	units	6.5-9.2	7.0	7.2	7.5	fortnightly	26	26	100%
Potassium	mg/L	N	0.8	0.8	0.8	annually	1	-	-
Silica (SiO_2)	mg/L	80	6.2	6.2	6.2	annually	1	1	100%
Sodium	mg/L	180	4.8	4.8	4.8	annually	1	1	100%
Sulphate	mg/L	250	1.7	1.7	1.7	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.3	1.3	1.3	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	31	31	31	annually	1	1	100%
Turbidity	NTU	5[1]	<0.1	1.0[1]	1.4	weekly	52	-	within standard
Zinc	mg/L	3	0.002	0.002	0.002	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.001	0.002	0.007	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.005	0.007	0.012	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.013	0.022	0.027	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.025	0.032	0.039	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	<0.005	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.009	0.014	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU).
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Deer Park	Locality No.	4
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	53,687

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	100	>weekly	182	182	100%
Total Coliforms	orgs/100mL	N	<1	<1	2400	>weekly	182	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	182	182	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.20	0.46	>weekly	182	182	100%
Total Chlorine	mg/L	5	0.05	0.31	0.56	>weekly	182	182	100%
Alkalinity (as $CaCO_3$)	mg/L	N	10	10	10	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.01	0.02	0.03	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.0002	<0.0002	<0.0002	annually	1	1	100%
Calcium	mg/L	N	6.2	6.2	6.2	annually	1	-	-
Chloride	mg/L	250	15	15	15	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	8	fortnightly	26	26	100%
Conductivity	µS/cm	~900	68	77	100	fortnightly	26	26	100%
Copper	mg/L	1	<0.01	<0.01	<0.01	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.85	0.92	0.96	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	22	22	22	annually	1	1	100%
Iron	mg/L	0.3	<0.01	0.06	0.10	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.7	1.7	1.7	annually	1	-	-
Manganese	mg/L	0.1	<0.001	0.002	0.006	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.33	1.33	1.33	annually	1	1	100%
pH	units	6.5-8.5	6.9	7.2	8.6	fortnightly	26	25	96.2%
pH	units	6.5-9.2	6.9	7.2	8.6	fortnightly	26	26	100%
Potassium	mg/L	N	1.1	1.1	1.1	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.2	3.2	3.2	annually	1	1	100%
Sodium	mg/L	180	8.5	8.5	8.5	annually	1	1	100%
Sulphate	mg/L	250	8.3	8.3	8.3	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.1	1.1	1.1	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	64	64	64	annually	1	1	100%
Turbidity	NTU	5[1]	<0.1	0.9[1]	1.5	weekly	52	-	within standard
Zinc	mg/L	3	0.002	0.002	0.002	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.002	0.003	0.006	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.006	0.008	0.013	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.010	0.021	0.034	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.026	0.033	0.045	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.007	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.008	0.015	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	East Keilor	Locality No.	6
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	38,063

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	150	>weekly	145	145	100%
Total Coliforms	orgs/100mL	N	<1	<1	2	>weekly	143	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	145	145	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.35	0.70	>weekly	145	145	100%
Total Chlorine	mg/L	5	0.03	0.45	0.79	>weekly	145	145	100%
Alkalinity (as $CaCO_3$)	mg/L	N	10	10	10	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.01	0.02	0.02	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	7.0	7.0	7.0	annually	1	-	-
Chloride	mg/L	250	15	15	15	annually	1	1	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	6	fortnightly	26	26	100%
Conductivity	µS/cm	~900	69	79	110	fortnightly	26	26	100%
Copper	mg/L	1	<0.01	<0.01	<0.01	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.81	0.90	0.94	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	25	25	25	annually	1	1	100%
Iron	mg/L	0.3	0.01	0.06	0.10	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Magnesium	mg/L	N	1.8	1.8	1.8	annually	1	-	-
Manganese	mg/L	0.1	<0.001	0.002	0.006	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.001	<0.001	<0.001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.28	1.28	1.28	annually	1	1	100%
pH	units	6.5-8.5	6.9	7.3	8.1	fortnightly	26	26	100%
pH	units	6.5-9.2	6.9	7.3	8.1	fortnightly	26	26	100%
Potassium	mg/L	N	1.2	1.2	1.2	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.0	3.0	3.0	annually	1	1	100%
Sodium	mg/L	180	9.1	9.1	9.1	annually	1	1	100%
Sulphate	mg/L	250	9.7	9.7	9.7	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.0	1.0	1.0	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	46	46	46	annually	1	1	100%
Turbidity	NTU	5[1]	<0.1	0.8[1]	1.2	weekly	53	-	within standard
Zinc	mg/L	3	<0.01	<0.01	<0.01	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.001	0.003	0.007	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.004	0.007	0.011	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.009	0.019	0.032	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.020	0.030	0.046	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.008	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.006	0.009	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Little River	Locality No.	1A
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	625

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	3	>weekly	67	67	100%
Total Coliforms	orgs/100mL	N	<1	<1	<1	>weekly	67	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	67	67	within standard (actual 100%)
Free Chlorine	mg/L	5	0.01	0.33	0.61	>weekly	67	67	100%
Total Chlorine	mg/L	5	0.06	0.42	0.74	>weekly	67	67	100%
Alkalinity (as $CaCO_3$)	mg/L	N	24	24	24	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	<0.01	0.02	0.04	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	11.0	11.0	11.0	annually	1	-	-
Chloride	mg/L	250	16	16	16	annually	1	1	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	8	fortnightly	26	26	100%
Conductivity	µS/cm	~900	82	99	140	fortnightly	26	26	100%
Copper	mg/L	1	0.030	0.030	0.030	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.73	0.89	1.1	fortnightly	27	27	100%
Hardness (as $CaCO_3$)	mg/L	200	34	34	34	annually	1	1	100%
Iron	mg/L	0.3	0.02	0.06	0.12	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Magnesium	mg/L	N	1.4	1.4	1.4	annually	1	-	-
Manganese	mg/L	0.1	0.001	0.003	0.004	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.001	<0.001	<0.001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.11	1.11	1.11	annually	1	1	100%
pH	units	6.5-8.5	6.5	7.2	8.4	fortnightly	26	26	100%
pH	units	6.5-9.2	6.5	7.2	8.4	fortnightly	26	26	100%
Potassium	mg/L	N	1.2	1.2	1.2	annually	1	-	-
Silica (SiO_2)	mg/L	80	4.0	4.0	4.0	annually	1	1	100%
Sodium	mg/L	180	9.4	9.4	9.4	annually	1	1	100%
Sulphate	mg/L	250	7.7	7.7	7.7	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.2	1.2	1.2	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	95	95	95	annually	1	1	100%
Turbidity	NTU	5[1]	0.2	0.7[1]	1.0	weekly	53	-	within standard
Zinc	mg/L	3	<0.01	<0.01	<0.01	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.002	0.004	0.008	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.011	0.013	0.015	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.027	0.048	0.077	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.051	0.066	0.095	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.009	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.011	0.024	0.043	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Maribyrnong	Locality No.	3A
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	101,272

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	53	>weekly	354	354	100%
Total Coliforms	orgs/100mL	N	<1	<1	2	>weekly	354	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	354	354	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.19	0.53	>weekly	354	354	100%
Total Chlorine	mg/L	5	0.02	0.27	0.62	>weekly	354	354	100%
Alkalinity (as $CaCO_3$)	mg/L	N	11	11	11	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.02	0.03	0.04	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	5.5	5.5	5.5	annually	1	-	-
Chloride	mg/L	250	13	13	13	annually	1	1	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	annually	1	1	100%
Colour	Pt/Co	25**	<2	5	10	fortnightly	26	26	100%
Conductivity	µS/cm	~900	63	75	85	fortnightly	26	26	100%
Copper	mg/L	1	<0.01	<0.01	<0.01	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.83	0.89	0.95	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	21	21	21	annually	1	1	100%
Iron	mg/L	0.3	0.02	0.04	0.07	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Magnesium	mg/L	N	1.7	1.7	1.7	annually	1	-	-
Manganese	mg/L	0.1	0.002	0.004	0.007	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.001	<0.001	<0.001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.06	1.06	1.06	annually	1	1	100%
pH	units	6.5-8.5	7.1	7.3	8.3	fortnightly	26	26	100%
pH	units	6.5-9.2	7.1	7.3	8.3	fortnightly	26	26	100%
Potassium	mg/L	N	1.0	1.0	1.0	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.7	3.7	3.7	annually	1	1	100%
Sodium	mg/L	180	7.4	7.4	7.4	annually	1	1	100%
Sulphate	mg/L	250	6.4	6.4	6.4	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.3	1.3	1.3	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	52	52	52	annually	1	1	100%
Turbidity	NTU	5[1]	0.2	0.6[1]	1.0	weekly	52	-	within standard
Zinc	mg/L	3	<0.01	<0.01	<0.01	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.001	0.003	0.004	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.008	0.011	0.014	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.028	0.054	0.074	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.045	0.068	0.090	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.007	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.010	0.024	0.035	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Moonee Ponds	Locality No.	9B
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	68,395

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	22	>weekly	223	223	100%
Total Coliforms	orgs/100mL	N	<1	<1	1	>weekly	223	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	223	223	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.13	0.42	>weekly	223	223	100%
Total Chlorine	mg/L	5	0.02	0.21	0.53	>weekly	223	223	100%
Alkalinity (as $CaCO_3$)	mg/L	N	12	12	12	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.02	0.03	0.04	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	5.1	5.1	5.1	annually	1	-	-
Chloride	mg/L	250	12	12	12	annually	1	1	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	annually	1	1	100%
Colour	Pt/Co	25**	<2	6	10	fortnightly	26	26	100%
Conductivity	µS/cm	~900	59	70	84	fortnightly	26	26	100%
Copper	mg/L	1	0.010	0.010	0.010	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.78	0.89	0.98	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	20	20	20	annually	1	1	100%
Iron	mg/L	0.3	0.03	0.05	0.08	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Magnesium	mg/L	N	1.7	1.7	1.7	annually	1	-	-
Manganese	mg/L	0.1	0.002	0.004	0.007	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.001	<0.001	<0.001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	0.93	0.93	0.93	annually	1	1	100%
pH	units	6.5-8.5	7.1	7.3	7.6	fortnightly	26	26	100%
pH	units	6.5-9.2	7.1	7.3	7.6	fortnightly	26	26	100%
Potassium	mg/L	N	1.0	1.0	1.0	annually	1	-	-
Silica (SiO_2)	mg/L	80	4.1	4.1	4.1	annually	1	1	100%
Sodium	mg/L	180	7.2	7.2	7.2	annually	1	1	100%
Sulphate	mg/L	250	5.6	5.6	5.6	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.2	1.2	1.2	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	70	70	70	annually	1	1	100%
Turbidity	NTU	5[1]	0.2	1.0[1]	6.1	weekly	53	-	within standard
Zinc	mg/L	3	<0.01	<0.01	<0.01	annually	1	1	100%
Dibromochloromethane	mg/L	N	<0.001	0.002	0.004	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.008	0.010	0.012	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.038	0.058	0.071	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.054	0.070	0.082	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.007	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.014	0.026	0.039	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Parkville	Locality No.	11
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	111,305

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	30	>weekly	368	368	100%
Total Coliforms	orgs/100mL	N	<1	<1	<1	>weekly	368	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	368	368	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.22	0.55	>weekly	368	368	100%
Total Chlorine	mg/L	5	0.03	0.32	0.66	>weekly	368	368	100%
Alkalinity (as $CaCO_3$)	mg/L	N	10	10	10	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.02	0.03	0.04	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	5.9	5.9	5.9	annually	1	-	-
Chloride	mg/L	250	14	14	14	annually	1	1	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	annually	1	1	100%
Colour	Pt/Co	25**	<2	5	12	fortnightly	26	26	96.3%
Conductivity	µS/cm	~900	59	79	89	fortnightly	26	26	100%
Copper	mg/L	1	<0.01	<0.01	<0.01	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.74	0.89	0.96	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	22	22	22	annually	1	1	100%
Iron	mg/L	0.3	0.02	0.04	0.09	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Magnesium	mg/L	N	1.8	1.8	1.8	annually	1	-	-
Manganese	mg/L	0.1	0.002	0.004	0.007	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.001	<0.001	<0.001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.15	1.15	1.15	annually	1	1	100%
pH	units	6.5-8.5	7.0	7.2	7.4	fortnightly	26	26	100%
pH	units	6.5-9.2	7.0	7.2	7.4	fortnightly	26	26	100%
Potassium	mg/L	N	1.1	1.1	1.1	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.5	3.5	3.5	annually	1	1	100%
Sodium	mg/L	180	8.5	8.5	8.5	annually	1	1	100%
Sulphate	mg/L	250	7.6	7.6	7.6	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.0	1.0	1.0	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	29	29	29	annually	1	1	100%
Turbidity	NTU	5[1]	0.2	0.7[1]	1.2	weekly	52	-	within standard
Zinc	mg/L	3	<0.01	<0.01	<0.01	annually	1	1	100%
Dibromochloromethane	mg/L	N	<0.001	0.003	0.005	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.008	0.011	0.014	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.031	0.048	0.085	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.048	0.063	0.094	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.008	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.005	0.024	0.036	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Richmond	Locality No.	54
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	20,646

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	70	>weekly	106	106	100%
Total Coliforms	orgs/100mL	N	<1	<1	200	>weekly	106	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	106	106	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.06	0.45	>weekly	106	106	100%
Total Chlorine	mg/L	5	0.02	0.12	0.56	>weekly	106	106	100%
Alkalinity (as $CaCO_3$)	mg/L	N	12	12	12	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.02	0.03	0.05	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.0002	<0.0002	<0.0002	annually	1	1	100%
Calcium	mg/L	N	4.1	4.1	4.1	annually	1	-	-
Chloride	mg/L	250	8	8	8	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	2	7	10	fortnightly	26	26	100%
Conductivity	µS/cm	~900	57	61	82	fortnightly	26	26	100%
Copper	mg/L	1	0.011	0.011	0.011	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.83	0.89	0.95	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	16	16	16	annually	1	1	100%
Iron	mg/L	0.3	0.03	0.07	0.09	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.3	1.3	1.3	annually	1	-	-
Manganese	mg/L	0.1	0.003	0.005	0.008	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	0.62	0.62	0.62	annually	1	1	100%
pH	units	6.5-8.5	7.1	7.3	7.6	fortnightly	26	26	100%
pH	units	6.5-9.2	7.1	7.3	7.6	fortnightly	26	26	100%
Potassium	mg/L	N	0.8	0.8	0.8	annually	1	-	-
Silica (SiO_2)	mg/L	80	5.3	5.3	5.3	annually	1	1	100%
Sodium	mg/L	180	4.6	4.6	4.6	annually	1	1	100%
Sulphate	mg/L	250	1.5	1.5	1.5	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.8	1.8	1.8	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	26	26	26	annually	1	1	100%
Turbidity	NTU	5[1]	0.4	0.9[1]	1.8	weekly	53	-	within standard
Zinc	mg/L	3	0.003	0.003	0.003	annually	1	1	100%
Dibromochloromethane	mg/L	N	<0.001	<0.001	0.001	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.008	0.010	0.013	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.057	0.075	0.092	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.071	0.086	0.101	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.007	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.014	0.029	0.058	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Strathmore	Locality No.	9A
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	8,917

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	1	320	>weekly	79	79	100%
Total Coliforms	orgs/100mL	N	<1	<1	48	>weekly	79	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	79	79	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.06	0.22	>weekly	79	79	100%
Total Chlorine	mg/L	5	0.03	0.13	0.34	>weekly	79	79	100%
Alkalinity (as $CaCO_3$)	mg/L	N	16	16	16	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.02	0.03	0.05	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.0002	<0.0002	<0.0002	annually	1	1	100%
Calcium	mg/L	N	4.5	4.5	4.5	annually	1	-	-
Chloride	mg/L	250	8	8	8	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	<2	6	12	fortnightly	26	26	100%
Conductivity	µS/cm	~900	58	68	110	fortnightly	26	26	100%
Copper	mg/L	1	0.003	0.003	0.003	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.76	0.89	0.99	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	16	16	16	annually	1	1	100%
Iron	mg/L	0.3	<0.01	0.06	0.08	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.3	1.3	1.3	annually	1	-	-
Manganese	mg/L	0.1	<0.001	0.004	0.007	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	0.66	0.66	0.66	annually	1	1	100%
pH	units	6.5-8.5	7.2	7.6	8.6	fortnightly	26	25	96%
pH	units	6.5-9.2	7.2	7.6	8.6	fortnightly	26	26	100%
Potassium	mg/L	N	0.8	0.8	0.8	annually	1	-	-
Silica (SiO_2)	mg/L	80	4.9	4.9	4.9	annually	1	1	100%
Sodium	mg/L	180	4.6	4.6	4.6	annually	1	1	100%
Sulphate	mg/L	250	1.8	1.8	1.8	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.7	1.7	1.7	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	26	26	26	annually	1	1	100%
Turbidity	NTU	5[1]	<0.1	0.8[1]	1.1	weekly	53	-	within standard
Zinc	mg/L	3	0.003	0.003	0.003	annually	1	1	100%
Dibromochloromethane	mg/L	N	<0.001	0.002	0.007	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.008	0.010	0.015	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.016	0.058	0.079	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.036	0.071	0.090	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.007	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.018	0.034	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Taylors Lakes	Locality No.	5A
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	63,394

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	2200	>weekly	208	207	99.9%
Total Coliforms	orgs/100mL	N	<1	<1	2400	>weekly	208	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	208	208	within standard (actual 100%)
Free Chlorine	mg/L	5	0.06	0.44	0.77	>weekly	208	208	100%
Total Chlorine	mg/L	5	0.13	0.55	0.93	>weekly	208	208	100%
Alkalinity (as $CaCO_3$)	mg/L	N	17	17	17	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	<0.01	0.02	0.03	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	5.4	5.4	5.4	annually	1	-	-
Chloride	mg/L	250	10	10	10	annually	1	1	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	annually	1	1	100%
Colour	Pt/Co	25**	2	5	12	fortnightly	26	26	100%
Conductivity	µS/cm	~900	61	64	67	fortnightly	26	26	100%
Copper	mg/L	1	<0.01	<0.01	<0.01	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.89	0.94	1.2	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	20	20	20	annually	1	1	100%
Iron	mg/L	0.3	0.05	0.09	0.12	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Magnesium	mg/L	N	1.5	1.5	1.5	annually	1	-	-
Manganese	mg/L	0.1	0.001	0.003	0.007	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.001	<0.001	<0.001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	0.62	0.62	0.62	annually	1	1	100%
pH	units	6.5-8.5	7.0	7.1	7.4	fortnightly	26	26	100%
pH	units	6.5-9.2	7.0	7.1	7.4	fortnightly	26	26	100%
Potassium	mg/L	N	0.8	0.8	0.8	annually	1	-	-
Silica (SiO_2)	mg/L	80	6.7	6.7	6.7	annually	1	1	100%
Sodium	mg/L	180	5.2	5.2	5.2	annually	1	1	100%
Sulphate	mg/L	250	2.1	2.1	2.1	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.3	1.3	1.3	annually	1	-	-
Total Phosphorus	mg/L	N	0.006	0.006	0.006	annually	1	-	-
Total Dissolved Solids	mg/L	600	36	36	36	annually	1	1	100%
Turbidity	NTU	5[1]	0.6	1.2[1]	1.7	weekly	52	-	within standard
Zinc	mg/L	3	<0.01	<0.01	<0.01	annually	1	1	100%
Dibromochloromethane	mg/L	N	<0.001	<0.001	0.001	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.003	0.005	0.008	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.011	0.020	0.030	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.016	0.026	0.040	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	0.005	0.008	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.009	0.012	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Tullamarine	Locality No.	7A
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	9,833

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	530	>weekly	78	78	100%
Total Coliforms	orgs/100mL	N	<1	<1	200	>weekly	78	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	78	78	within standard (actual 100%)
Free Chlorine	mg/L	5	0.01	0.37	0.70	>weekly	78	78	100%
Total Chlorine	mg/L	5	0.02	0.47	0.84	>weekly	78	78	100%
Alkalinity (as $CaCO_3$)	mg/L	N	13	13	13	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.01	0.02	0.03	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	5.5	5.5	5.5	annually	1	-	-
Chloride	mg/L	250	9	9	9	annually	1	1	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	8	fortnightly	26	26	100%
Conductivity	µS/cm	~900	62	79	110	fortnightly	26	26	100%
Copper	mg/L	1	<0.01	<0.01	<0.01	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.74	0.91	0.97	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	20	20	20	annually	1	1	100%
Iron	mg/L	0.3	0.01	0.05	0.10	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.01	<0.01	<0.01	annually	1	1	100%
Magnesium	mg/L	N	1.4	1.4	1.4	annually	1	-	-
Manganese	mg/L	0.1	<0.001	0.002	0.006	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.001	<0.001	<0.001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	0.62	0.62	0.62	annually	1	1	100%
pH	units	6.5-8.5	6.8	7.3	9.0	fortnightly	26	24	92%
pH	units	6.5-9.2	6.8	7.3	9.0	fortnightly	26	26	100%
Potassium	mg/L	N	0.8	0.8	0.8	annually	1	-	-
Silica (SiO_2)	mg/L	80	6.6	6.6	6.6	annually	1	1	100%
Sodium	mg/L	180	5.2	5.2	5.2	annually	1	1	100%
Sulphate	mg/L	250	2.4	2.4	2.4	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.2	1.2	1.2	annually	1	-	-
Total Phosphorus	mg/L	N	0.006	0.006	0.006	annually	1	-	-
Total Dissolved Solids	mg/L	600	24	24	24	annually	1	1	100%
Turbidity	NTU	5[1]	0.8	1.0[1]	1.4	weekly	52	-	within standard
Zinc	mg/L	3	<0.01	<0.01	<0.01	annually	1	1	100%
Dibromochloromethane	mg/L	N	<0.001	0.003	0.009	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.004	0.007	0.015	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.010	0.016	0.031	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.016	0.026	0.042	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.012	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.006	0.011	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Werribee	Locality No.	1
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	124,833

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	59	>weekly	394	394	100%
Total Coliforms	orgs/100mL	N	<1	<1	6	>weekly	394	394	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	394	394	within standard (actual 100%)
Free Chlorine	mg/L	5	0.01	0.20	0.49	>weekly	394	394	100%
Total Chlorine	mg/L	5	0.03	0.29	0.60	>weekly	394	394	100%
Alkalinity (as $CaCO_3$)	mg/L	N	14	14	14	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.01	0.02	0.04	>fortnightly	37	37	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	7.6	7.6	7.6	annually	1	-	-
Chloride	mg/L	250	14	14	14	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	10	>fortnightly	37	37	100%
Conductivity	µS/cm	~900	68	80	98	>fortnightly	37	37	100%
Copper	mg/L	1	<0.001	<0.001	<0.001	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.84	0.90	0.94	>fortnightly	38	38	100%
Hardness (as $CaCO_3$)	mg/L	200	25	25	25	annually	1	1	100%
Iron	mg/L	0.3	0.02	0.05	0.08	>fortnightly	37	37	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.4	1.4	1.4	annually	1	-	-
Manganese	mg/L	0.1	<0.002	0.003	0.005	>fortnightly	37	37	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.24	1.24	1.24	annually	1	1	100%
pH	units	6.5-8.5	7.1	7.6	9.1	>fortnightly	37	33	89.2%
pH	units	6.5-9.2	7.1	7.6	9.1	>fortnightly	37	37	100%
Potassium	mg/L	N	1.0	1.0	1.0	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.7	3.7	3.7	annually	1	1	100%
Sodium	mg/L	180	8.1	8.1	8.1	annually	1	1	100%
Sulphate	mg/L	250	7.4	7.4	7.4	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.3	1.3	1.3	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	56	56	56	annually	1	1	100%
Turbidity	NTU	5[1]	0.2	0.7[1]	1.4	>weekly	63	-	within standard
Zinc	mg/L	3	0.002	0.002	0.002	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.002	0.003	0.007	>monthly	24	-	-
Dichlorobromomethane	mg/L	N	0.009	0.012	0.015	>monthly	24	-	-
Bromoform	mg/L	N	<0.001	<0.001	0.001	>monthly	24	-	-
Chloroform	mg/L	N	0.027	0.046	0.063	>monthly	24	-	-
Total Trihalomethanes	mg/L	0.25	0.045	0.061	0.082	>monthly	24	24	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	>monthly	24	24	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.006	>monthly	24	24	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.020	0.036	>monthly	24	24	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Werribee South	Locality No.	2A
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	807

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	3	>weekly	65	65	100%
Total Coliforms	orgs/100mL	N	<1	<1	330	>weekly	65	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	65	65	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.41	1.0	>weekly	65	65	100%
Total Chlorine	mg/L	5	0.03	0.51	1.1	>weekly	65	65	100%
Alkalinity (as $CaCO_3$)	mg/L	N	12	12	12	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.01	0.02	0.03	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.0002	<0.0002	<0.0002	annually	1	1	100%
Calcium	mg/L	N	6.8	6.8	6.8	annually	1	-	-
Chloride	mg/L	250	14	14	14	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	6	fortnightly	26	26	100%
Conductivity	µS/cm	~900	74	83	100	fortnightly	26	26	100%
Copper	mg/L	1	0.003	0.003	0.003	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.86	0.90	0.96	fortnightly	27	27	100%
Hardness (as $CaCO_3$)	mg/L	200	24	24	24	annually	1	1	100%
Iron	mg/L	0.3	0.02	0.05	0.09	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.6	1.6	1.6	annually	1	-	-
Manganese	mg/L	0.1	0.001	0.002	0.004	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.24	1.24	1.24	annually	1	1	100%
pH	units	6.5-8.5	7.3	7.7	8.3	fortnightly	26	26	100%
pH	units	6.5-9.2	7.3	7.7	8.3	fortnightly	26	26	100%
Potassium	mg/L	N	1.1	1.1	1.1	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.5	3.5	3.5	annually	1	1	100%
Sodium	mg/L	180	8.5	8.5	8.5	annually	1	1	100%
Sulphate	mg/L	250	7.4	7.4	7.4	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.2	1.2	1.2	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	54	54	54	annually	1	1	100%
Turbidity	NTU	5[1]	0.2	0.7[1]	1.4	weekly	52	-	within standard
Zinc	mg/L	3	0.003	0.003	0.003	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.002	0.004	0.007	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.011	0.013	0.016	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	0.001	monthly	13	-	-
Chloroform	mg/L	N	0.030	0.047	0.064	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.054	0.065	0.078	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.008	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.012	0.023	0.038	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	Williamstown	Locality No.	3B
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	35,996

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			Sampling frequency	No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max		Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	11	>weekly	144	144	100%
Total Coliforms	orgs/100mL	N	<1	<1	<1	>weekly	144	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	>weekly	144	144	within standard (actual 100%)
Free Chlorine	mg/L	5	0.02	0.23	0.49	>weekly	144	144	100%
Total Chlorine	mg/L	5	0.09	0.33	0.60	>weekly	144	144	100%
Alkalinity (as $CaCO_3$)	mg/L	N	12	12	12	annually	1	-	-
Aluminium (acid soluble)	mg/L	0.2	0.02	0.03	0.04	fortnightly	26	26	100%
Arsenic	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Cadmium	mg/L	0.002	<0.002	<0.002	<0.002	annually	1	1	100%
Calcium	mg/L	N	5.4	5.4	5.4	annually	1	-	-
Chloride	mg/L	250	13	13	13	annually	1	1	100%
Chromium	mg/L	0.05	<0.001	<0.001	<0.001	annually	1	1	100%
Colour	Pt/Co	25**	<2	4	12	fortnightly	26	26	100%
Conductivity	µS/cm	~900	65	79	88	fortnightly	26	26	100%
Copper	mg/L	1	0.006	0.006	0.006	annually	1	1	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	annually	1	1	100%
Fluoride	mg/L	1.5	0.75	0.89	0.94	fortnightly	28	28	100%
Hardness (as $CaCO_3$)	mg/L	200	21	21	21	annually	1	1	100%
Iron	mg/L	0.3	0.02	0.04	0.05	fortnightly	26	26	100%
Lead	mg/L	0.01	<0.001	<0.001	<0.001	annually	1	1	100%
Magnesium	mg/L	N	1.8	1.8	1.8	annually	1	-	-
Manganese	mg/L	0.1	0.002	0.003	0.004	fortnightly	26	26	100%
Mercury	mg/L	0.001	<0.0001	<0.0001	<0.0001	annually	1	1	100%
Nitrate (NO_3)	mg/L	50	1.11	1.11	1.11	annually	1	1	100%
pH	units	6.5-8.5	7.0	7.3	7.9	fortnightly	26	26	100%
pH	units	6.5-9.2	7.0	7.3	7.9	fortnightly	26	26	100%
Potassium	mg/L	N	1.1	1.1	1.1	annually	1	-	-
Silica (SiO_2)	mg/L	80	3.8	3.8	3.8	annually	1	1	100%
Sodium	mg/L	180	7.8	7.8	7.8	annually	1	1	100%
Sulphate	mg/L	250	6.8	6.8	6.8	annually	1	1	100%
Total Organic Carbon	mg/L	N	1.1	1.1	1.1	annually	1	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	<0.005	annually	1	-	-
Total Dissolved Solids	mg/L	600	42	42	42	annually	1	1	100%
Turbidity	NTU	5[1]	0.3	0.7[1]	2.4	weekly	52	-	within standard
Zinc	mg/L	3	0.003	0.003	0.003	annually	1	1	100%
Dibromochloromethane	mg/L	N	0.002	0.003	0.005	monthly	13	-	-
Dichlorobromomethane	mg/L	N	0.008	0.011	0.014	monthly	13	-	-
Bromoform	mg/L	N	<0.001	<0.001	<0.001	monthly	13	-	-
Chloroform	mg/L	N	0.024	0.047	0.060	monthly	13	-	-
Total Trihalomethanes	mg/L	0.25	0.042	0.062	0.073	monthly	13	13	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	monthly	13	13	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.006	monthly	13	13	100%
Trichloroacetic acid	mg/L	0.1	0.010	0.025	0.035	monthly	13	13	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	annually	1	1	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	<0.1	annually	1	1	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix A Water quality data by locality (cont'd)

Water Sampling Locality	ALL WATER SAMPLING LOCALITIES		
For period	1 July 2014 to 30 June 2015	Population (2011 Census)	823,331

Parameter	Unit	Guideline Value *(ADWG 2011)*	Concentration or value (all samples)			No. of Samples		Performance against standard / guideline
			Min	Mean[G]	Max	Total	Passing	
Total Plate Count (37°C)	orgs/mL	1000*	<1	<1	2,200	2988	2987	99.9%
Total Coliforms	orgs/100mL	N	<1	<1	2400	2989	-	-
E. coli	orgs/100mL	98%<1[#]	<1	<1	<1	2989	2989	within standard (actual 100%)
Free Chlorine	mg/L	5	<0.01	0.22	1.0	2989	2989	100%
Total Chlorine	mg/L	5	0.02	0.31	1.1	2989	2989	100%
Alkalinity (as $CaCO_3$)	mg/L	N	10	13	24	15	-	-
Aluminium (acid soluble)	mg/L	0.2	<0.01	0.02	0.05	401	401	100%
Arsenic	mg/L	0.01	<0.001	<0.01	<0.01	15	15	100%
Cadmium	mg/L	0.002	<0.0002	<0.002	<0.002	15	15	100%
Calcium	mg/L	N	4.1	6.1	11.0	15	-	-
Chloride	mg/L	250	8.0	12.3	16.0	15	15	100%
Chromium	mg/L	0.05	<0.01	<0.01	<0.01	15	15	100%
Colour	Pt/Co	25**	<2	5	12	401	401	100%
Conductivity	µS/cm	~900	57	77	140	401	401	100%
Copper	mg/L	1	<0.001	0.008	0.03	15	15	100%
Cyanide	mg/L	0.08	<0.005	<0.005	<0.005	15	15	100%
Dissolved Oxygen	mg/L	N	8.4	9.8	11.5	26	-	-
Fluoride	mg/L	1.5	0.73	0.90	1.2	427	427	100%
Hardness (as $CaCO_3$)	mg/L	200	16	22	34	15	15	100%
Iron	mg/L	0.3	0.01	0.06	0.12	401	401	100%
Lead	mg/L	0.01	<0.001	<0.01	<0.01	15	15	100%
Magnesium	mg/L	N	1.3	1.6	1.8	15	-	-
Manganese	mg/L	0.1	<0.001	0.003	0.008	401	401	100%
Mercury	mg/L	0.001	<0.0001	<0.001	<0.001	15	15	100%
Nitrate (NO_3)	mg/L	50	0.62	0.97	1.3	15	15	100%
pH	units	6.5-8.5	6.5	7.3	9.1	401	392	97.8%
pH	units	6.5-9.2	6.5	7.3	9.1	401	401	100%
Potassium	mg/L	N	0.8	1.0	1.2	15	-	-
Silica (SiO_2)	mg/L	80	3.0	4.4	6.7	15	15	100%
Sodium	mg/L	180	4.6	7.1	9.4	15	15	100%
Sulphate	mg/L	250	1.5	5.6	9.7	15	15	100%
Temperature	°C	N	11.5	17.2	23.5	27	-	-
Total Organic Carbon	mg/L	N	1.0	1.3	1.8	15	-	-
Total Phosphorus	mg/L	N	<0.005	<0.005	0.006	15	-	-
Total Dissolved Solids	mg/L	600	24	46	95	15	15	100%
Turbidity	NTU	5[1]	<0.1	0.8[1]	6.1	796	-	within standard
Zinc	mg/L	3	<0.001	<0.01	<0.01	15	15	100%
Dibromochloromethane	mg/L	N	<0.001	0.003	0.009	206	-	-
Dichlorobromomethane	mg/L	N	0.003	0.010	0.016	206	-	-
Bromoform	mg/L	N	<0.001	<0.001	0.001	206	-	-
Chloroform	mg/L	N	0.009	0.042	0.092	206	-	-
Total Trihalomethanes	mg/L	0.25	0.016	0.055	0.101	206	206	100%
Chloroacetic acid	mg/L	0.15	<0.005	<0.005	<0.005	206	206	100%
Dichloroacetic acid	mg/L	0.1	<0.005	<0.005	0.012	206	206	100%
Trichloroacetic acid	mg/L	0.1	<0.005	0.017	0.058	206	206	100%
Bromate	mg/L	0.02	<0.01	<0.01	<0.01	15	15	100%
Formaldehyde	mg/L	0.5	<0.1	<0.1	0.1	15	15	100%

* Internal City West Water guideline.
** Guideline set for "True Colour" (15 PCU) however "Apparent Colour" is measured (with a benchmark guideline of 25 PCU)
N No guideline/standard set for this parameter.
Victorian standard: 98% of samples must not contain any *E. coli*/100mL.
G Geometric means shown for bacterial parameters.
[1] Victorian standard: 95% upper confidence limit of mean (shown) less than or equal to 5 NTU.

Appendix B Spatial and time-based water quality summaries

Figure B.1 *E. coli* **performance in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**

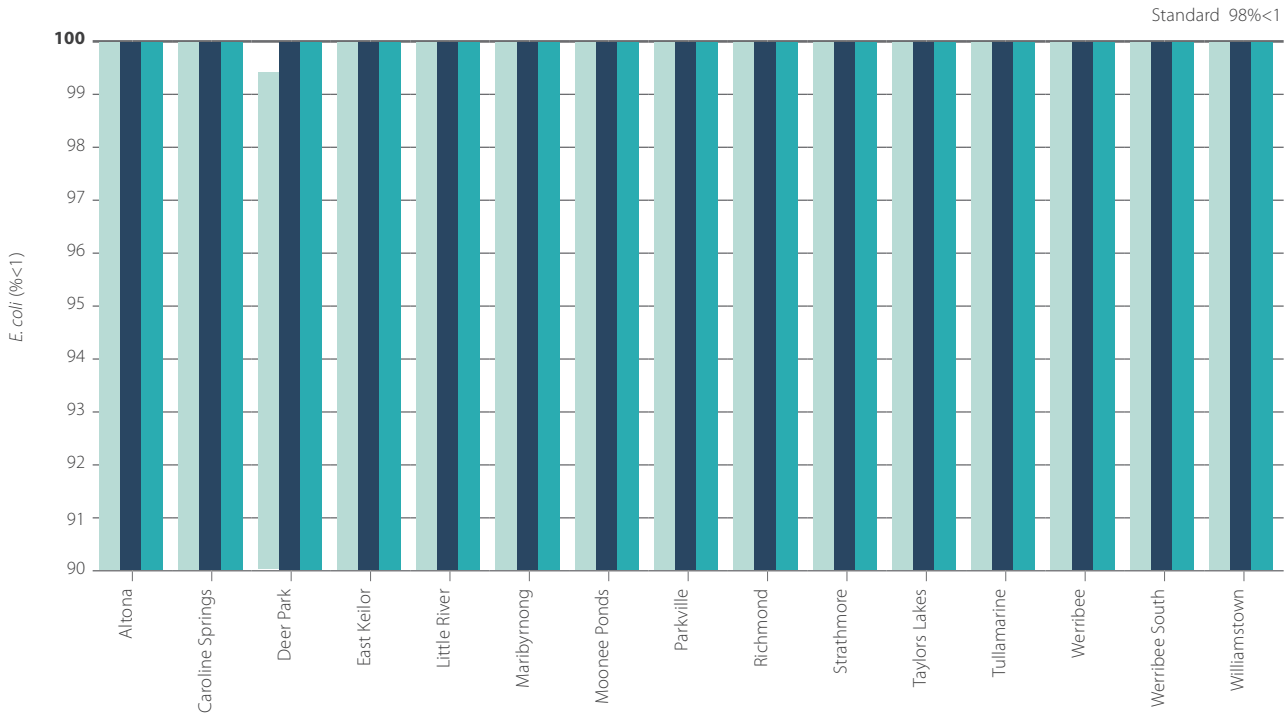
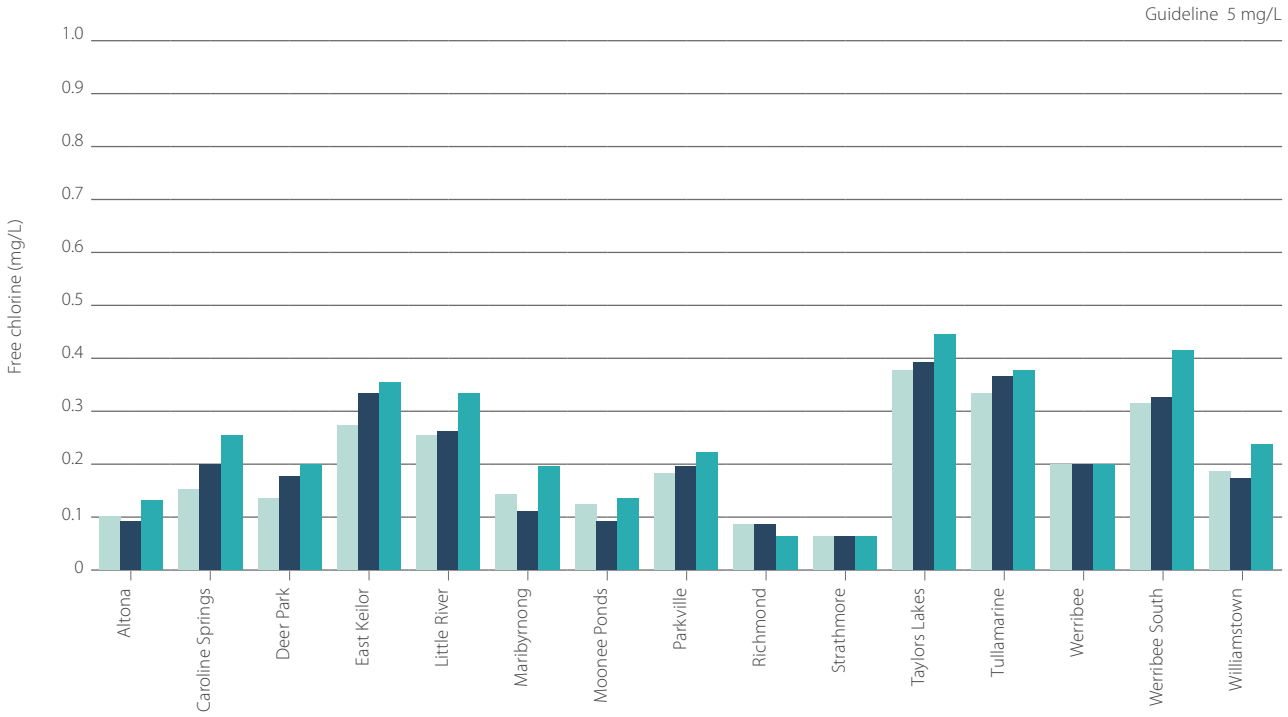


Figure B.2 **Annual average free chlorine concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.3 **Average aluminium concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**

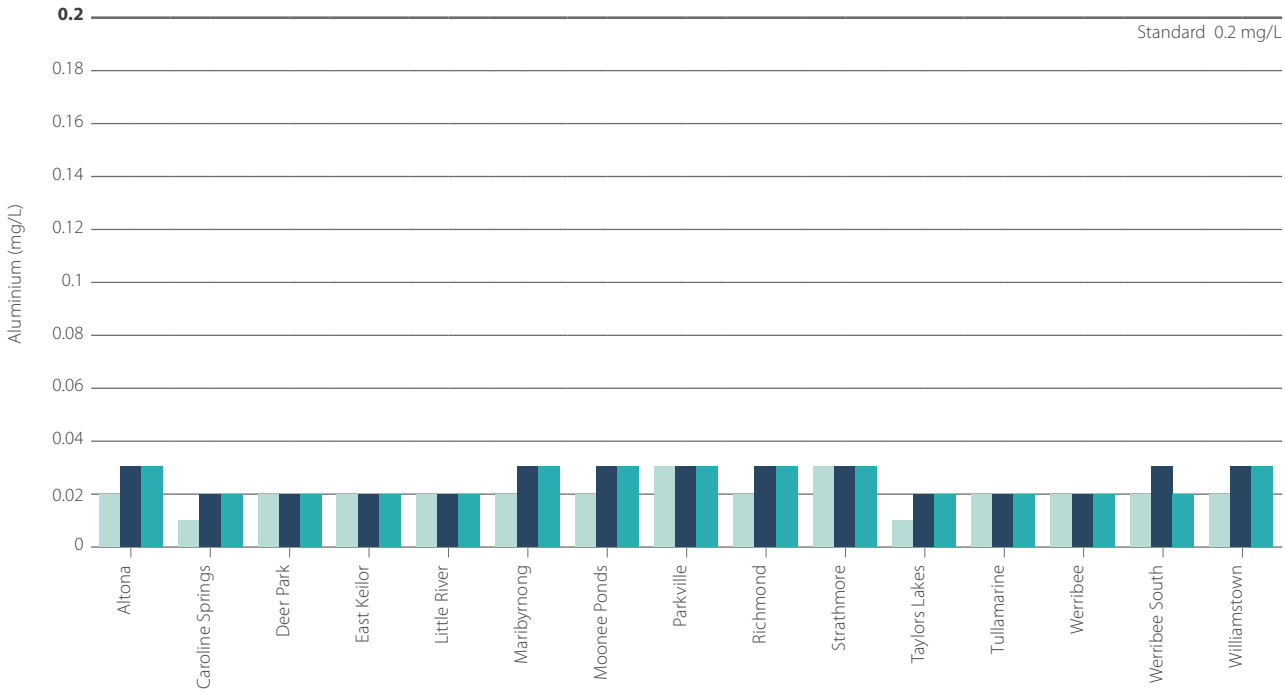
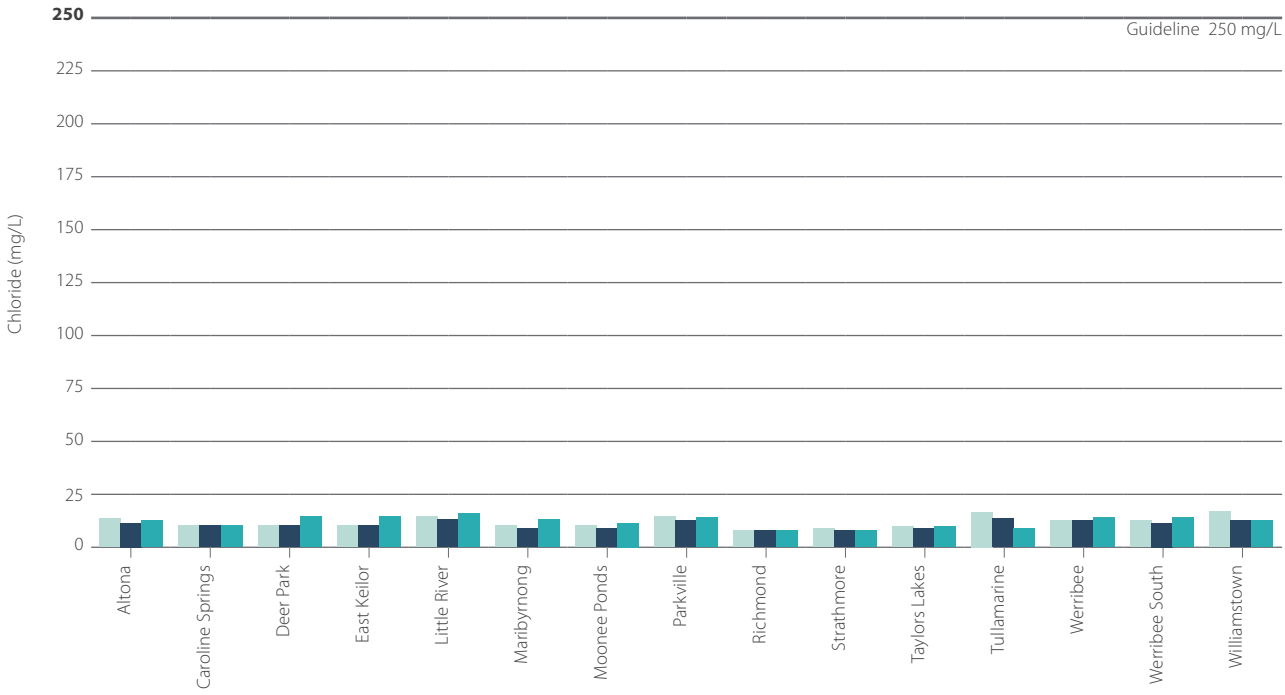


Figure B.4 **Chloride concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.5 **Average apparent colour levels in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**

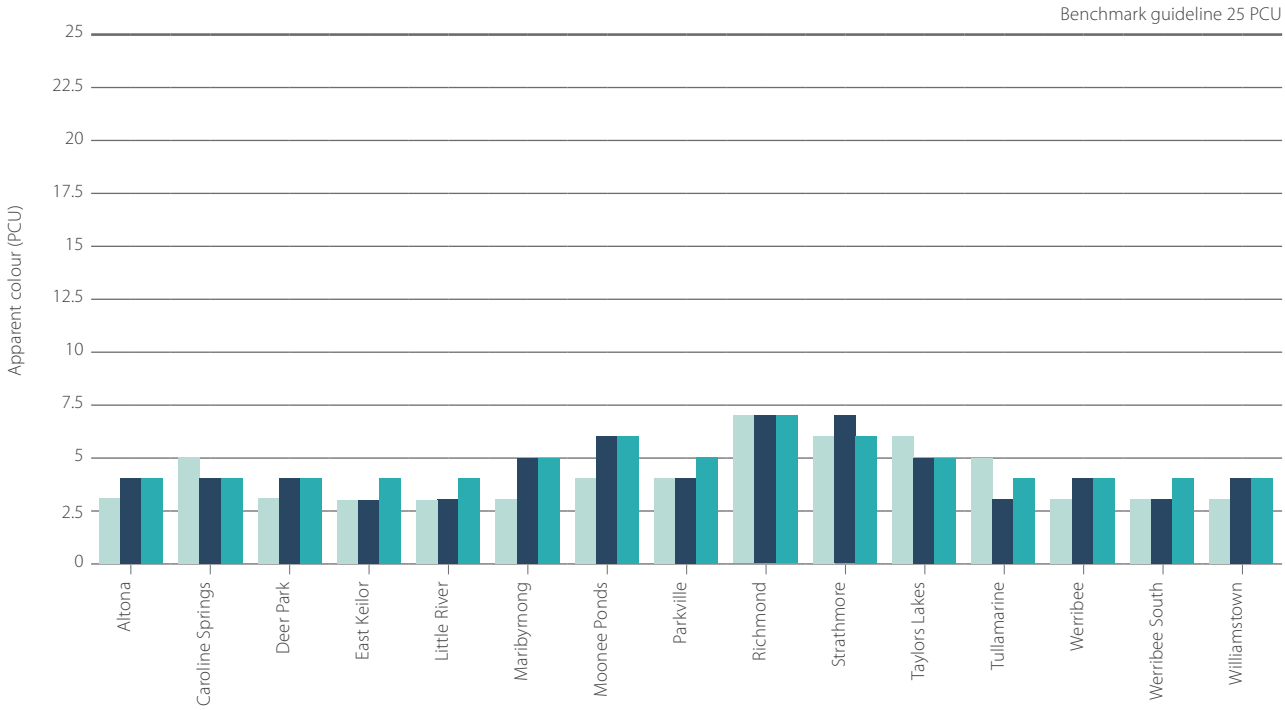
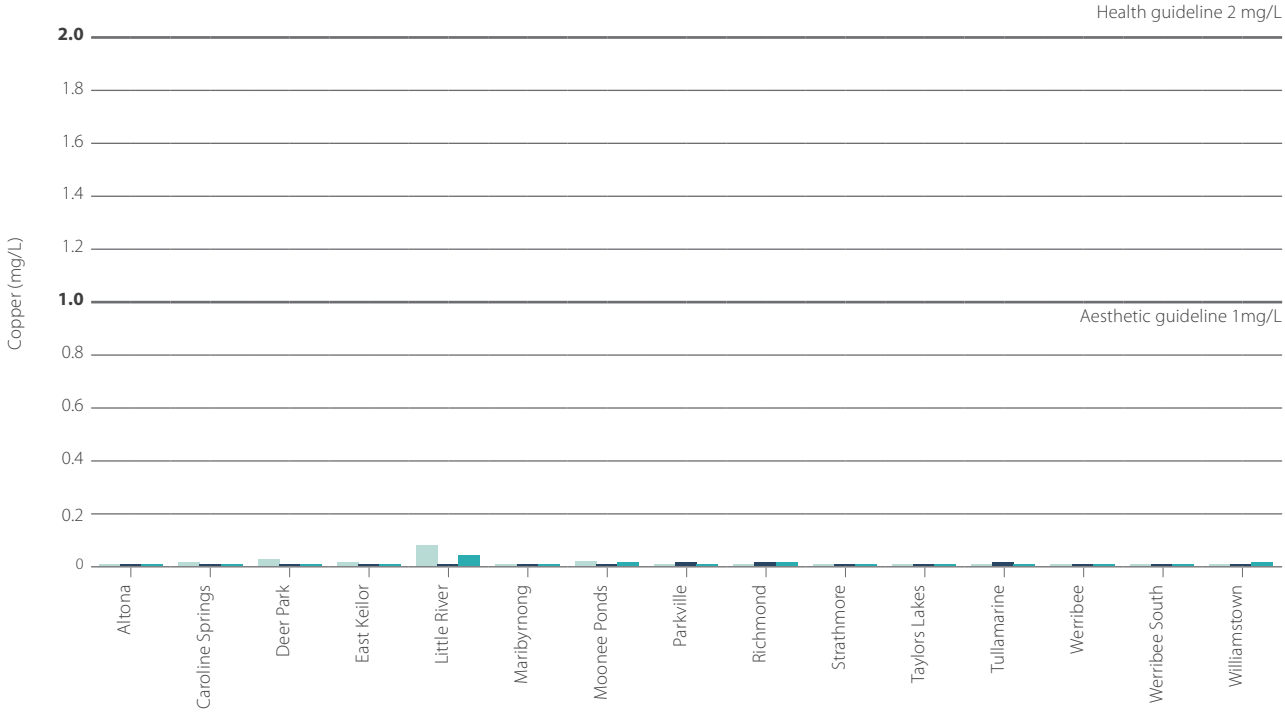


Figure B.6 **Copper concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.7 **Average electrical conductivity levels in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**

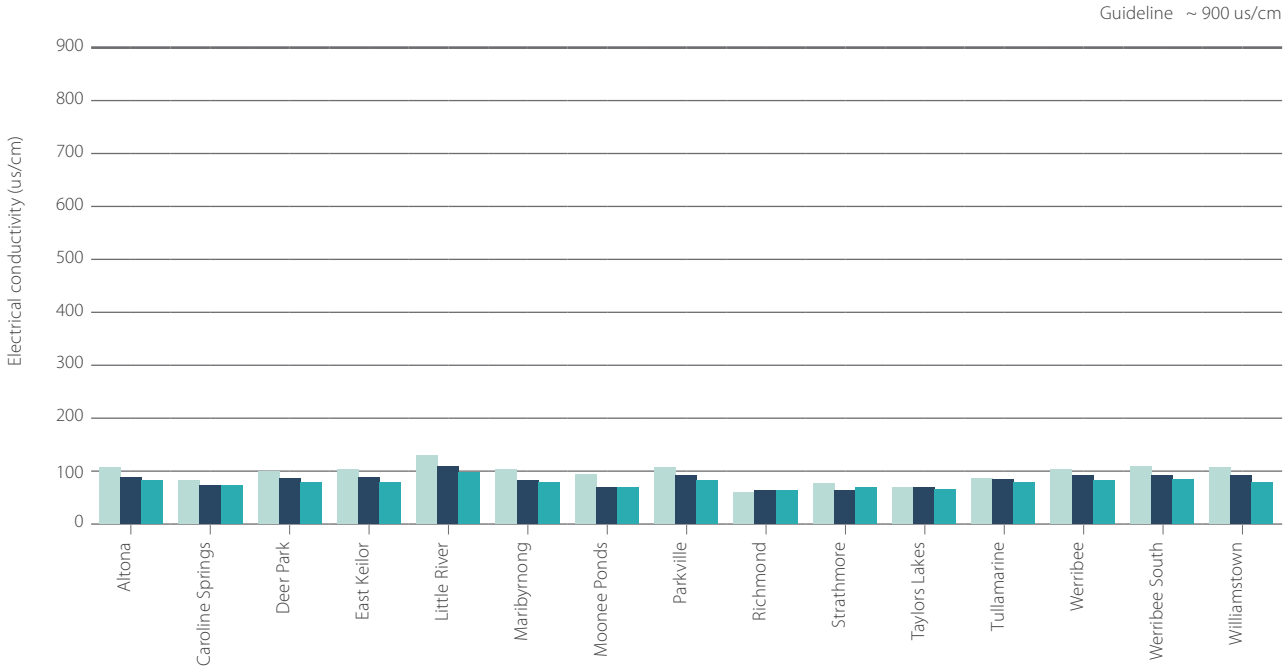
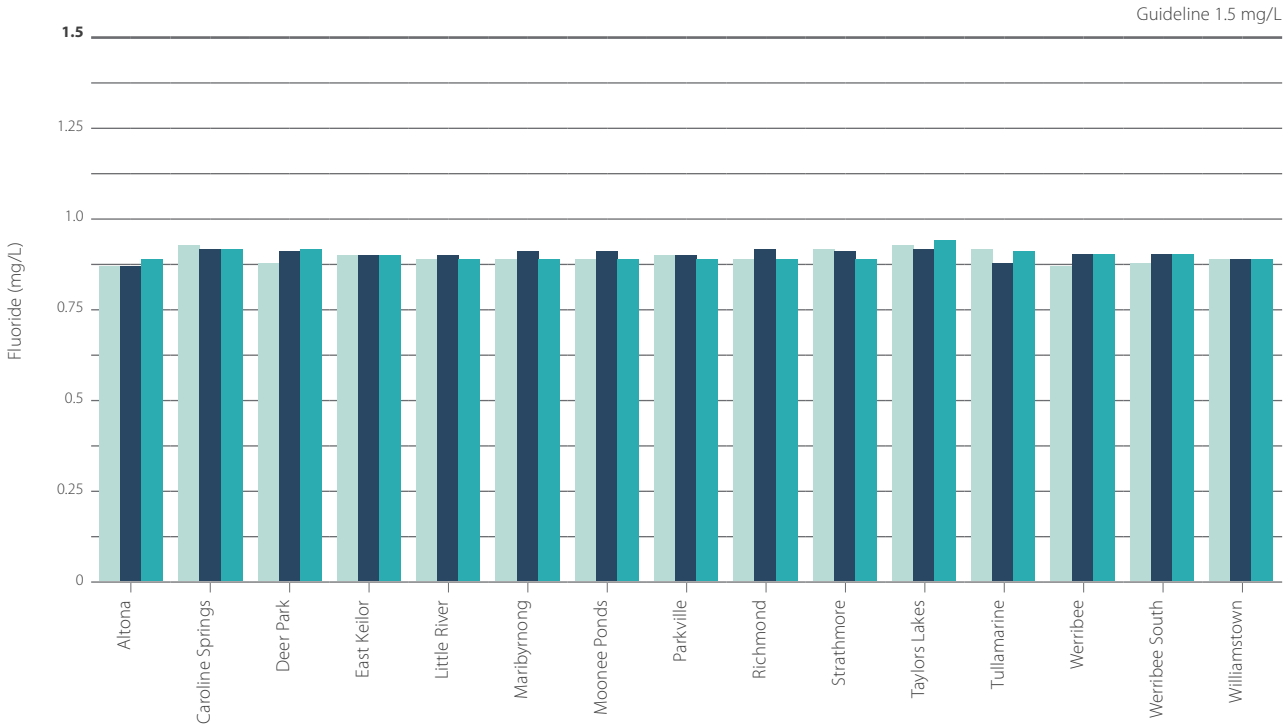


Figure B.8 **Average fluoride concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.9 **Hardness concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**

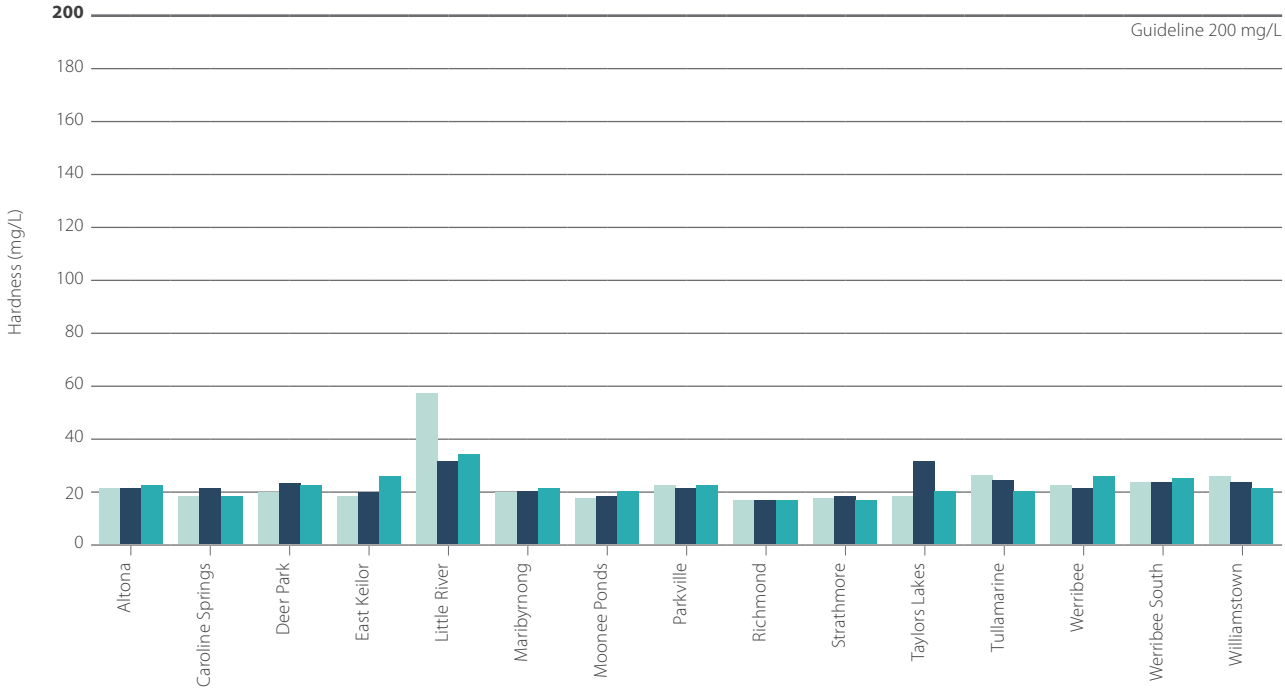
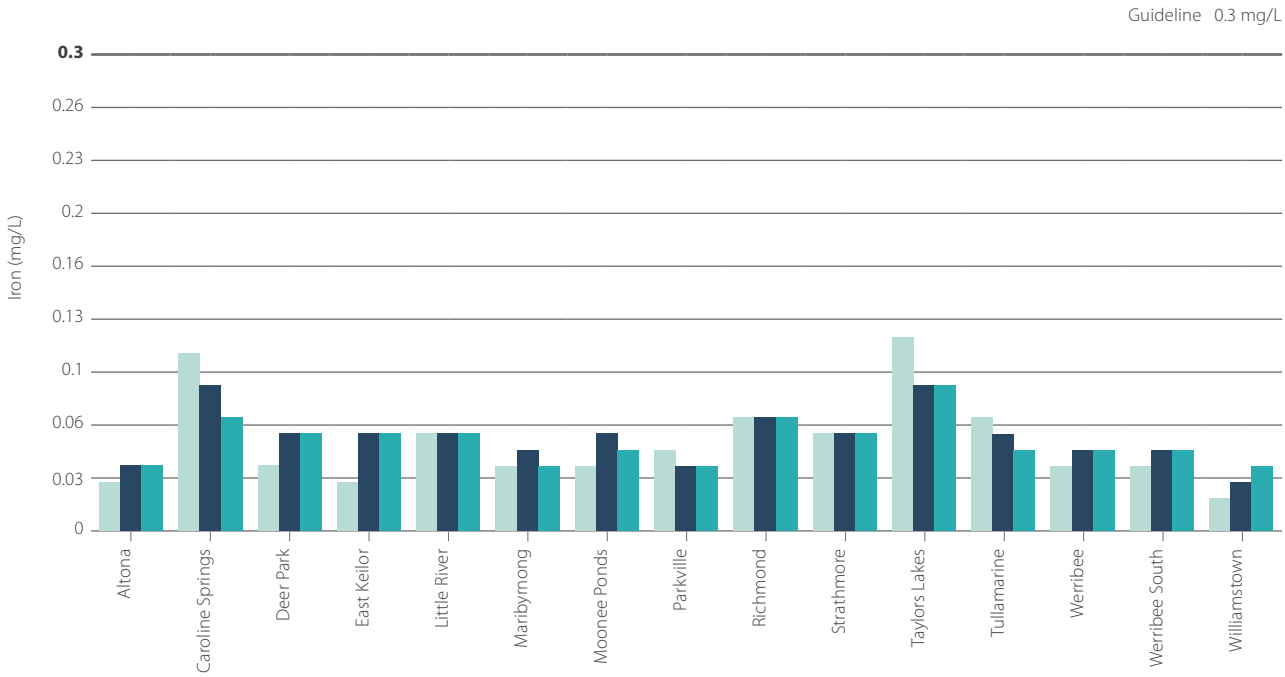


Figure B.10 **Average iron concentrations in water sampling localities (between 2011-2012 and 2013-2014, from left to right within each locality)**



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.11 **Average manganese concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**

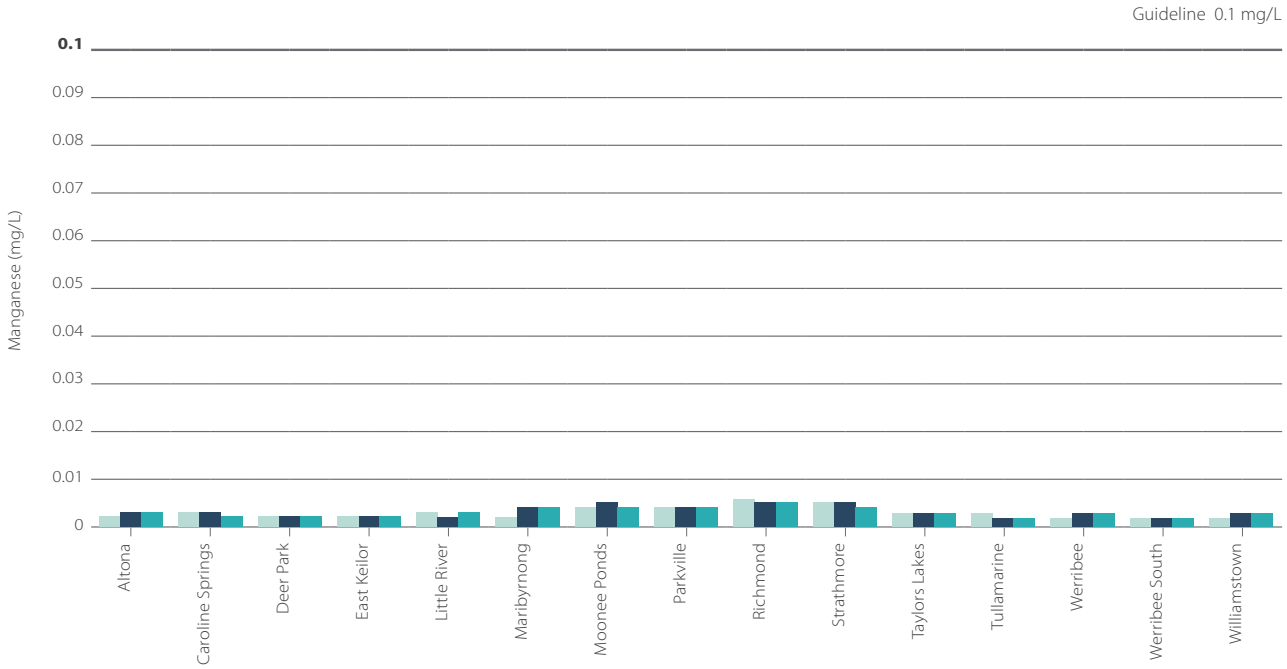
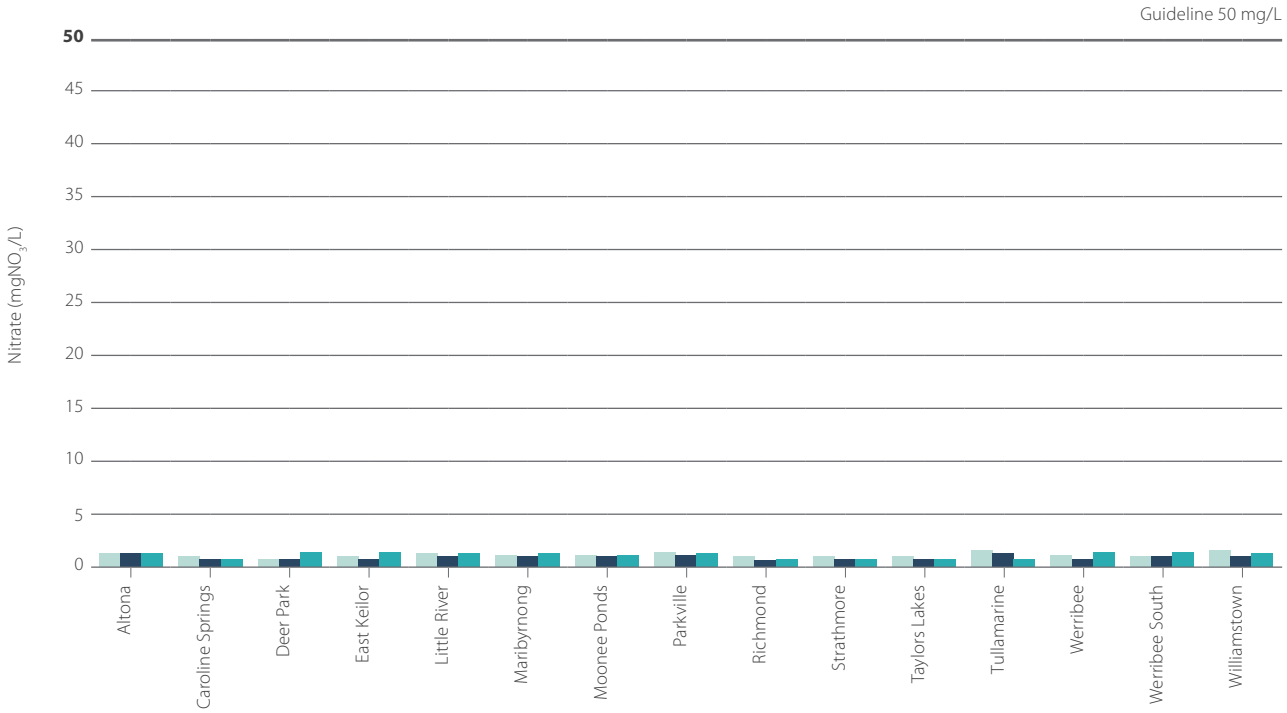


Figure B.12 **Nitrate concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.13 Average pH values in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)

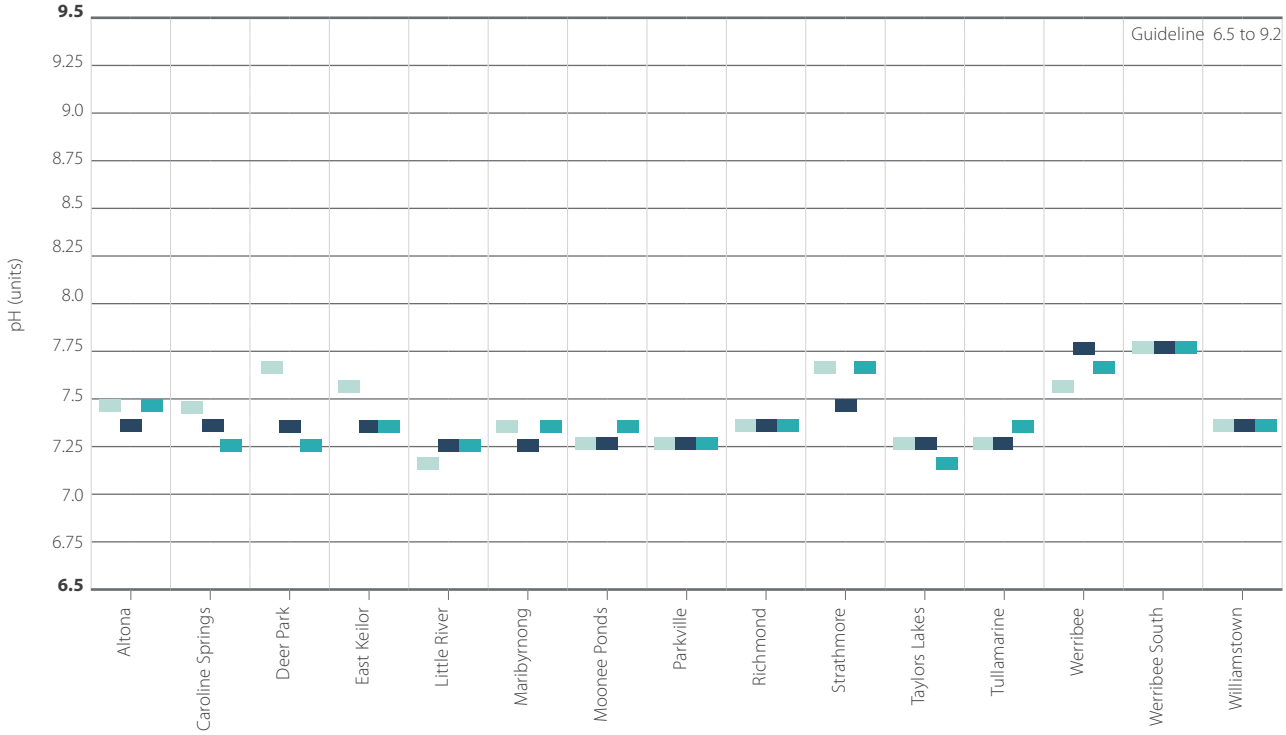
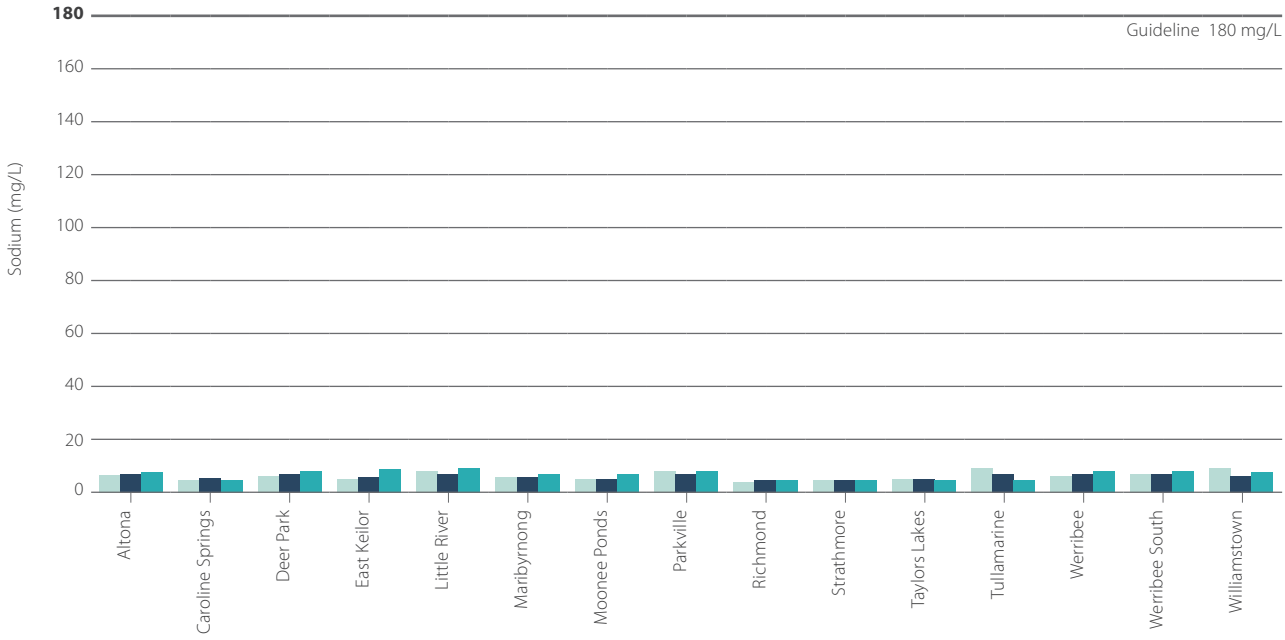


Figure B.14 Sodium concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.15 **Summary turbidity levels in water sampling zones (between 2012-2013 and 2014-2015, from left to right within each locality)**

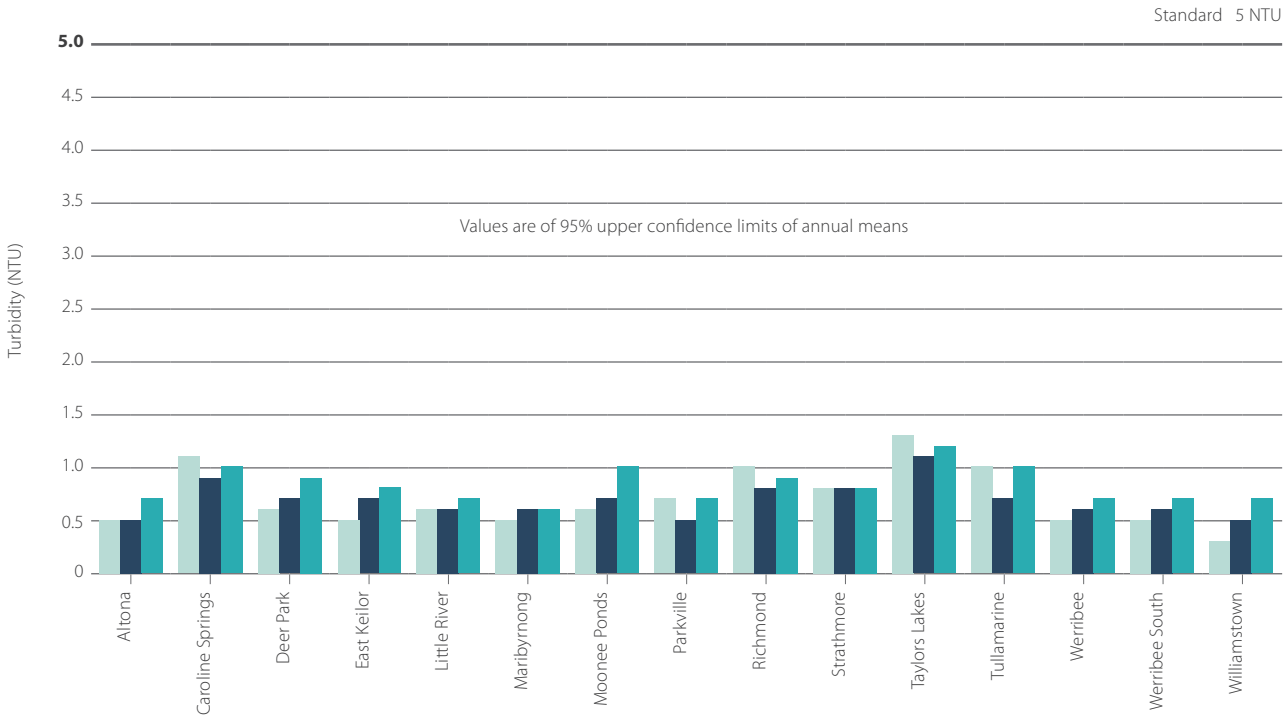
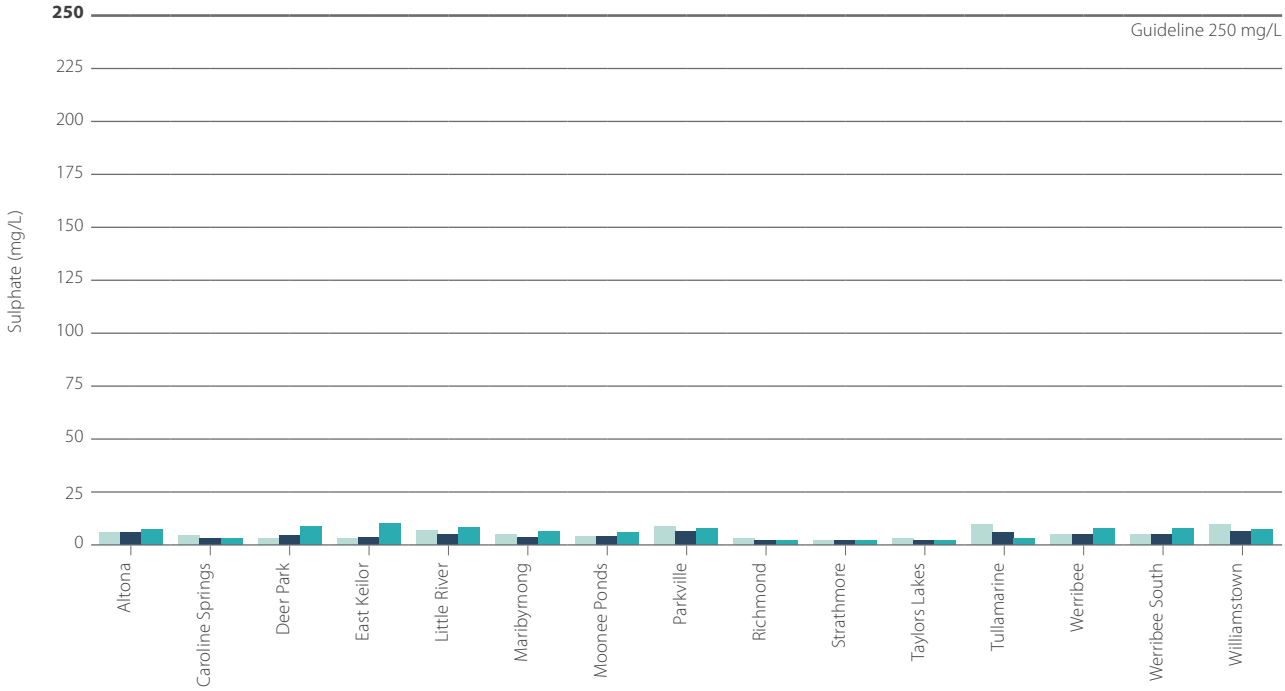
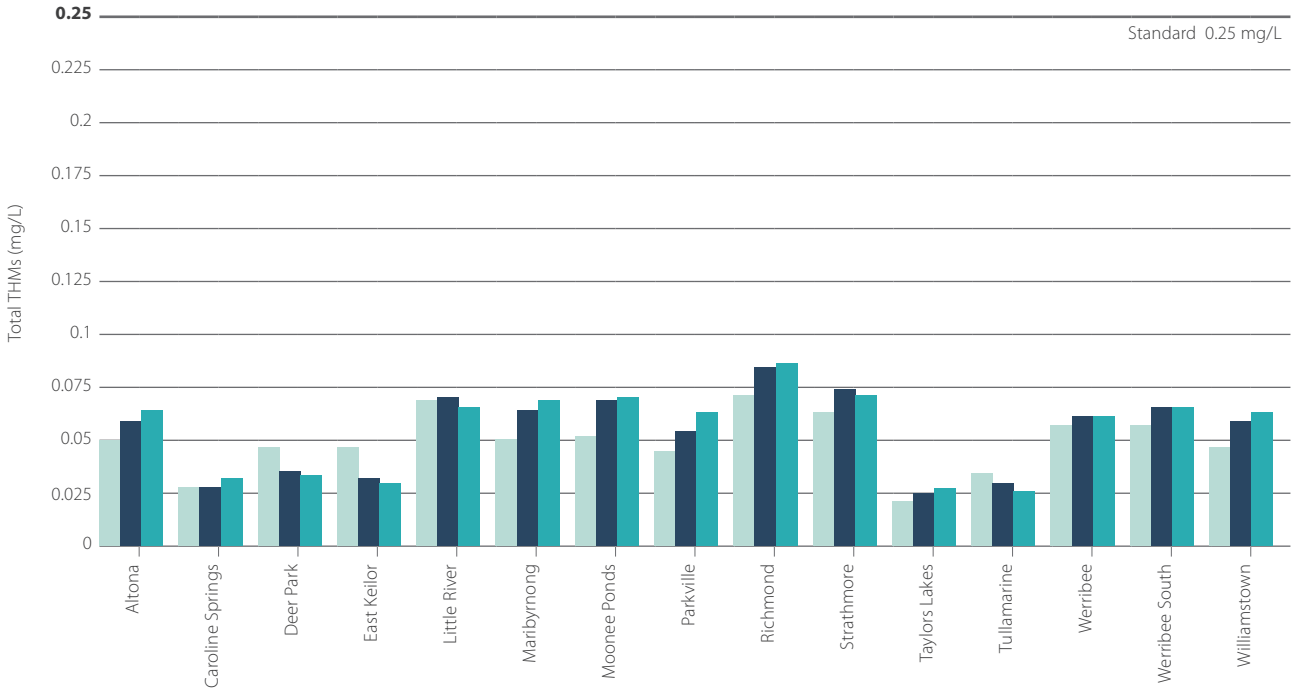


Figure B.16 **Sulphate concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**



Appendix B Spatial and time-based water quality summaries (cont'd)

Figure B.17 **Average total trihalomethane concentrations in water sampling localities (between 2012-2013 and 2014-2015, from left to right within each locality)**



Appendix C 2014 Risk Management Plan regulatory audit certificate and opportunities for improvement

RMP systems
WATER AUDITORS & SOFTWARE
ABN 46 122 146 767

Regulation 8

Schedule 1

Safe Drinking Water Regulations 2005

RISK MANAGEMENT PLAN AUDIT CERTIFICATE

Certificate Number: 109196

Audit Period: 11th April 2012 to 14th March 2014

To: Ms Anne Barker
Managing Director
City West Water Limited
Locked Bag 350
Sunshine Vic 3020

Australian Business Number (ABN): 70 066 902 467

I, Tom Teunissen, after conducting a risk management plan audit of the water supplied by City West Water, am of the opinion that:

City West Water Werribee Disinfection Plant has complied with the obligations imposed by Section 7(1) of the ***Safe Drinking Water Act 2003*** during the audit period.

Signature of Approved Auditor:

Tom Teunissen

Date*: 5th April 2014*

RMP Systems, Suite 3, Ground Floor, 24 Albert Road, South Melbourne, 3205.
Mobile: 0410 624 604 Tel: 03 9694 3231 Fax: 03 864 00 581
Email: tom@rmpsystems.com

Appendix C 2014 Risk Management Plan regulatory audit certificate and opportunities for improvement (cont'd)

City West Water: 2014 drinking water risk management plan audit: Opportunities for improvement

Suggested opportunity for Improvement	City West Water comments / response / actions
We would suggest consider a deputy being trained either, part time or full time as a second, to support the Water Quality Scientist.	City West Water has one official staff position that addresses water quality. The incumbent works closely with City West Water engineers and technical staff within the Network Operations department. This is leading to increased familiarity with the water quality position's functions. In addition, City West Water has a comprehensive training course on its management of water quality that is delivered to key operations staff. A part-time role as a second to the water quality position is currently being planned.
While it was encouraging though to note that the keys had been upgraded for the chlorine dosing installations. We suggest keys register is considered to ensure that all staff that may require access are provided with keys.	City West Water has a register and secure key depositary. Staff have been reminded to utilise these to obtain correct access keys when required.
During tank inspections photographs could be taken on the condition of the tanks this may for example be of assistance if a quote is needed and also confirming jobs have been completed satisfactorily.	Photographic records are made during tank inspections to demonstrate issues when remedial works are required. Follow-up photographs are taken to demonstrate completion of such works.
Also a potential opportunity for improvement is during periods of higher reservoir levels (higher rain fall periods) to consider restarting some mains cleaning.	Mains cleaning programs are generally undertaken in response to accumulations of sediments in water mains, as evidenced by customer feedback of discoloured water and routine water quality monitoring data. Current customer feedback numbers are at record low levels and water quality data do not show any issues. City West Water closely monitors these metrics and will undertake mains cleaning as required.

City West Water™

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