



**Gippsland Water
2011-12 Annual Report on
Drinking Water Quality**

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1 INTRODUCTION

1.1 CHARACTERISATION OF THE SYSTEM

The Central Gippsland Region Water Corporation, trading as Gippsland Water, was constituted on 21 December 1994 under the *Water Act 1989*.

Gippsland Water is the second largest regional water corporation in Victoria in terms of revenue earned and is the largest in terms of the total volume of water supplied and wastewater collected. It manages;

- 17 water treatment plants;
- 14 wastewater treatment plants and;
- two ocean outfalls.

Gippsland Water provides water and wastewater services to customers in the central Gippsland region of Victoria. Its geographic region stretches from Drouin in the west to Stratford in the east, and from Mirboo North in the south to Rawson and Briagalong in the north.

Gippsland Water manages five business streams, one of which is the provision of water services. Its region consists of;

- 42 towns;
- approximately 65,202 properties connected to the 17 drinking water supply systems.

These towns are grouped into 35 localities for the purposes of monitoring and reporting in accordance with the Safe Drinking Water Regulations 2005 (SDWR).

Gippsland Water is committed to providing responsible asset management, quality management, incident management and operational audit of the reticulated urban water supply system to ensure that customer service levels are achieved according to its Customer Charter targets and the *Safe Drinking Water Act 2003 (SDWA)*.

A major objective for the corporation is to achieve and maintain community confidence in the safety, reliability and quality of their water supply.

Our mission

We will manage the resources in our care in a manner that secures social, environmental and economic benefits to our customers, stakeholders and the Gippsland region.

Our vision

We will deliver value in sustainable water and waste management within central Gippsland.

2 DRINKING WATER QUALITY MANAGEMENT FRAMEWORK

The regulatory environment in which Gippsland Water operates is to provide safe drinking water at **all** times. Safe drinking water is water that does not cause illness in those who consume it. To achieve this, the water must be free of pathogens and free of harmful chemicals.

The regulatory environment that provides guidance in the production of safe drinking water consists of:

- ***Victorian Safe Drinking Water Act 2003 (SDWA)***

The Victorian State Government passed the **Safe Drinking Water Act** in June 2003. This Act provides details of further requirements for Victorian Water Corporations.

The purpose of the Safe Drinking Water Act (2003) is to make provision for the supply of safe drinking water. In outline this Act:

- requires water suppliers and water storage managers to prepare and implement plans to manage risks in relation to drinking water and some types of non-potable water;
- provides for the auditing of those plans by approved auditors;
- requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations;
- requires water suppliers to disclose to the public information concerning the quality of drinking water;
- provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors;
- requires the reporting of known or suspected contamination of drinking water to the Secretary to the Department of Health;
- empowers the Secretary to enforce this Act.

- ***Victorian Safe Drinking Water Regulations 2005 (SDWR)***

The Victorian State Government passed the **Safe Drinking Water Regulations** in July 2005. This act provides details of further requirements for Victorian Water Corporations.

The purpose of the Safe Drinking Water Regulations (2005) is to make provision for the supply of safe drinking water. In outline this Act:

- set out the further matters to be addressed in risk management plans and the risks to be specified in risk management plans
- describe the documents that are to be available for inspection in the risk management plan audit;
- prescribe the form of audit certificates to be given to the person who has commissioned a risk management plan audit at the completion of the audit;
- set out the risk management plan auditor approval criteria
- set out the drinking water standards;
- set out the requirements relating to the frequency of collection of samples of water quality analysis;
- empowers the Secretary to:
 - (i) divide areas supplied by water suppliers into water sampling localities;

- (ii) specify locations within a water sampling locality at which samples of water are to be collected;
- (iii) vary the frequency of collection for samples of water in certain circumstances;
- (iv) approve persons to be water analysts;
- require all samples of water collected to be analysed by an approved water analyst and a summary of results of the analysis to be given to the secretary;
- specify the issues relating to the quality of drinking water, in an annual report in respect of every financial year to be given to the Secretary by a water supplier and water storage manager;
- set out details to be included in an annual report to the secretary referred to in sub-regulation (2)(i).

○ **Australian Drinking Water Guidelines 2011 (ADWG)**

The purpose of the Australian Drinking Water Guidelines 2011 is to 'provide the authoritative reference for use within Australia's administrative and legislative framework to ensure the accountability of drinking water suppliers. The ADWG are not, however, mandatory, legally enforceable standards.

The guidelines set the framework for the management of drinking water quality known as the 12 elements

The ADWG 12 elements comprise:

1. Commitment to Drinking Water Quality Management.
2. Assessment of the Drinking Water Supply System.
3. Preventive Measures for Drinking Water Quality Management.
4. Operational Procedures and Process Control.
5. Verification of Drinking Water Quality.
6. Management of Incidents and Emergencies.
7. Employee Awareness and Training.
8. Community Involvement and Awareness.
9. Research and Development.
10. Documentation and Reporting.
11. Evaluation and Audit.
12. Review and Continual Improvement

○ **Code of Practice for Fluoridation of Drinking Water Supplies 2009**

The Department of Human Services released the **Code of Practice for Fluoridation of Drinking Water Supplies** in March 2009.

This code provides details of further requirements for Victorian Water Corporations.

The objective of the code is to provide for safe and effective addition of fluoride into the drinking water supply.

This will be achieved by specifying:

- (a) the optimum fluoride levels for drinking water supplies and the design control limits for fluoridation plants
- (b) the minimum requirements for the safe and effective addition of fluoride chemicals to drinking water supplies, covering the design and operation of a fluoridation plant
- (c) monitoring and reporting requirements for the proposed fluoridation scheme

The code also includes works undertaken on fluoridation plants and integrates the practices with the SDWA through:

- (a) the inclusion of water fluoridation into the corporations' risk management plan under the SDWA
- (b) integration and compliance with the auditing, notification and reporting requirements of the SDWA

The code also describes the gap analysis and subsequent works program associated with water fluoridation plant by;

- (a) the regulatory frame work including the procedure to fluoridate
- (b) safety in design
- (c) requirements for the design and control of fluoridation facilities
- (d) requirement for plant operation including monitoring, training or personnel, occupational health and safety, security and environmental protection

3 DRINKING WATER SUPPLY SYSTEMS

3.1.1 Map of the Gippsland Water system

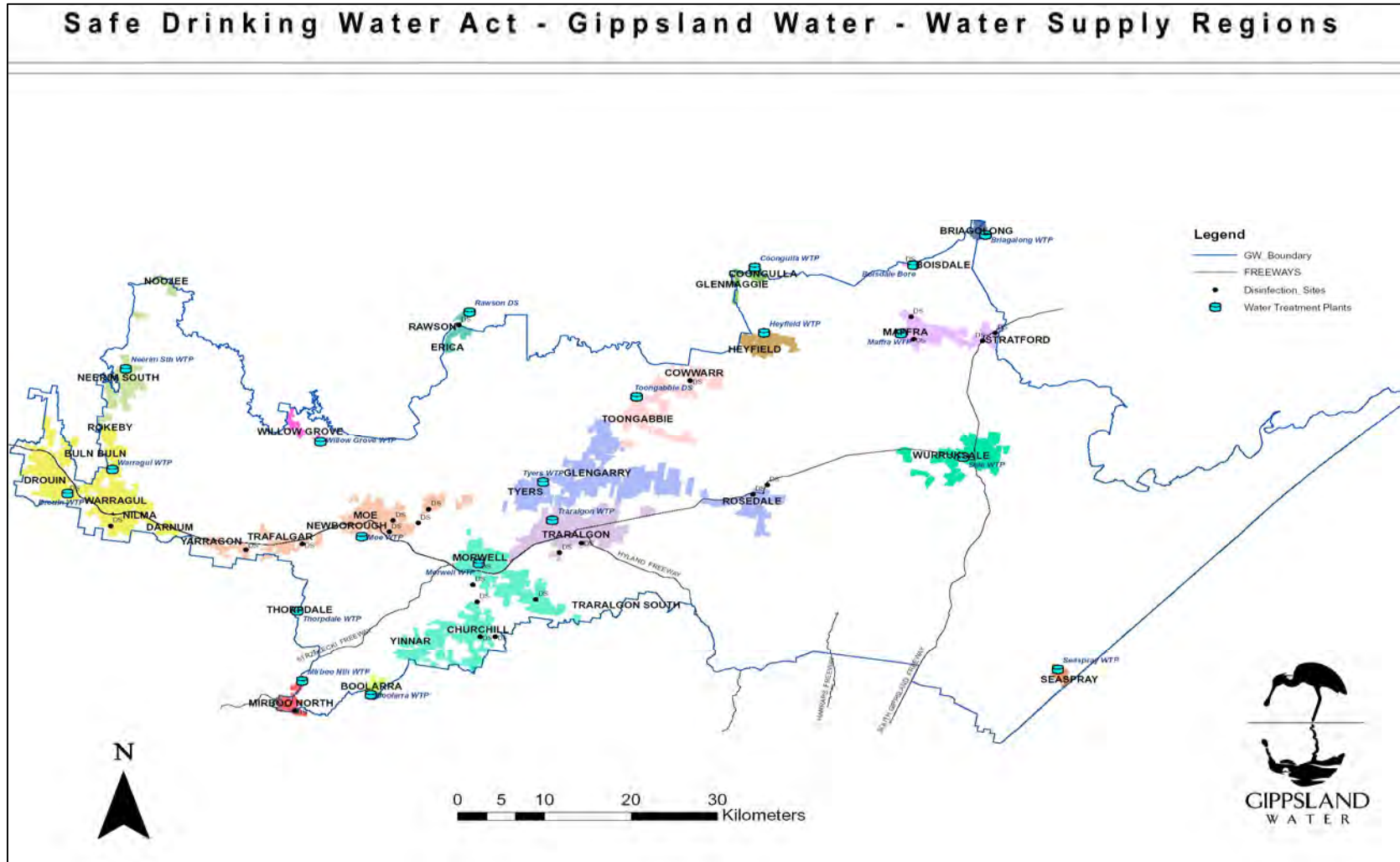


Figure 1: Overview of water supply system operated by Gippsland Water

3.1.2 Source of water

Gippsland Water operated 17 water treatment systems supplying 35 water sampling localities and 42 towns in 2011-12. The water for these systems is sourced from a variety of water supplies including stream off-takes, reservoirs, and groundwater (bore water). The table below provides information on where the raw water is sourced for each water sampling locality, identifies the raw water storage (if one exists prior to each water treatment plant) and details the water treatment processes used to produce safe drinking water.

Table 1: Gippsland Water Locality Water Source and Water treatment process

Locality	Population ¹	Source water	Storage	Water Treatment Plant	Treatment process									Sludge Thickening Dewatering	Added Substances						
					Coagulation & Flocculation	Clarification		Filtration		Disinfection			Other		Lime / Soda Ash	Alum Based Coagulants	Iron Based Coagulants	Potassium Permanganate	Polymers	Sodium Fluoride ² / Hydrofluorosilicic Acid	
						Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite									Calcium Hypochlorite
Maffra	5390	Macalister River	N/A	Maffra	X	X		X		X				X		Soda Ash	Alum / PACI-23* (High Turbidity)		X	LT22	Hydrofluorosilicic acid
Stratford	2130																				
Boisdale	90																				
Boolarra	710	Walkley Creek O'Gradys Creek (supplementary supply)	Boolarra Raw water basin	Boolarra	X	X		X		X					X	Soda Ash	Alum				
Briarolong	930	Bore (Freestone Creek Aquifer)	N/A	Briarolong	X			X					X		Soda Ash		Polymerised Ferric Sulphate			1115 & 1160	

- 1 = The listed populations are for the water sampling localities calculated using 2006 census data to calculate the number of persons per dwelling per locality and then multiplying it with Gippsland Water's 2011-12 figures for number of connections. Figures have also been rounded to the nearest 10.
- 2 = Sodium Fluoride - (dissolvable PVA bag)
- 3 = The water supplied to Darnum changed from the Warragul System to the Moe System in March 2012.
- 4 = PAC/GAC used as required to treat for taste and odour compounds
- * = PACI-23 used as required to treat high turbidity raw water
- X₁ = Plant capability for activated carbon dosing (not currently in use)

Table 1 (cont.): Gippsland Water Locality Water Source and Water treatment process

Locality	Population ¹	Source water	Storage	Water Treatment Plant	Treatment process									Sludge Thickening Dewatering	Added Substances					
					Coagulation & Flocculation	Clarification		Filtration		Disinfection			Other		Lime / Soda Ash	Alum Based Coagulants	Iron Based Coagulants	Potassium Permanganate	Polymers	Sodium Fluoride ² / Hydrofluosilicic Acid
						Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite								
Morwell	16540	Tyers River	Moondarra	Morwell	X	X	X	X	X	X	Morwell, Churchill, Jumbuk, Hazelwood Nth	Traralgon Sth	X	Soda Ash	Alum	LT20	Sodium Fluoride			
Churchill	5420																			
Yinnar	1100																			
Jumbuk	380																			
Traralgon South/Hazelwood North	2370																			
Tyers/Glengarry	2290	Tyers River	Moondarra	Tyers (Plant 1)	X		X				Tyers, Rosedale & Toongabbie	X	Soda Ash	Alum	1115 & 1160					
Rosedale	1850			Tyers (Plant 2)	X	X	X													
Toongabbie	960																			
Cowwarr	370																			
Traralgon	29490	Tyers River	Moondarra	Traralgon	X	X	X	X	X	X		X	Soda Ash	Alum	LT20	Sodium Fluoride				

- 1 = The listed populations are for the water sampling localities calculated using 2006 census data to calculate the number of persons per dwelling per locality and then multiplying it with Gippsland Water's 2011-12 figures for number of connections. Figures have also been rounded to the nearest 10.
- 2 = Sodium Fluoride - (dissolvable PVA bag)
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						Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite									Calcium Hypochlorite
Warragul (including Nilma, Darnum ³ , Drouin East)	16210	Pederson Weir (Tarago River) Tarago Reservoir - (supplementary supply)	Tarago Reservoir (supplementary supply)	Warragul	X		X	X		X		Warragul South & Drouin		X ₁	X	Lime	Alum			LT20	Sodium Fluoride
Warragul South	820																				
Drouin	11000																				
Roakeby/Buln Buln	490																				
Coongulla/ Glenmaggie	310	Macalister River	Lake Glenmaggie	Coongulla	X			X				X		X	X	Soda Ash	Alum 90			1190, 1115	
Rawson	350	Trigger Creek	Amours Basins	Rawson	X		X	X				Rawson WTP, Parkers Corner			X	Soda Ash		Ferric Chloride		1160	
Erica	230																				
Heyfield	2130	Thomson River	Heyfield Raw water storage	Heyfield	X			X		X				X ₁	X	Soda Ash	Alum 90 (for poor water quality)	PFS (Polymerised Ferric Sulphate)		1115, 1160	

- 1 = The listed populations are for the water sampling localities calculated using 2006 census data to calculate the number of persons per dwelling per locality and then multiplying it with Gippsland Water's 2011-12 figures for number of connections. Figures have also been rounded to the nearest 10.
- 2 = Sodium Fluoride - (dissolvable PVA bag)
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Table 1 (cont.): Gippsland Water Locality Water Source and Water treatment process

Locality	Population ¹	Source water	Storage	Water Treatment Plant	Treatment process										Sludge Thickening Dewatering	Added Substances					
					Coagulation & Flocculation	Clarification		Filtration		Disinfection			Other	Lime / Soda Ash		Alum Based Coagulants	Iron Based Coagulants	Potassium Permanganate	Polymers	Sodium Fluoride ² / Hydrofluosilicic Acid	
						Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite									Calcium Hypochlorite
Mirboo North	1980	Little Morwell River	N/A	Mirboo North	X	X	X	X		X					X	Soda Ash	PASS			LT20	
Moe	11510	Tanjil River and Narracan Creek	N/A	Moe	X	X	X	X	X	X	Newborough, Yalburn North, Trafalgar, Yarragon & Darnum			X	Soda Ash, Lime	Alum			LT20	Sodium Fluoride	
Newborough	7250																				
Yallourn North	1590																				
Trafalgar	3700																				
Yarragon	1450																				
Darnum ³	20																				
Neerim South	1460	Tarago River	Tarago Reservoir	Neerim South	X						X (Noojee System)	X (Neerim South)			X	Soda Ash		PFS (Polymerised Ferric Sulphate)		1115, 1160	
Noojee	350																				
Sale/Wurruk	17080	Bore (Boisdale Aquifer)	N/A	Sale				X		X					Lime			X			Sodium Fluoride

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						Sedimentation / Clarification	Dissolved Air Flotation	Granular Media Filter	Membrane	Chlorine Gas	Chloramination	Sodium Hypochlorite									Calcium Hypochlorite
Seaspray	240	Merrimans Creek	N/A	Seaspray	X			X				X			X	Soda Ash	Alum 90			1115, 1160	
Thorpdale	240	Easterbrook Creek	Thorpdale raw water storage	Thorpdale	X			X				X			X	Soda Ash	Alum				
Willow Grove	360	Tanjil River	Blue Rock Lake	Willow Grove	X			X			X				X	Soda Ash	Alum			1115, 1160	

- 1 = The listed populations are for the water sampling localities calculated using 2006 census data to calculate the number of persons per dwelling per locality and then multiplying it with Gippsland Water’s 2011-12 figures for number of connections. Figures have also been rounded to the nearest 10.
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- X₁ = Plant capability for activated carbon dosing (not currently in use)

3.2 WATER TREATMENT PROCESSES

Gippsland Water operates 17 water supply systems, with 17 water treatment plants (WTP), supplying 35 localities (42 towns).

The source waters are treated prior to distribution to Gippsland Water's customers with the objective of providing safe drinking water at all times. The treatment varies for each water supply system with the specific treatment process dependent on the quality and risks of the source water.

Table 1 identifies the regular treatment process for each of the water localities and lists the added substances and any periodic treatment activities.

The corporation uses the following treatment processes to produce safe drinking water.

3.2.1 Lime / Soda Ash Addition

To ensure the pH level in the raw water (before treatment chemicals are added) and filtered water (after treatment) is within the required ranges, lime or soda ash is added. Lime or soda ash is added to the raw water to adjust the pH to ensure the optimum level for chemical reactions to occur in the coagulation / flocculation process.

Lime or soda ash is also added to the water before it leaves the water treatment plant to maintain the pH in the desired range to optimise the effectiveness of disinfection chlorinated systems and to minimise the risk of corrosion and improve water taste.

3.2.2 Coagulation / Flocculation

Coagulation is a process to remove very fine suspended particles often associated with turbidity, colour or colloidal matter in water. These particles have a negative charge that causes them to repel each other and stay suspended in water. The addition of a suitable 'coagulant' of iron and/or aluminium salt with a positive charge neutralises or destabilises the negative charge enabling the fine particles to join together to form larger particles. The flocculation (floc) process involves stirring the water gently after the coagulant has been added. This allows the particles to come into contact, and eventually causes it to stick together and form floc. This process removes the fine particles, dirt and colour present in the water.

3.2.3 Clarification / Sedimentation

The clarification or sedimentation of the floc materials is usually carried out under still conditions (e.g. in the sedimentation tank or clarifier). A sedimentation tank relies on gravity to separate the floc from the water, which is heavy and falls to the bottom of the tank – leaving the 'cleaner' water on top. A clarifier uses a mechanical process to separate the floc, and the water is collected in troughs at the surface. Once the floc has been removed the clean water is sent to filters.

3.2.4 Membrane Filtration

Membrane filtration is used to remove suspended solids and some colloidal matter from the source water. The water is pumped through the filter membrane trapping suspended solids in the process. The concentrate (material that does not pass through the membrane) is periodically removed to waste to prevent the blocking of the membrane filters.

3.2.5 Filtration

The clarified water is passed through a filter consisting of several types of graded filter media (sand, gravel and coal) to remove any remaining particles, floc or dissolved chemicals that may have passed through the clarification/sedimentation process.

Another method used utilises Dissolved Air Flotation and Filtration (DAFF) which relies on the injection of microscopic air particles into the water stream, causing the flocculated particles to float to the surface. These particles are then drawn off the surface and off the filtration tank and removed to waste. The clear water then is filtered, as above, through graded filter media.

Over time, the filters gradually become clogged with trapped particles. A filter backwash is carried out to clean the filters, returning it to optimum condition. Air and water is forced up through the filter nozzles to agitate the filter bed and remove any trapped particles. The final turbidity of water leaving the filters, during normal plant operation, is less than 0.1 NTU (unit of measure for turbidity).

The backwash water produced during the filter cleaning process is discharged to the sludge thickening system to separate solids from process water. To maximise water use, the separated process water is then returned to the treatment plant and mixed with new raw water to recommence the treatment process.

3.2.6 Disinfection

Drinking water is disinfected to prevent the spread of waterborne pathogens that cause diseases such as dysentery, cholera, typhoid and gastroenteritis.

A low residual level of disinfection also ensures that the water remains disinfected once it leaves the water treatment plant until it arrives at the customer's tap.

In Gippsland Water's service area, chlorination is the most commonly used disinfectant because of its reliability and cost effectiveness. Chlorine is the most widely used disinfectant for water supplies in the world. The other disinfection treatment processes used in our region is chloramination.

3.2.7 Fluoridation

Gippsland Water fluoridates the drinking water supplies of Moe, Morwell, Maffra Traralgon, Sale, and Warragul. For information about the health issues associated with the water fluoridation program contact the Department of Health (DH) on 1800 651 723.

3.3 SYSTEM ISSUES FOR 2011-12

During the 2011-12 monitoring period, the following issues occurred in the Gippsland Water -water supply system;

- Jumbuk reticulation water - *E. coli* (September 2011, December 2011 & March 2012)
- Yallourn North reticulation water - *E. coli* (March 2012)
- Moe reticulation water - widespread taste and odour complaints (November 2011)
- Warragul reticulation water - mercury (November 2011)
- Tyers reticulation water - manganese (November 2011)
- Traralgon reticulation water – treatment failure/dirty water (February 2012)
- Sale reticulation water widespread complaint - dirty water (June 2012)

These events were reportable under Section 22 of the SDWA and as such are detailed in Section 5 of this report.

4 QUALITY OF DRINKING WATER 2011-12

The SDWR require a water quality monitoring program to be undertaken to verify compliance or non-compliance of specified water quality parameters as listed in the regulations. The quality of water is to be measured at a customer's tap in each of the 35 localities to determine that the water meets the specified quality standard. The following section provides a summary of the results against the water quality parameters monitored through the year at the required sampling frequency.

A brief explanation of the required water quality parameters is provided below. A more detailed explanation can be obtained from the ADWG prepared by the National Health and Medical Research Council.

Escherichia coli (E. coli) – *E. coli* is the most common thermo tolerant coliform present in faeces and is regarded as the most specific indicator of recent faecal contamination from warm blooded animals. The presence of *E. coli* in the water supply can therefore indicate the potential for other pathogenic bacteria to be present. Any *E. coli* detections at customer tap samples must be reported to DH under SDWA reporting requirements.

Chloroacetic, Dichloroacetic and Trichloroacetic Acid – These chloroacetic acids are produced in drinking water as by-products of the reaction between chlorine and naturally occurring organic matter derived from the decay of aquatic and terrestrial vegetative matter, present in water supplies. Results from samples taken at customer taps that exceed the maximum levels for these parameters are reported to the DH under SDWA reporting requirements.

Trihalomethanes (THM) – Trihalomethanes are a category of by-products produced in drinking water, principally as a result of disinfection chemicals (chlorine) reacting with naturally occurring organic matter derived from the decay of aquatic and terrestrial vegetative matter, present in water supplies. Results from samples taken at customer taps that exceed the maximum levels for these parameters are reported to DH under SDWA reporting requirements.

Acid Soluble Aluminium – Aluminium concentrations may be present in water through natural leaching from soil and rock, or from the use of aluminium salts as coagulants in water treatment. The naturally occurring aluminium concentrations are removed using conventional water treatment practices. "Acid soluble aluminium" is the biologically available fraction of aluminium present in water. Results from samples taken at customer taps that exceed the maximum level of this parameter are reported to DH under SDWA reporting requirements.

Turbidity – Turbidity is caused by the presence of fine suspended matter such as clay, silt, colloidal particles, algae and other microscopic organisms in the water. In high levels, this matter gives the water the appearance of being dirty, muddy or milky. Turbidity is best removed by coagulation and filtration treatment processes.

Results from samples taken at customer taps that exceed the maximum level of this parameter are reported to DH under SDWA reporting requirements.

5 EMERGENCY/INCIDENT MANAGEMENT

5.1 EMERGENCY/INCIDENT MANAGEMENT

Gippsland Water has aligned its emergency management approach to the Australasian Inter-service Incident Management Systems (AIIMS) as part of its SDWA and SDWR emergency and incident management processes.

5.2 INCIDENTS AND POTENTIAL WATER QUALITY EVENTS

Section 18 of the SDWA states

'A water supplier must notify the secretary in writing if it becomes known that the drinking water it is supplying to another person does not comply, or is not likely to comply, with any relevant water quality standard and must do so within 10 days after it becomes aware of the fact'

In 2011-12, there was one water quality incident reported to the DH pursuant to section 18 of the SDWA. This related to the detection of *E.coli* in the Jumbuk System. The notification was due to the 12 month rolling average result for *E.coli* not complying with the limits detailed in Schedule 2 of the SDWR.

5.3 EMERGENCIES AND WATER QUALITY EVENTS

Section 22 of the SDWA states

'(1) This section applies if an officer of a water supplier believes or suspects on reasonable grounds that the water supplied, or to be supplied for drinking purposes –

- a. may be the cause of illness; or
- b. may be the means by which an illness is being, has been or will be transmitted; or
- c. may contain any pathogens, substance, chemical or blue-green algae toxin, whether alone or in combination, at levels that may pose a risk to human health; or
- d. may be the cause of widespread public complaint

'(2) On forming that belief or suspicion, the officer must immediately report his or her belief or suspicion to the Secretary, and must make the report in the form required by the Secretary.'

During the reporting year there were nine reportable events that required notification to the Drinking Water Regulatory Unit of DH, under section 22 of the SDWA.

Where *E.coli* was detected and reported to the Secretary, flushing of mains in the immediate area was undertaken and the follow up inspection of the sampling taps and re-testing of samples occurred. *E.coli* was not detected in any follow up samples tested from customer taps.

Gippsland Water investigated the positive results and identified the cause as either sample contamination at the point of collection at the time of sampling, either due to contamination of the sample bottle or inadequate disinfection of the sampling equipment.

In 2011-12, the water quality events reported to the DH pursuant to section 22 of the SDWA are summarised below. For further details on actions taken in response to these incidents, please refer to section 8.

Table 2: Summary of incidents and actions taken under Section 22

Locality	Date and duration of incident	Location of incident	Nature of the incident	Drinking water supplies affected	Actions taken in response to the incident	Was the community notified
Jumbuk	September 2011	Jumbuk Water Reticulation	<i>E. coli</i> detected in drinking water (2 organisms/100mL)	Jumbuk Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p> <p>Refresher training of sampling staff undertaken.</p>	No
Moe	November 2011	Moe Water Reticulation	Taste and Odour	Moe Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p>	Yes
Tyers	November 2011	Tyers Water Reticulation	Manganese	Tyers Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p>	No

Table 2 (cont.): Summary of incidents and actions taken under Section 22

Locality	Date and duration of incident	Location of incident	Nature of the incident	Drinking water supplies affected	Actions taken in response to the incident	Was the community notified
Warragul	November 2011	Warragul Water Reticulation	Mercury	Warragul Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p> <p>Suspected cause was sample contamination.</p>	No
Jumbuk	December 2011	Jumbuk Water Reticulation	<i>E. coli</i> detected in drinking water (1 organism/100mL)	Jumbuk Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p> <p>Installation of secondary disinfection system.</p> <p>Re-sealing of roof joint seams of tanks within Jumbuk system</p>	No
Traralgon	February 2012	Traralgon Water Reticulation	Treatment Failure/Dirty Water (Acid Soluble Aluminium)	Traralgon Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Equipment adjusting pH during coagulation process failed, resulting in aluminium passing through the filters.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>Installation of additional equipment and verification of process monitoring alarms undertaken.</p> <p>All subsequent reticulation monitoring was compliant.</p>	No

Table 2 (cont.): Summary of incidents and actions taken under Section 22

Locality	Date and duration of incident	Location of incident	Nature of the incident	Drinking water supplies affected	Actions taken in response to the incident	Was the community notified
Jumbuk	March 2012	Jumbuk Water Reticulation	<i>E. coli</i> detected in drinking water (12 organisms/ 100mL)	Jumbuk Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p> <p>Installation and commissioning of secondary disinfection system was completed during the reporting period. (refer to section 8.7)</p>	No
Yallourn North	March 2012	Yallourn North Water Reticulation	<i>E. coli</i> detected in drinking water (1 organism/ 100mL))	Yallourn North Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p> <p>Suspected cause was sample contamination due to poor location of sampling point.</p> <p>Refresher training of sampling staff undertaken.</p>	No
Sale	June 2012	Sale Water Reticulation	Widespread Complaints - Dirty Water	Sale Water Reticulation	<p>Department of Health (DH) Notification under section 22 SDWA.</p> <p>Extensive flushing undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event.</p> <p>All subsequent reticulation monitoring was compliant.</p>	No

5.3.1 Other Events Not Reportable

During the reporting period, heavy rains affected the Gippsland region resulting in a deterioration of raw water quality. The treatment process in place throughout Gippsland Water service area continued to produce safe drinking water. No water treatment assets were impacted by flood water during the reporting period.

There were no other events to note for the reporting period of 2011-12.

6 COMPLAINTS

6.1 WATER QUALITY COMPLAINTS

A summary of customer complaints received by Gippsland Water relating to the quality of drinking water supplied is reported below.

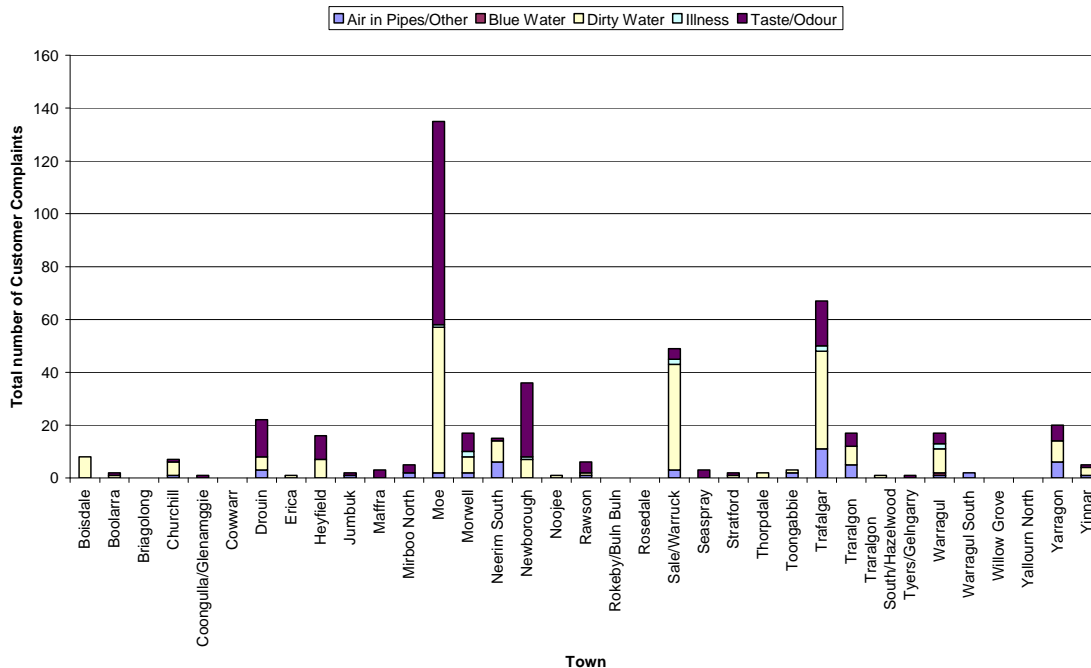
Gippsland Water records and reports on customer complaints relating to dirty water, taste and odour problems, suspected illness/health concerns, blue water, and appearance of air-filled or “white” water received from the tap.

Table 3: Water quality complaints per 100 customers supplied

Type of Complaint	2011-12		2010-2011	2009-2010	2008-2009
	No. of Complaints	Complaints per 100 customers	Complaints per 100 customers	Complaints per 100 customers	Complaints per 100 customers
Discoloured water	214	0.328	0.148	0.192	0.116
Taste / odour	192	0.294	0.090	0.075	0.113
Blue water	1	0.002	0.000	0.009	0.000
Air in water	49	0.075	0.032	0.043	0.042
Alleged illness	10	0.015	0.005	0.002	0.019
Other	0	0.000	0.000	0.000	0.000
Total	466	0.715	0.276	0.321	0.290

The total number of complaints received by Gippsland Water is presented below by type and locality.

Figure 2: Total Customer Complaints for 2011-12



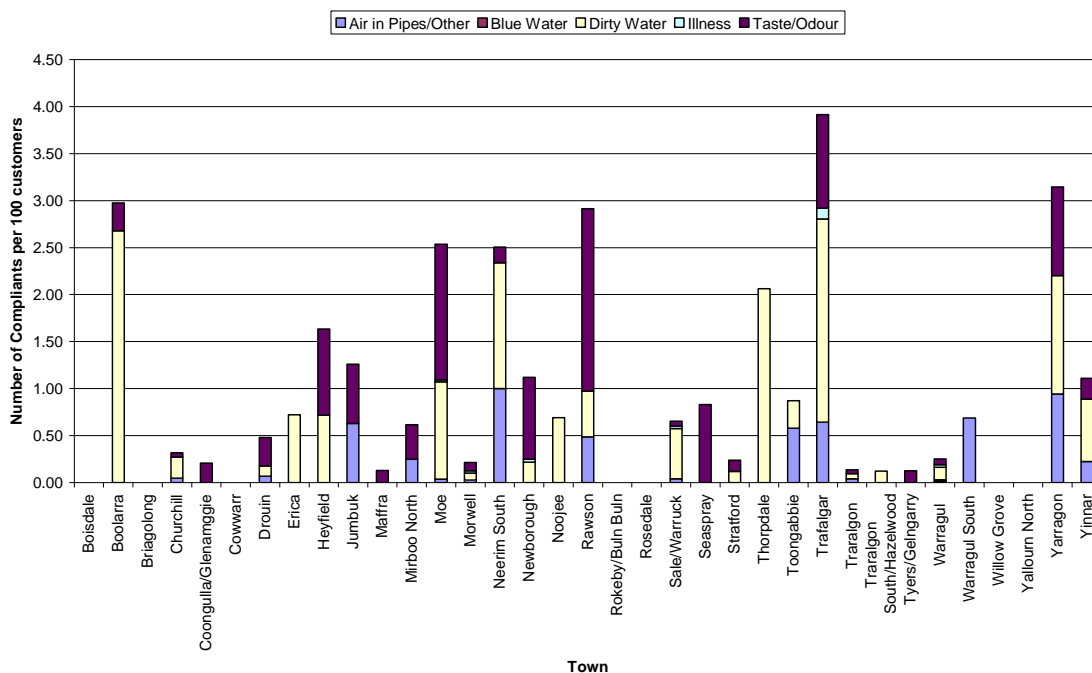
Of note is the increase in taste and odour and dirty water complaints associated with the Moe system during 2011-12. This is predominantly due to the Moe taste and odour event notified to the Department of Health in under a section 22 in November 2011 (refer Table 2). Extensive flushing was undertaken throughout the reticulation network and additional monitoring of water quality parameters undertaken during and after the event. The flushing undertaken contributed to dirty water complaints around the same time due to scouring of the reticulation network.

The level of dirty water complaints was also influence by a burst water main event in Sale in June 2012. A 300mm water main in Sale failed resulting in high flow rates (in excess of 500 litres per second) which scoured the main and caused widespread dirty water issues. Subsequent flushing to remove significant quantities of air within the reticulation system as a result of the break also contributed to the increase in dirty water complaints.

All subsequent reticulation compliance monitoring was compliant during this period.

When calculating the number of complaints per 100 customers, there were no localities within Gippsland Water’s supply district which exceeded 4 complaints per 100 customers, as represented in the figure below.

Figure 3: Customer Complaints per 100 customers for 2011-12



6.2 A SUMMARY OF THE CUSTOMER COMPLAINT PROCESS

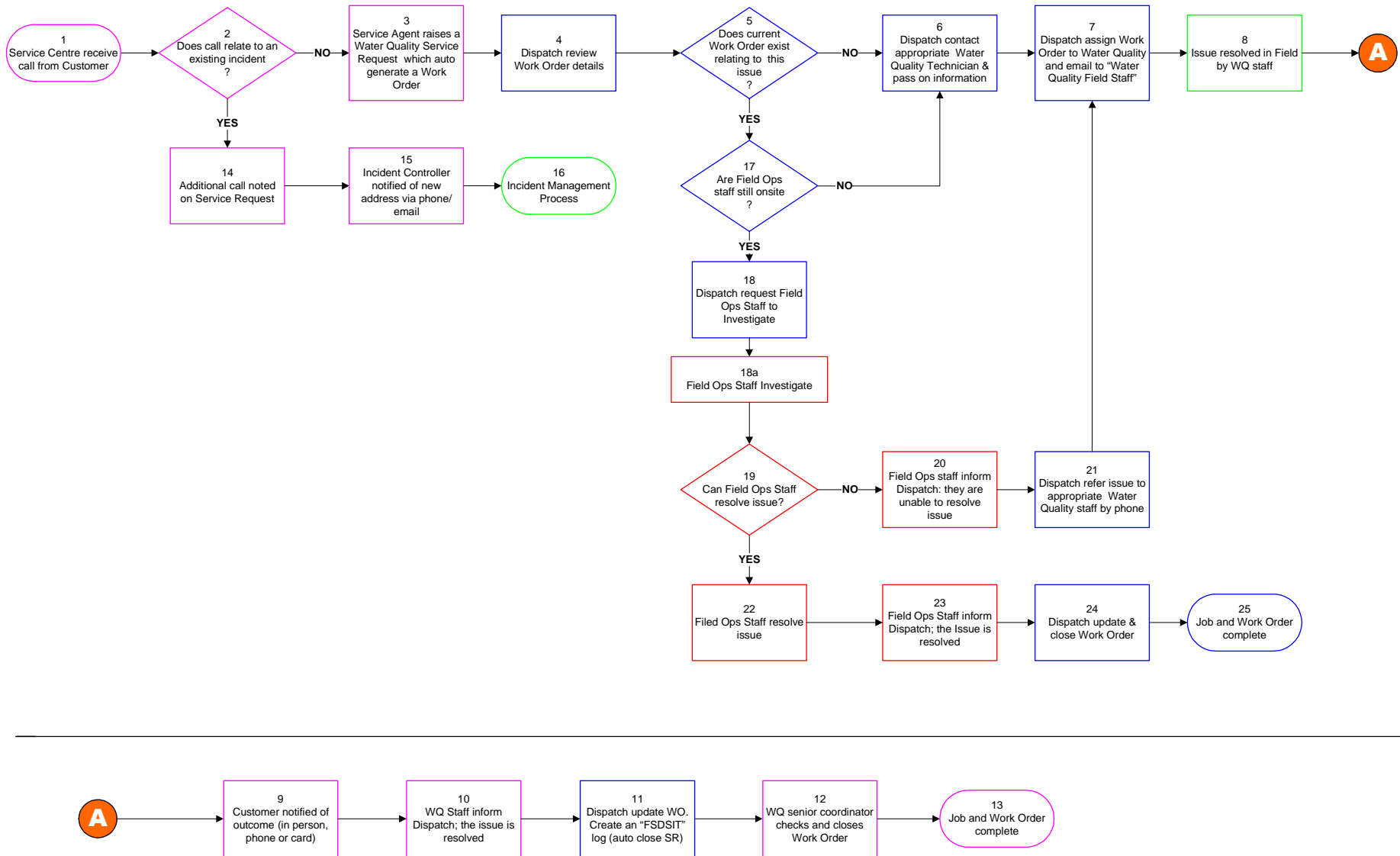
Customer complaints are managed according to the following summary procedure:

- Customer complaints received by Gippsland Water’s Service Centre are recorded in a database. Details include information of who, where, time and nature of complaint.
- The Water Quality Group investigates by visiting the site and contacting the customer if necessary to determine details of the water quality problem.

- For complaints associated with taste and odour, dirty water, and air in pipes, field measurements are performed, the reticulation system is typically flushed then field measurements are taken again to verify the problem has been corrected.
- Follow up contact may be made with the customer to determine if they are satisfied with the quality of service or alternatively a standard Gippsland Water contact card is left with the customer. This also encourages customers to keep Gippsland Water informed of any reoccurrence of water quality problems.
- Details of actions undertaken are entered into a database to provide a record/history of the site, to document issues for maintenance programs, and to inform capital upgrade requirements where a history of system failures occurs.

This procedure is presented in more detail in the figure below.

Figure 4: Water Quality Complaints Resolution Procedure



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7 RISK MANAGEMENT PLAN AUDIT

Gippsland Water's Water Quality Risk Management Plan has been operational since 2005 and adopts the 12 elements outlined in the ADWG and preventative risk management strategies outlined in the SDWA.

In March 2012 Gippsland Water's Water Quality Risk Management Plan was audited by the DH approved auditor for compliance with section 7(1) of the SDWA. The audit also identified that opportunities identified in the previous audit (December 2009) had been satisfactorily addressed.

The March 2012 audit for the audit period 1 April 2010 to 29 March 2012 confirmed that Gippsland Water complied with the obligations of the SDWA, with eight opportunities for improvement identified (Table 21).

Gippsland Water developed an action plan to address the eight opportunities for improvement during the 2011-12 reporting period.

8 WATER QUALITY RESULTS FOR 2011-12

8.1 *ESCHERICHIA COLI (E. COLI)* RESULTS

8.1.1 *E. coli* results

Compliance under the SDWR requires at least 98% of all samples of drinking water collected within a locality in any 12 month period to contain no *E. coli* organism/100ml of drinking water. Most Gippsland Water localities, with the exception of Jumbuk, achieved compliance with this standard for the 2011-12 reporting period.

Table 4: *E. coli* results for localities 2011-12

Locality	Frequency of sampling	No. of samples*	No. of Non complying results	Max result (organisms/100mL)	% with no <i>E. coli</i>	Complying (Yes/No)
Boisdale	Weekly	52	0	0	100%	Yes
Boolarra	Weekly	52	0	0	100%	Yes
Briagolong	Weekly	52	0	0	100%	Yes
Churchill	Weekly	52	0	0	100%	Yes
Coongulla-Glenmaggie	Weekly	52	0	0	100%	Yes
Cowwarr	Weekly	52	0	0	100%	Yes
Drouin	Weekly	64	0	0	100%	Yes
Erica	Weekly	52	0	0	100%	Yes
Heyfield	Weekly	52	0	0	100%	Yes
Jumbuk	Weekly	52	3***	12	94.2%	No
Maffra	Weekly	52	0	0	100%	Yes
Mirboo North	Weekly	52	0	0	100%	Yes
Moe	Weekly	104	0	0	100%	Yes
Morwell	Weekly	76	0	0	100%	Yes
Neerim South	Weekly	52	0	0	100%	Yes
Newborough	Weekly	52	0	0	100%	Yes
Noojee	Weekly	52	0	0	100%	Yes
Rawson	Weekly	52	0	0	100%	Yes
Rokeby-Buln Buln	Weekly	52	0	0	100%	Yes
Rosedale	Weekly	52	0	0	100%	Yes
Sale-Wurruk	Weekly	76	0	0	100%	Yes
Seaspray	Weekly	52	0	0	100%	Yes
Stratford	Weekly	52	0	0	100%	Yes
Thorpdale	Weekly	52	0	0	100%	Yes
Toongabbie	Weekly	52	0	0	100%	Yes
Trafalgar	Weekly	52	0	0	100%	Yes
Traralgon	Weekly	104	0	0	100%	Yes
Traralgon South-Hazelwood North	Weekly	52	0	0	100%	Yes
Tyers-Glengarry	Weekly	76	0	0	100%	Yes
Warragul	Weekly	76	0	0	100%	Yes
Warragul South	Weekly	52	0	0	100%	Yes
Willow Grove	Weekly	52	0	0	100%	Yes
Yallourn North	Weekly	52	1**	1	98.1%	Yes
Yarragon	Weekly	52	0	0	100%	Yes
Yinnar	Weekly	52	0	0	100%	Yes

* The number of samples collected in a locality is determined by the *ADWG* recommendations (Section 10-5) regarding population-based sampling frequency for *E. coli*. Localities with populations greater than 5,000 have samples taken more frequently than weekly.

** One sample collected during the reporting period recorded positive results for *E. coli* at a customer tap, Under the reporting guideline,. A single positive result for *E. coli* with a percentage compliance 98.1% is greater than the compliance requirement of 98% which still meets the 100% SDWR compliance requirements.

*** Three samples collected during the reporting period recorded positive results for *E. coli* at a customer tap, Under the reporting guidelines, three positive result for *E. coli* with a percentage compliance 94.2% is below the compliance requirement of 98% which does not meet the 100% SDWR compliance requirements.

8.1.2 Actions taken in relation to non-compliance

During the 2011-12 reporting period, two water sampling localities recorded positive *E. coli* results.

In September 2011, December 2011 and March 2012 *E. coli* non-compliance results were recorded in the Jumbuk sampling locality, with results of 2, 1 and 11 organisms /100mL in the respective samples above the limit of 0 organisms/100mL. All samples were located at a customer tap. Compliance with the SDWR for *E. coli* results was not achieved in the Jumbuk sampling area for the reporting period. The SDWR (2005) require at least 98% of all samples collected in any 12 month period to contain no *E. coli*. The percentage compliance for the Jumbuk sampling area for the reporting period was 94.2%. As per the reporting guidelines, only the customer tap non-compliance sample is taken into statistical consideration. During the reporting period a secondary disinfection system was installed and commissioned as part of the risk management and compliance process (refer to section 8.7). The joints on the lid of the tank were also re-sealed.

In March 2012 an *E. coli* non-compliance results were recorded in the Yallourn North sampling locality, with a result of 11 organisms /100mL in the respective samples above the limit of 0 organisms/100mL. The sample was located at a customer tap.

Compliance with the SDWR for *E. coli* results was achieved in the Yallourn North sampling area even though positive results were recorded. The SDWR (2005) require at least 98% of all samples collected in any 12 month period to contain no *E. coli*. The percentage compliance for the Yallourn North sampling area for the reporting period was 99.1%. As per the reporting guidelines, only the customer tap non-compliance sample is taken into statistical consideration. The percentage (%) compliance for the Yallourn North sampling area of 98.1%, is still compliant with the requirements of the SDWR.

Gippsland Water investigated the positive results and identified the cause was either sample contamination at the point of collection at the time of sampling, either due to contamination of the sample bottle or inadequate disinfection of the sampling equipment. Additional sampling training was provided to the water quality samplers and the techniques audited against established procedures for compliance. Additional samples were collected within the reticulation immediately after the positive results were reported. None of the repeat samples indicated the presence of *E. coli*.

The figures below gives a 12-month trend for the Jumbuk and Yallourn North townships supplied with treated water from the Morwell and Moe water treatment plants respectively.

Figure 5: *E. coli* (organisms/100ml) for 2011-12 for Jumbuk

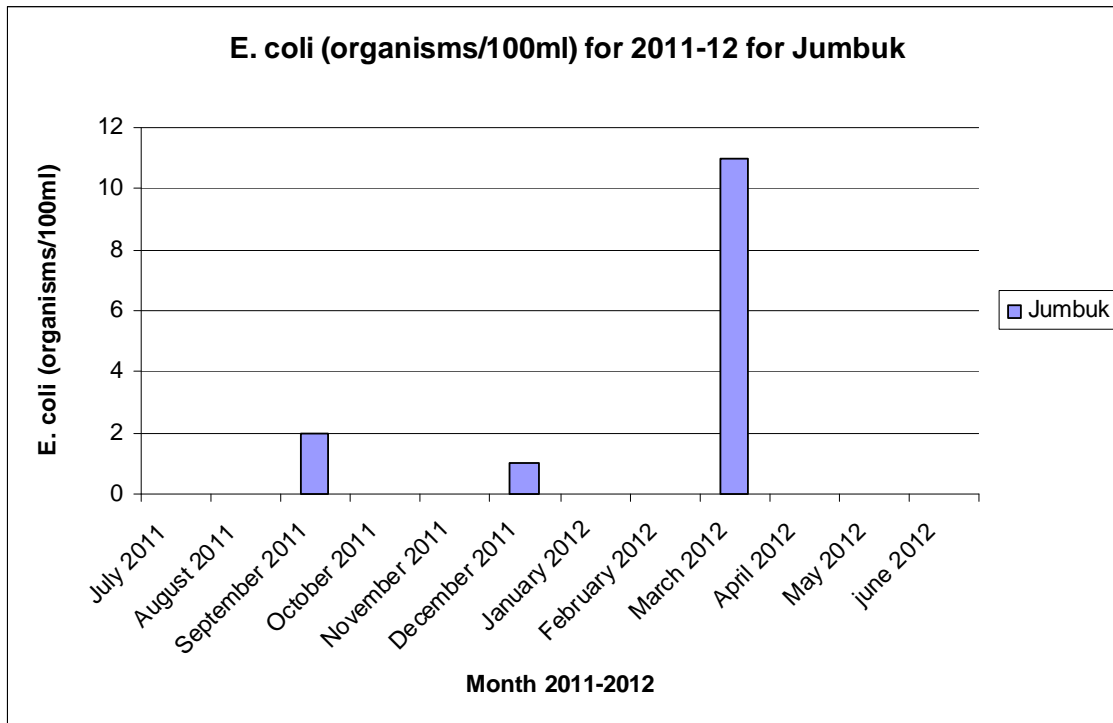
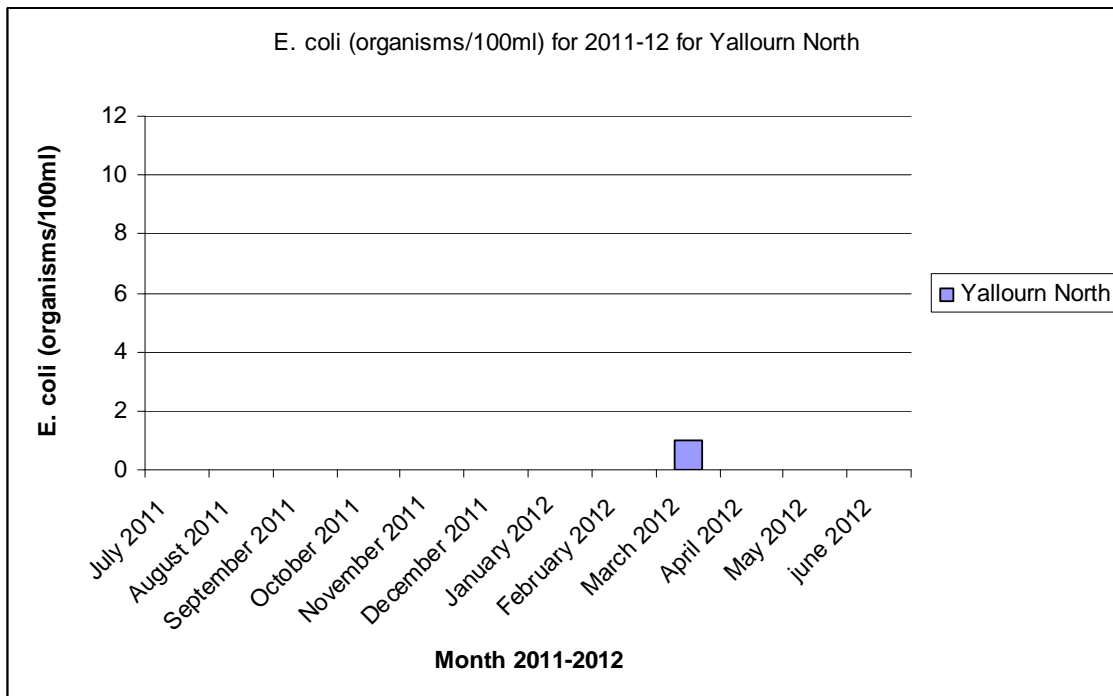


Figure 6: *E. coli* (organisms/100ml) for 2011-12 for Yallourn North



8.2 CHLORINE BASED DISINFECTION BY-PRODUCT CHEMICALS

8.2.1 Chloroacetic acid results

For compliance with the SDWR, a sample result must not exceed 0.15 mg/L for chloroacetic acid. All Gippsland Water sites achieved 100% compliance with this standard for the 2011-12 reporting period.

Table 5: Chloroacetic acid results for all localities 2011-12

Locality	Frequency of sampling	No. of samples	No of non complying samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0	<0.005	<0.005	Yes
Boolarra	Monthly	12	0	<0.005	<0.005	Yes
Briagolong	Monthly	12	0	<0.005	<0.005	Yes
Churchill	Monthly	12	0	<0.005	<0.005	Yes
Coongulla-Glenmaggie	Monthly	12	0	<0.005	<0.005	Yes
Cowwarr	Monthly	12	0	<0.005	<0.005	Yes
Drouin	Monthly	12	0	<0.005	<0.005	Yes
Erica	Monthly	12	0	<0.005	<0.005	Yes
Heyfield	Monthly	12	0	<0.005	<0.005	Yes
Jumbuk	Monthly	12	0	<0.005	<0.005	Yes
Maffra	Monthly	12	0	<0.005	<0.005	Yes
Mirboo North	Monthly	12	0	<0.005	<0.005	Yes
Moe	Monthly	12	0	<0.005	<0.005	Yes
Morwell	Monthly	12	0	<0.005	<0.005	Yes
Neerim South	Monthly	12	0	<0.005	<0.005	Yes
Newborough	Monthly	12	0	<0.005	<0.005	Yes
Noojee	Monthly	12	0	<0.005	<0.005	Yes
Rawson	Monthly	12	0	<0.005	<0.005	Yes
Rokeyby-Buln Buln	Monthly	12	0	<0.005	<0.005	Yes
Rosedale	Monthly	12	0	<0.005	<0.005	Yes
Sale-Wurruk	Monthly	12	0	<0.005	<0.005	Yes
Seaspray	Monthly	12	0	<0.005	<0.005	Yes
Stratford	Monthly	12	0	<0.005	<0.005	Yes
Thorpdale	Monthly	12	0	<0.005	<0.005	Yes
Toongabbie	Monthly	12	0	<0.005	<0.005	Yes
Trafalgar	Monthly	12	0	<0.005	<0.005	Yes
Traralgon	Monthly	12	0	<0.005	<0.005	Yes
Traralgon South-Hazelwood North	Monthly	12	0	<0.005	<0.005	Yes
Tyers-Glengarry	Monthly	12	0	<0.005	<0.005	Yes
Warragul	Monthly	12	0	<0.005	<0.005	Yes
Warragul South	Monthly	12	0	<0.005	<0.005	Yes
Willow Grove	Monthly	12	0	<0.005	<0.005	Yes
Yallourn North	Monthly	12	0	<0.005	<0.005	Yes
Yarragon	Monthly	12	0	<0.005	<0.005	Yes
Yinnar	Monthly	12	0	<0.005	<0.005	Yes

8.2.1.1 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.2.2 Dichloroacetic acid results

For compliance with the SDWR, a sample result must not exceed 0.1 mg/L dichloroacetic acid. All Gippsland Water sites achieved 100% compliance with this standard for the 2011-12 reporting period.

Table 6: Dichloroacetic acid results for all localities 2011-12

Locality	Frequency of sampling	No. of samples	No of non complying samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0	0.012	<0.005	Yes
Boolarra	Monthly	12	0	0.010	0.005	Yes
Briagolong	Monthly	12	0	<0.005	<0.005	Yes
Churchill	Monthly	12	0	0.011	<0.005	Yes
Coongulla-Glenmaggie	Monthly	12	0	0.013	<0.005	Yes
Cowwarr	Monthly	12	0	0.006	<0.005	Yes
Drouin	Monthly	12	0	0.015	<0.005	Yes
Erica	Monthly	12	0	0.018	<0.005	Yes
Heyfield	Monthly	12	0	<0.005	<0.005	Yes
Jumbuk	Monthly	12	0	<0.005	<0.005	Yes
Maffra	Monthly	12	0	0.010	<0.005	Yes
Mirboo North	Monthly	12	0	<0.005	<0.005	Yes
Moe	Monthly	12	0	0.007	<0.005	Yes
Morwell	Monthly	12	0	0.010	<0.005	Yes
Neerim South	Monthly	12	0	0.009	<0.005	Yes
Newborough	Monthly	12	0	<0.005	<0.005	Yes
Noojee	Monthly	12	0	0.008	<0.005	Yes
Rawson	Monthly	12	0	0.010	<0.005	Yes
Rokeyby-Buln Buln	Monthly	12	0	0.010	<0.005	Yes
Rosedale	Monthly	12	0	0.005	<0.005	Yes
Sale-Wurruk	Monthly	12	0	<0.005	<0.005	Yes
Seaspray	Monthly	12	0	<0.005	<0.005	Yes
Stratford	Monthly	12	0	<0.005	<0.005	Yes
Thorpdale	Monthly	12	0	0.006	<0.005	Yes
Toongabbie	Monthly	12	0	0.008	<0.005	Yes
Trafalgar	Monthly	12	0	0.007	<0.005	Yes
Traralgon	Monthly	12	0	0.008	<0.005	Yes
Traralgon South-Hazelwood North	Monthly	12	0	0.008	<0.005	Yes
Tyers-Glengarry	Monthly	12	0	0.013	<0.005	Yes
Warragul	Monthly	12	0	0.011	<0.005	Yes
Warragul South	Monthly	12	0	0.008	<0.005	Yes
Willow Grove	Monthly	12	0	0.006	<0.005	Yes
Yallourn North	Monthly	12	0	<0.005	<0.005	Yes
Yarragon	Monthly	12	0	0.008	<0.005	Yes
Yinnar	Monthly	12	0	<0.005	<0.005	Yes

8.2.2.1 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.2.3 Trichloroacetic acid results

For compliance with the SDWR, a sample result must not exceed 0.1 mg/L trichloroacetic acid. All Gippsland Water sites achieved 100% compliance with this standard for the 2011-12 reporting period.

Table 7: Trichloroacetic acid for all localities 2011-12

Locality	Frequency of sampling	No. of samples	No of non complying samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0	0.019	0.010	Yes
Boolarra	Monthly	12	0	0.009	<0.005	Yes
Briagolong	Monthly	12	0	<0.005	<0.005	Yes
Churchill	Monthly	12	0	0.026	0.011	Yes
Coongulla-Glenmaggie	Monthly	12	0	0.017	<0.005	Yes
Cowwarr	Monthly	12	0	0.032	0.018	Yes
Drouin	Monthly	12	0	0.019	0.005	Yes
Erica	Monthly	12	0	0.017	<0.005	Yes
Heyfield	Monthly	12	0	0.009	<0.005	Yes
Jumbuk	Monthly	12	0	0.030	0.014	Yes
Maffra	Monthly	12	0	0.015	<0.005	Yes
Mirboo North	Monthly	12	0	<0.005	<0.005	Yes
Moe	Monthly	12	0	0.006	<0.005	Yes
Morwell	Monthly	12	0	0.018	0.007	Yes
Neerim South	Monthly	12	0	0.006	<0.005	Yes
Newborough	Monthly	12	0	<0.005	<0.005	Yes
Noojee	Monthly	12	0	0.007	<0.005	Yes
Rawson	Monthly	12	0	0.015	0.005	Yes
Rokeyby-Buln Buln	Monthly	12	0	0.020	<0.005	Yes
Rosedale	Monthly	12	0	0.030	0.013	Yes
Sale-Wurruk	Monthly	12	0	<0.005	<0.005	Yes
Seaspray	Monthly	12	0	<0.005	<0.005	Yes
Stratford	Monthly	12	0	0.013	0.005	Yes
Thorpdale	Monthly	12	0	<0.005	<0.005	Yes
Toongabbie	Monthly	12	0	0.029	0.019	Yes
Trafalgar	Monthly	12	0	0.007	<0.005	Yes
Traralgon	Monthly	12	0	0.012	<0.005	Yes
Traralgon South-Hazelwood North	Monthly	12	0	0.032	0.012	Yes
Tyers-Glengarry	Monthly	12	0	0.023	0.014	Yes
Warragul	Monthly	12	0	0.015	<0.005	Yes
Warragul South	Monthly	12	0	0.015	0.008	Yes
Willow Grove	Monthly	12	0	<0.005	<0.005	Yes
Yallourn North	Monthly	12	0	0.005	<0.005	Yes
Yarragon	Monthly	12	0	0.007	<0.005	Yes
Yinnar	Monthly	12	0	0.022	0.012	Yes

8.2.3.1 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.2.4 Trihalomethanes (THM) results

For compliance with the SDWR, a sample result must not exceed 0.25 mg/L trihalomethanes. All Gippsland Water sites achieved 100% compliance with this standard for the 2011-12 reporting period.

Table 8: Trihalomethanes results for all localities for 2011-12

Locality	Frequency of sampling	No. of samples	No of non complying samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0	0.077	0.024	Yes
Boolarra	Monthly	12	0	0.110	0.035	Yes
Briagolong	Monthly	12	0	0.016	<0.001	Yes
Churchill	Monthly	12	0	0.130	0.037	Yes
Coongulla-Glenmaggie	Monthly	12	0	0.062	0.015	Yes
Cowwarr	Monthly	12	0	0.110	0.057	Yes
Drouin	Monthly	12	0	0.053	0.027	Yes
Erica	Monthly	12	0	0.048	0.019	Yes
Heyfield	Monthly	12	0	0.049	0.014	Yes
Jumbuk	Monthly	12	0	0.130	0.059	Yes
Maffra	Monthly	12	0	0.077	0.017	Yes
Mirboo North	Monthly	12	0	0.060	0.018	Yes
Moe	Monthly	12	0	0.052	0.021	Yes
Morwell	Monthly	12	0	0.063	0.025	Yes
Neerim South	Monthly	12	0	0.044	0.021	Yes
Newborough	Monthly	12	0	0.065	0.023	Yes
Noojee	Monthly	12	0	0.030	0.011	Yes
Rawson	Monthly	12	0	0.038	0.011	Yes
Rokeyby-Buln Buln	Monthly	12	0	0.060	0.021	Yes
Rosedale	Monthly	12	0	0.130	0.062	Yes
Sale-Wurruk	Monthly	12	0	0.029	0.017	Yes
Seaspray	Monthly	12	0	0.099	0.047	Yes
Stratford	Monthly	12	0	0.084	0.027	Yes
Thorpdale	Monthly	12	0	0.077	0.030	Yes
Toongabbie	Monthly	12	0	0.087	0.057	Yes
Trafalgar	Monthly	12	0	0.068	0.022	Yes
Traralgon	Monthly	12	0	0.046	0.009	Yes
Traralgon South-Hazelwood North	Monthly	12	0	0.072	0.029	Yes
Tyers-Glengarry	Monthly	12	0	0.085	0.046	Yes
Warragul	Monthly	12	0	0.052	0.019	Yes
Warragul South	Monthly	12	0	0.062	0.035	Yes
Willow Grove	Monthly	12	0	0.002	<0.001	Yes
Yallourn North	Monthly	12	0	0.071	0.036	Yes
Yarragon	Monthly	12	0	0.091	0.031	Yes
Yinnar	Monthly	12	0	0.097	0.053	Yes

8.2.4.1 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

Although compliant for the reporting period, works to decrease the THM levels produced at the Seaspray Water Treatment Plant have commenced. These works will involve the installation of activated carbon treatment as well as refurbishment of the filter.

8.3 OZONE BASED DISINFECTION BY-PRODUCT CHEMICALS

Gippsland Water has no ozone dosing systems and therefore the ozone based chemical concentrations of bromate and formaldehyde have not been included in the routine testing program.

8.4 ALUMINIUM

8.4.1 Aluminium results

For compliance with the SDWR, a sample result must not exceed a maximum of 0.2mg/L aluminium (acid soluble) in drinking water. Gippsland Water recorded one result of 0.22 mg/L for Drouin during the 2011-12 reporting period. With rounding to the nearest significant figure, this result is considered compliant with the requirements of the SDWR (ie. Less than 0.25 mg/L)

Table 9: Aluminium results for all localities in 2011-12

Locality	Frequency of Sampling	No. of Samples	No of non complying samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0	0.02	<0.01	Yes
Boolarra	Monthly	12	0	0.13	<0.01	Yes
Briagolong	Monthly	12	0	<0.01	<0.01	Yes
Churchill	Monthly	12	0	0.15	0.02	Yes
Coongulla & Glenmaggie	Monthly	12	0	0.03	0.01	Yes
Cowwarr	Monthly	12	0	0.03	0.01	Yes
Drouin	Monthly	12	0	0.22	0.02	Yes
Erica	Monthly	12	0	0.01	<0.01	Yes
Heyfield	Monthly	12	0	<0.01	<0.01	Yes
Jumbuk	Monthly	12	0	0.04	0.02	Yes
Maffra	Monthly	12	0	0.01	<0.01	Yes
Mirboo North	Monthly	12	0	<0.01	<0.01	Yes
Moe	Monthly	12	0	0.01	<0.01	Yes
Morwell	Monthly	12	0	0.12	0.02	Yes
Neerim South	Monthly	12	0	<0.01	<0.01	Yes
Newborough	Monthly	12	0	0.02	<0.01	Yes
Noojee	Monthly	12	0	<0.01	<0.01	Yes
Rawson	Monthly	12	0	0.01	<0.01	Yes
Rokeyby & Buln Buln	Monthly	12	0	0.12	0.02	Yes
Rosedale	Monthly	12	0	0.03	0.02	Yes
Sale/Wurruk	Monthly	12	0	0.02	<0.01	Yes
Seaspray	Monthly	12	0	0.02	<0.01	Yes
Stratford	Monthly	12	0	0.01	<0.01	Yes
Thorpdale	Monthly	12	0	0.07	<0.01	Yes
Toongabbie	Monthly	12	0	0.03	0.02	Yes
Trafalgar	Monthly	12	0	0.03	<0.01	Yes
Traralgon	Monthly	12	0	0.05	0.01	Yes
Traralgon South & Hazelwood North	Monthly	12	0	0.10	0.01	Yes
Tyers & Glengarry	Monthly	12	0	0.03	0.01	Yes
Warragul	Monthly	12	0	0.11	0.02	Yes
Warragul South	Monthly	12	0	0.19	0.03	Yes
Willow Grove	Monthly	12	0	0.03	0.01	Yes
Yallourn North	Monthly	12	0	0.02	<0.01	Yes
Yarragon	Monthly	12	0	0.08	<0.01	Yes
Yinnar	Monthly	12	0	0.09	0.01	Yes

8.4.1.1 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.5 TURBIDITY

8.5.1 Turbidity results

For compliance with the SDWR, the 95% upper confidence limit of the mean of all values for samples of drinking water collected in any 12-month period, must have turbidity measured as less than or equal to 5.0 NTU (Nephelometric Turbidity Unit). All Gippsland Water sites achieved 100% compliance with this standard for the 2011-12 reporting period.

Table 10: Turbidity results for all localities in 2011-12

Locality	Frequency of Sampling	No. of Samples	No of non complying samples	Max (NTU)	Min (NTU)	95% UCL of mean*	Complying (Yes/No)
Boisdale	Weekly	52	0	0.2	0.1	0.1	Yes
Boolarra	Weekly	52	0	1.3	0.1	0.3	Yes
Briagolong	Weekly	52	0	0.2	0.1	0.1	Yes
Churchill	Weekly	52	0	0.2	0.1	0.1	Yes
Coongulla & Glenmaggie	Weekly	52	0	10	0.1	0.8	Yes
Cowwarr	Weekly	52	0	0.8	0.1	0.2	Yes
Drouin	Weekly	52	0	0.3	0.1	0.1	Yes
Erica	Weekly	52	0	0.8	0.1	0.2	Yes
Heyfield	Weekly	52	0	0.3	0.1	0.2	Yes
Jumbuk	Weekly	52	0	4.6	0.1	0.4	Yes
Maffra	Weekly	52	0	0.3	0.1	0.1	Yes
Mirboo North	Weekly	52	0	0.7	0.1	0.1	Yes
Moe	Weekly	52	0	0.3	0.1	0.1	Yes
Morwell	Weekly	52	0	0.2	0.1	0.1	Yes
Neerim South	Weekly	52	0	0.2	0.1	0.2	Yes
Newborough	Weekly	52	0	0.4	0.1	0.1	Yes
Noojee	Weekly	52	0	0.3	0.1	0.2	Yes
Rawson	Weekly	52	0	0.2	0.1	0.1	Yes
Rokeyby & Buln Buln	Weekly	52	0	1.5	0.1	0.2	Yes
Rosedale	Weekly	52	0	0.4	0.1	0.1	Yes
Sale/Wurruk	Weekly	52	0	1.0	0.1	0.2	Yes
Seaspray	Weekly	52	0	0.6	0.1	0.3	Yes
Stratford	Weekly	52	0	0.2	0.1	0.1	Yes
Thorpdale	Weekly	52	0	1.8	0.1	0.4	Yes
Toongabbie	Weekly	52	0	1.3	0.1	0.2	Yes
Trafalgar	Weekly	52	0	0.4	0.1	0.1	Yes
Traralgon	Weekly	52	0	0.9	0.1	0.2	Yes
Traralgon South & Hazelwood North	Weekly	52	0	2.2	0.1	0.2	Yes
Tyers & Glengarry	Weekly	52	0	0.6	0.1	0.2	Yes
Warragul	Weekly	52	0	0.7	0.1	0.2	Yes
Warragul South	Weekly	52	0	0.5	0.1	0.2	Yes
Willow Grove	Weekly	52	0	0.2	0.1	0.1	Yes
Yallourn North	Weekly	52	0	0.2	0.1	0.1	Yes
Yarragon	Weekly	52	0	0.9	0.1	0.2	Yes
Yinnar	Weekly	52	0	0.5	0.1	0.2	Yes

*In order to calculate the mean, standard deviation and confidence levels results <0.1NTU were rounded up to 0.1NTU

8.5.1.1 Actions taken in relation to non-compliance

All localities complied with this water quality parameter.

8.6 FLUORIDE

Fluoride testing has been performed in the water supply systems where fluoride is artificially added to the water (supplies of Maffra, Warragul, Sale Traralgon, Morwell and Moe).

Gippsland Water has sampled localities on a weekly basis even though some of the localities listed in table 11 require monthly samples according to section 5.1.4 of the Code of Practice for Fluoridation of Drinking Water Supplies (i.e. if a fluoride plant supplies five or more water sampling localities then the authority must take a sample each month from a water sampling point in each water sampling locality supplied from those plant such that a sample is collected from the distribution system at least once per week).

8.6.1 Fluoride results

Based on health considerations, no single sample concentration of fluoride in drinking water should exceed 1.5 mg/L, and the average level of fluoride should not exceed 1.0 mg/L. All Gippsland Water sites achieved 100% compliance with this standard for the 2011-12 reporting period.

Table 11: Fluoride results for all fluoridated localities in 2011-12

Treatment Plant	Locality	Required Frequency of Sampling	Actual No. of Samples	Max (mg/L)	Min (mg/L)	Average* (mg/L)	Complying (Yes/No)
Maffra	Boisdale	Weekly	52	0.66	<0.05	0.24 (0.52)**	Yes
	Maffra	Weekly	52	0.68	<0.05	0.23 (0.54)**	Yes
	Stratford	Weekly	52	0.67	<0.05	0.24 (0.54)**	Yes
Morwell	Churchill	Monthly	52	1.00	0.50	0.78	Yes
	Jumbuk	Monthly	52	0.94	0.64	0.8	Yes
	Morwell	Monthly	52	1.00	0.41	0.78	Yes
	Traralgon South/ Hazelwood North	Monthly	52	0.97	0.44	0.78	Yes
	Yinnar	Monthly	52	0.98	0.59	0.78	Yes
Moe	Moe	Monthly	52	0.91	<0.05	0.60 (0.63)**	Yes
	Newborough	Monthly	52	0.88	<0.05	0.61 (0.65)**	Yes
	Trafalgar	Monthly	52	0.94	<0.05	0.62 (0.66)**	Yes
	Yallourn North	Monthly	52	0.85	0.06	0.61 (0.63)**	Yes
	Yarragon	Monthly	52	0.91	<0.05	0.64 (0.68)**	Yes
Sale	Sale/Wurruk	Weekly	52	0.92	0.53	0.83	Yes
Traralgon	Traralgon	Weekly	52	0.78	<0.05	0.11 (0.23)**	Yes
Warragul	Drouin	Weekly	52	1.10	0.61	0.91	Yes
	Rokeyby/Buln Buln	Weekly	52	1.10	0.45	0.91	Yes
	Warragul	Weekly	52	1.20	0.40	0.90	Yes
	Warragul South	Weekly	52	1.10	0.76	0.91	Yes

* = The average value calculated based on all monitoring conducted over the 2011-12 reporting period, including the when dosing did not occur.

** = The average calculated excluding the times where dosing did not occur.

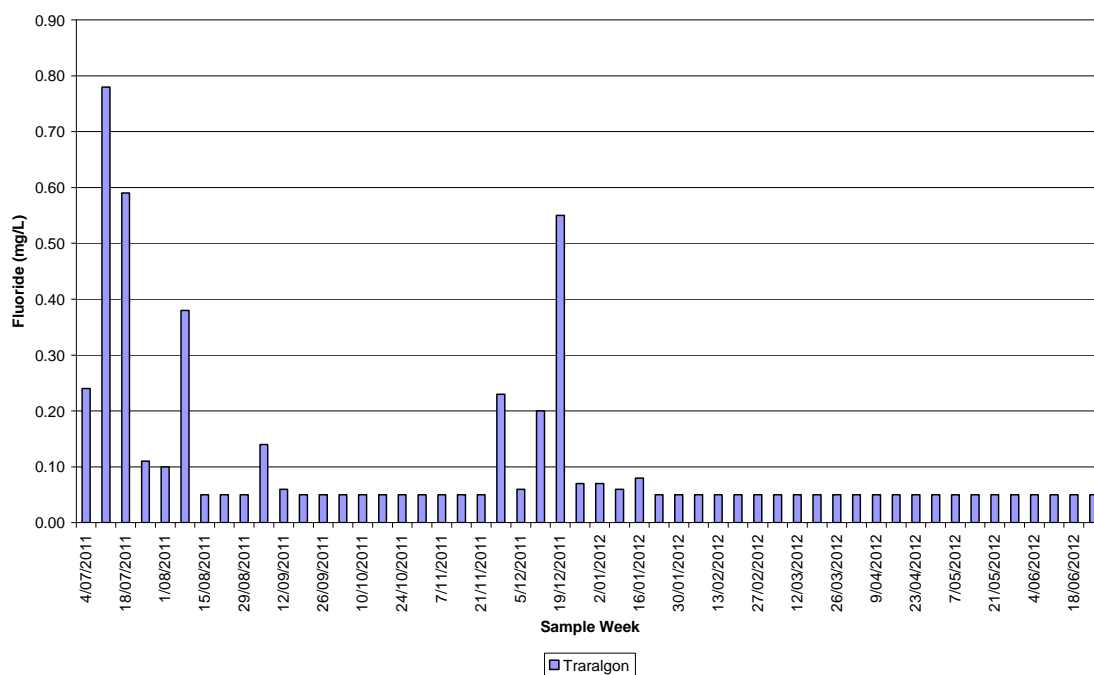
8.6.1.1 Actions taken in relation to non-compliance

All Gippsland Water sites achieved 100% compliance with this standard for the 2011-12 reporting period.

8.6.1.2 Localities which did not receive fluoridated water as a results of treatment plant issues and upgrades

The fluoride dosing system at the **Traralgon** water treatment plant was turned off within the reporting period between 15 September 2011 to 30 June 2012 due to issues with the delivery system and repairs to chemical containment bunding. During this period, non fluoridated water was supplied to the locality produced by the Traralgon water treatment plant as presented in the figure below.

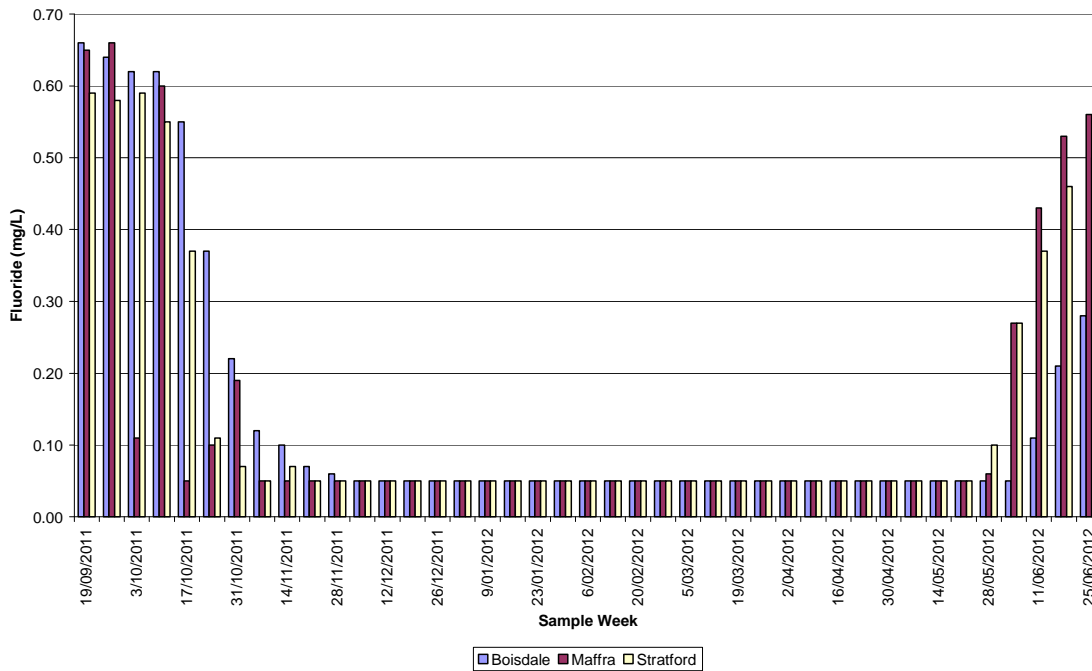
Figure 7: Fluoride (mg/L) for July 2011 - June 2012 for the localities supplied by Traralgon WTP



* - Note that the fluoride dosing system was not operating during the period 15 September 2011 to 30 June 2012.

The fluoride dosing system at the **Maffra** water treatment plant was turned off within the reporting period between 17 October 2011 to 11 June 2012 due to upgrades associated with the delivery, safety and monitoring systems. During this period, non fluoridated water was supplied to the localities produced by the Maffra water treatment plant as presented in the figure below.

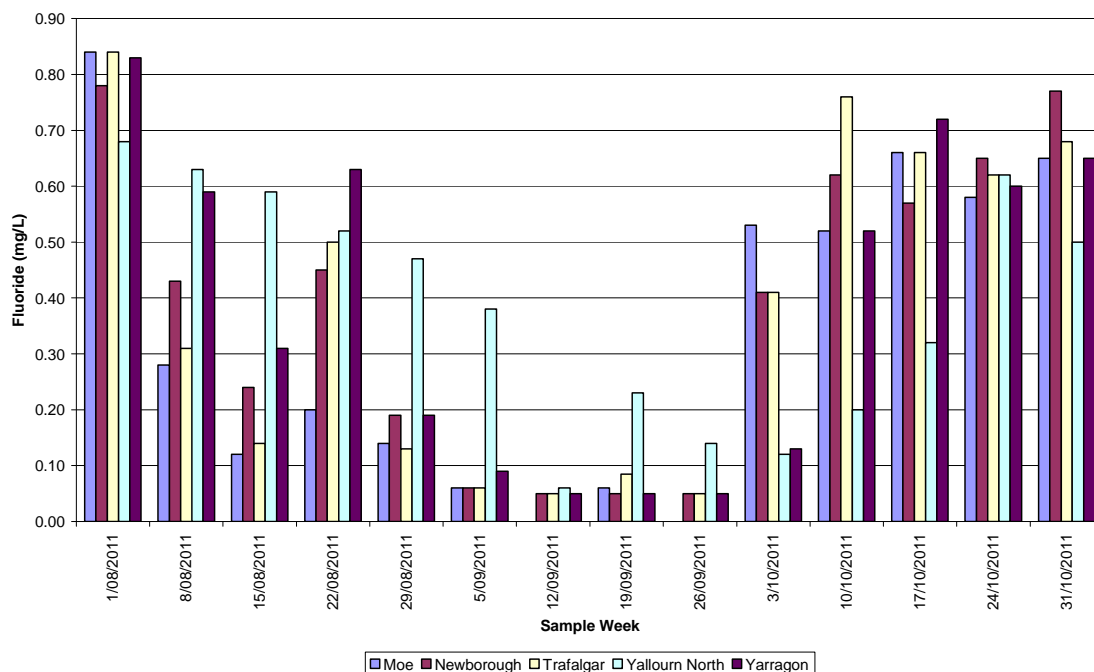
Figure 8: Fluoride (mg/L) for September 2011 – June 2012 for the localities supplied by Maffra WTP



* - Note that the fluoride dosing system was not operating during the period 17 October 2011 to 11 June 2012.

The fluoride dosing system at the **Moe** water treatment plant was turned off within the reporting period between 12 September to 29 September 2011, due to issues associated with the delivery systems. During this period, non fluoridated water was supplied to the localities produced by the Moe water treatment plant as presented in the figure below.

Figure 9: Fluoride (mg/L) for August 2011 – October 2011 for the localities supplied by Moe WTP



Since the fluoride product is supplied in Polyvinyl Alcohol (PVA) dissolvable bags at 5 of the 6 fluoridated water supply systems, PVA monitoring was undertaken in the reticulation systems of the following localities quarterly (3 monthly) between July 2011 to June 2012, to assess any product carry over from the fluoridation process. All Gippsland Water sites tested achieved compliance with the guideline limits for the 2011-12 reporting period.

Table 12: Polyvinyl Alcohol results for fluoridated systems in 2011-12

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)*
Moe	Monthly	4	<0.01
Morwell	Monthly	4	<0.01
Sale	Monthly	4	<0.01
Traralgon	Monthly	4	<0.01
Warragul	Monthly	4	<0.01

*Results of <0.01 mg/L are at the detection limit for this parameter.

8.7 WATER TREATMENT PROJECTS & PROGRAMS UNDERTAKEN

During the 2011-12 reporting period Gippsland Water undertook a number of works, programs or projects to ensure that continual improvements were made to ensure the ongoing provision of safe drinking water to its customers. These included:

- Ongoing water treatment plant filter upgrades and refurbishment program
- Preparation to install activated carbon at Seaspray WTP to reduce THM levels
- Ongoing treated water basin storage inspection and cleaning program
- Installation and upgrades of remote disinfection sites including installation of new site in Jumbuk water supply locality
- Initiation of water reticulation mains air scouring program
- Upgrades to fluoride dosing and monitoring systems at Traralgon and Maffra
- Installation of chemical delivery bunding for environmental protection at Morwell
- Commence review of water sample collection procedures

Figure 10: Jumbuk Water Supply Locality Remote Disinfection Site



Figure 11: Chemical Deliver Bunding Installed At Buckley's Hill Disinfection Site - Morwell



8.8 OTHER ALGAE, PATHOGEN, CHEMICAL OR SUBSTANCE NOT SPECIFIED THAT MAY POSE A RISK TO HUMAN HEALTH

8.8.1 Overall results

During the reporting period, the corporation monitored for the following health-related aspects of the drinking water supplied to customer taps. Table 13 lists the parameters and the frequency of samples taken across all localities, comparing the results to the ADWG and the recommended value.

Table 13: Other sampled parameter results for all localities in 2011-12

Parameter	Frequency of sampling	No. samples	Results According to ADWG values		
			Recommended value	Result	Locality
Nitrite	Weekly (3 Localities)	144	≤ 3 mg/L	All results below ADWG health guideline values with exception of mercury in Warragul WTP filtered water inlet to reservoir in March 2012 where a result of 0.0012mg/L was reported. No cause was identified for result. All subsequent reticulation monitoring was compliant	
Mercury	Quarterly	140	≤ 0.001 mg/L		
Chromium	Quarterly	140	≤ 0.05 mg/L		
Cadmium	Quarterly	140	≤ 0.002 mg/L		
Nitrate	Quarterly	140	≤ 50 mg/L		
Nickel	Annually	35	≤ 0.02 mg/L		

Monitoring for other parameters such as radiological, pesticides, protozoan organisms is conducted routinely. A complete list of raw water parameters monitored is contained in Appendix 1. Additional monitoring is performed on a risk basis and as the need arises.

The following table contains Blue Green Algae (BGA) monitoring undertaken across Gippsland Water storages based on visual and water quality triggers. Major raw water supply/storages are routinely monitored for BGA as part of the routine catchment monitoring program.

Table 14: Routine BGA monitoring for raw water supplies in 2011-12

Location	Jul '11	Aug '11	Sept '11	Oct '11	Nov '11	Dec '11	Jan '12	Feb '12	Mar '12	Apr '12	May '12	Jun '12
Maffra Weir					1			1				
Heyfield Raw Water Storage	1	1	1	1	1	1	1	1	1	1	1	1
Boolarra Raw Water Storage					1			1				
Thorpdale Raw Water Storage				1	1	1	1	1				
Neerim South Tarago Reservoir				1	1	1	1	1	1			
Rawson Amours Basin				1				1				
Blue Rock Lake	<i>As required (Southern Rural Water BGA Program)</i>											
Lake Glenmaggie	<i>As required (Southern Rural Water BGA Program)</i>											
Tarago Reservoir	<i>As required (Melbourne Water BGA Program)</i>											
Moondarra Surface	1	1	1	1	1	1	1	1	1	1	1	1
Moondarra Pipe line	1	1	1	1						1	1	1
Moondarra Upper reaches	<i>As required</i>											

8.8.2 Manganese

Manganese can be naturally present in either soluble or insoluble forms in water. When concentrations exceed the aesthetic guideline of 0.1 mg/L, manganese can create unacceptable tastes in water, as well as stain fixtures and laundry. Compliance is measured against the health guideline value of 0.5 mg/L in ADWG. Gippsland Water sites achieved 100% compliance against manganese guideline values.

Table 15: Manganese results for all localities in 2011-12

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0.001	<0.001	Yes
Boolarra	Monthly	12	0.032	0.002	Yes
Briagolong	Monthly	12	<0.001	<0.001	Yes
Churchill	Monthly	12	0.001	<0.001	Yes
Coongulla & Glenmaggie	Monthly	12	0.005	<0.001	Yes
Cowwarr	Monthly	12	0.008	<0.001	Yes
Drouin	Monthly	12	0.002	<0.001	Yes
Erica	Monthly	12	0.019	0.002	Yes
Heyfield	Monthly	12	0.014	0.003	Yes
Jumbuk	Monthly	12	0.002	<0.001	Yes
Maffra	Monthly	12	0.002	<0.001	Yes
Mirboo North	Monthly	12	0.001	<0.001	Yes
Moe	Monthly	12	0.019	0.002	Yes
Morwell	Monthly	12	0.003	<0.001	Yes
Neerim South	Monthly	12	0.005	0.002	Yes
Newborough	Monthly	12	0.002	<0.001	Yes
Noojee	Monthly	12	0.010	0.002	Yes
Rawson	Monthly	12	0.008	0.002	Yes
Rokeby & Buln Buln	Monthly	12	0.004	<0.001	Yes
Rosedale	Monthly	12	<0.001	<0.001	Yes
Sale/Wurruk	Monthly	12	0.003	<0.001	Yes
Seaspray	Monthly	12	0.005	<0.001	Yes
Stratford	Monthly	12	0.002	<0.001	Yes
Thorpdale	Monthly	12	0.035	0.002	Yes
Toongabbie	Monthly	12	<0.001	<0.001	Yes
Trafalgar	Monthly	12	0.020	0.002	Yes
Traralgon	Monthly	12	0.004	<0.001	Yes
Traralgon South & Hazelwood North	Monthly	12	0.002	<0.001	Yes
Tyers & Glengarry	Monthly	12	0.004	<0.001	Yes
Warragul	Monthly	12	0.010	<0.001	Yes
Warragul South	Monthly	12	0.001	<0.001	Yes
Willow Grove	Monthly	12	0.008	0.002	Yes
Yallourn North	Monthly	12	0.003	<0.001	Yes
Yarragon	Monthly	12	0.042	<0.001	Yes
Yinnar	Monthly	12	<0.001	<0.001	Yes

8.8.3 Lead

Lead can be present in drinking water as a result of dissolution from natural sources or from household plumbing. Based on health considerations in the ADWG, concentrations of lead in drinking water should not exceed 0.01 mg/L. Gippsland Water sites achieved 100% compliance against lead guideline values.

Table 16: Lead results for all localities in 2011-12

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Quarterly	4	<0.001	<0.001	Yes
Boolarra	Quarterly	4	<0.001	<0.001	Yes
Briagolong	Quarterly	4	<0.001	<0.001	Yes
Churchill	Quarterly	4	<0.001	<0.001	Yes
Coongulla & Glenmaggie	Quarterly	4	<0.001	<0.001	Yes
Cowwarr	Quarterly	4	<0.001	<0.001	Yes
Drouin	Quarterly	4	<0.001	<0.001	Yes
Erica	Quarterly	4	<0.001	<0.001	Yes
Heyfield	Quarterly	4	<0.001	<0.001	Yes
Jumbuk	Quarterly	4	<0.001	<0.001	Yes
Maffra	Quarterly	4	<0.001	<0.001	Yes
Mirboo North	Quarterly	4	<0.001	<0.001	Yes
Moe	Quarterly	4	<0.001	<0.001	Yes
Morwell	Quarterly	4	<0.001	<0.001	Yes
Neerim South	Quarterly	4	<0.001	<0.001	Yes
Newborough	Quarterly	4	<0.001	<0.001	Yes
Noojee	Quarterly	4	<0.001	<0.001	Yes
Rawson	Quarterly	4	<0.001	<0.001	Yes
Rokeby & Buln Buln	Quarterly	4	<0.001	<0.001	Yes
Rosedale	Quarterly	4	<0.001	<0.001	Yes
Sale/Wurruk	Quarterly	4	<0.001	<0.001	Yes
Seaspray	Quarterly	4	<0.001	<0.001	Yes
Stratford	Quarterly	4	<0.001	<0.001	Yes
Thorpdale	Quarterly	4	<0.001	<0.001	Yes
Toongabbie	Quarterly	4	0.003	<0.001	Yes
Trafalgar	Quarterly	4	<0.001	<0.001	Yes
Traralgon	Quarterly	4	<0.001	<0.001	Yes
Traralgon South & Hazelwood North	Quarterly	4	<0.001	<0.001	Yes
Tyers & Glengarry	Quarterly	4	<0.001	<0.001	Yes
Warragul	Quarterly	4	<0.001	<0.001	Yes
Warragul South	Quarterly	4	0.002	<0.001	Yes
Willow Grove	Quarterly	4	<0.001	<0.001	Yes
Yallourn North	Quarterly	4	<0.001	<0.001	Yes
Yarragon	Quarterly	4	<0.001	<0.001	Yes
Yinnar	Quarterly	4	<0.001	<0.001	Yes

8.8.4 Copper

Copper is present in raw water supplies at very low concentrations. Copper can be found in higher concentrations in drinking water as a result of corrosion of copper pipes and fittings. Based on health considerations in the ADWG concentrations of copper in drinking water should not exceed 2 mg/L. The aesthetic guideline value is 1 mg/L. Gippsland Water sites achieved 100% compliance against both copper guideline values.

Table 17: Copper results for all localities in 2011-12

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Quarterly	4	0.008	0.005	Yes
Boolarra	Quarterly	4	0.011	0.004	Yes
Briagolong	Quarterly	4	0.005	0.002	Yes
Churchill	Quarterly	4	0.005	0.001	Yes
Coongulla & Glenmaggie	Quarterly	4	0.008	<0.001	Yes
Cowwarr	Quarterly	4	0.033	<0.001	Yes
Drouin	Quarterly	4	0.018	0.001	Yes
Erica	Quarterly	4	0.057	0.005	Yes
Heyfield	Quarterly	4	0.034	0.008	Yes
Jumbuk	Quarterly	4	0.029	0.003	Yes
Maffra	Quarterly	4	0.024	0.006	Yes
Mirboo North	Quarterly	4	0.017	0.007	Yes
Moe	Quarterly	4	0.057	0.003	Yes
Morwell	Quarterly	4	0.025	0.004	Yes
Neerim South	Quarterly	4	0.035	0.023	Yes
Newborough	Quarterly	4	0.003	0.003	Yes
Noojee	Quarterly	4	0.016	0.004	Yes
Rawson	Quarterly	4	0.031	0.01	Yes
Rokey & Buln Buln	Quarterly	4	0.005	<0.001	Yes
Rosedale	Quarterly	4	0.02	0.003	Yes
Sale-Wurruk	Quarterly	4	0.003	<0.001	Yes
Seaspray	Quarterly	4	0.001	<0.001	Yes
Stratford	Quarterly	4	0.019	0.001	Yes
Thorpdale	Quarterly	4	0.019	0.002	Yes
Toongabbie	Quarterly	4	0.11	0.002	Yes
Trafalgar	Quarterly	4	0.008	<0.001	Yes
Traralgon	Quarterly	4	0.026	0.002	Yes
Traralgon South & Hazelwood North	Quarterly	4	0.007	<0.001	Yes
Tyers & Glengarry	Quarterly	4	0.015	0.004	Yes
Warragul	Quarterly	4	0.002	<0.001	Yes
Warragul South	Quarterly	4	0.013	<0.001	Yes
Willow Grove	Quarterly	4	0.023	<0.001	Yes
Yallourn North	Quarterly	4	0.004	0.002	Yes
Yarragon	Quarterly	4	0.008	<0.001	Yes
Yinnar	Quarterly	4	0.003	<0.001	Yes

8.9 AESTHETICS

8.9.1 pH results

In addition to the monitoring of parameters to determine compliance against the SDWA regulations, pH is routinely monitored in the reticulation system. The ADWG suggest that the drinking water be between pH 6.5 and pH 8.5. The pH results for all towns are provided below.

Table 18: pH results for all localities in 2011-12

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)
Boisdale	Weekly	52	7.8	7.5
Boolarra	Weekly	52	7.6	6.7
Briagolong	Weekly	52	7.6	7.1
Churchill	Weekly	52	7.8	7.0
Coongulla & Glenmaggie	Weekly	52	9.2	7.3
Cowwarr	Weekly	52	8.6	7.2
Drouin	Weekly	52	8.4	6.6
Erica	Weekly	52	9.0	6.4
Heyfield	Weekly	52	7.6	7.0
Jumbuk	Weekly	52	7.7	7.2
Maffra	Weekly	52	7.7	6.6
Mirboo North	Weekly	52	8.6	6.9
Moe	Weekly	52	7.8	6.8
Morwell	Weekly	52	7.9	6.9
Neerim South	Weekly	52	7.3	6.6
Newborough	Weekly	52	8.4	6.8
Noojee	Weekly	52	7.6	7.2
Rawson	Weekly	52	7.5	6.9
Rokey & Buln Buln	Weekly	52	8.0	6.0
Rosedale	Weekly	52	8.7	7.2
Sale/Wurruk	Weekly	52	8.6	7.6
Seaspray	Weekly	52	9.2	7.5
Stratford	Weekly	52	7.7	7.0
Thorpdale	Weekly	52	8.0	7.0
Toongabbie	Weekly	52	7.7	7.0
Trafalgar	Weekly	52	7.9	6.9
Traralgon	Weekly	52	7.5	6.9
Traralgon South & Hazelwood North	Weekly	52	7.6	6.9
Tyers & Glengarry	Weekly	52	8.1	6.8
Warragul	Weekly	52	8.4	6.4
Warragul South	Weekly	52	9.0	6.7
Willow Grove	Weekly	52	7.4	6.8
Yallourn North	Weekly	52	8.3	7.0
Yarragon	Weekly	52	9.1	7.0
Yinnar	Weekly	52	8.0	7.1

Some systems have experienced elevated pH results, as a result of long residence of water in the reticulation, cement-lined pipes in parts of the reticulation and reduced flushing programs due to the permanent water saving rules in place.

ADWG states that cement mortar lined pipes can significantly increase the pH and a value up to 9.2 may be tolerated provided monitoring indicates no deterioration in the microbiological quality.

8.9.2 Iron results

Iron can become apparent in taste in water at about 0.3 mg/L and above. High concentrations can give water a rust-brown appearance and cause staining of laundry and plumbing fittings. Based on aesthetic considerations the concentration in the ADWG, of iron in drinking water should not exceed 0.3 mg/L however no health-based guideline value has been set for iron.

Table 19: Iron results for all localities in 2011-12

Locality	Frequency of Sampling	No. of Samples	Max (mg/L)	Min (mg/L)	Complying (Yes/No)
Boisdale	Monthly	12	0.02	<0.01	Yes
Boolarra	Monthly	12	0.04	<0.01	Yes
Briagolong	Monthly	12	0.02	<0.01	Yes
Churchill	Monthly	12	0.03	<0.01	Yes
Coongulla & Glenmaggie	Monthly	12	0.04	<0.01	Yes
Cowwarr	Monthly	12	0.07	<0.01	Yes
Drouin	Monthly	12	0.03	<0.01	Yes
Erica	Monthly	12	0.10	<0.01	Yes
Heyfield	Monthly	12	0.04	<0.01	Yes
Jumbuk	Monthly	12	0.16	0.01	Yes
Maffra	Monthly	12	0.02	<0.01	Yes
Mirboo North	Monthly	12	0.06	<0.01	Yes
Moe	Monthly	12	0.02	<0.01	Yes
Morwell	Monthly	12	0.06	<0.01	Yes
Neerim South	Monthly	12	0.06	0.02	Yes
Newborough	Monthly	12	0.03	<0.01	Yes
Noojee	Monthly	12	0.08	<0.02	Yes
Rawson	Monthly	12	0.07	0.03	Yes
Rokeby & Buln Buln	Monthly	12	0.03	<0.01	Yes
Rosedale	Monthly	12	0.02	<0.01	Yes
Sale/Wurruk	Monthly	12	0.05	<0.01	Yes
Seaspray	Monthly	12	0.24	0.02	No
Stratford	Monthly	12	0.02	<0.01	Yes
Thorpdale	Monthly	12	0.09	0.02	Yes
Toongabbie	Monthly	12	0.02	<0.01	Yes
Trafalgar	Monthly	12	0.02	<0.01	Yes
Traralgon	Monthly	12	0.04	<0.01	Yes
Traralgon South & Hazelwood North	Monthly	12	0.05	<0.01	Yes
Tyers & Glengarry	Monthly	12	0.02	<0.01	Yes
Warragul	Monthly	12	0.04	<0.01	Yes
Warragul South	Monthly	12	0.02	<0.01	Yes
Willow Grove	Monthly	12	0.05	<0.01	Yes
Yallourn North	Monthly	12	0.03	<0.01	Yes
Yarragon	Monthly	12	0.02	<0.01	Yes
Yinnar	Monthly	12	0.11	0.02	Yes

8.10 ANALYSIS OF RESULTS

8.10.1 Comparison to previous years

The water quality standards required under the SDWR have been represented as trend data over the previous three financial years. This information allows for a comparison of data for the major towns.

An analysis by the percentage of water sampling localities where the drinking water complied with each of Schedule 2 of the SDWR parameters, over the past three reporting periods, is shown below. The table also shows an analysis of the percentage of customers supplied with drinking water that complied with the standards.

Table 20: Compliance by locality and population

Parameter	Percentage by Locality			Percentage by Population		
	2009-2010	2010-2011	2011-2012	2009-2010	2010-2011	2011-2012
Aluminium	97.14%	100%	100%	99.77%	100%	100%
Chloroacetic Acid	100%	100%	100%	100%	100%	100%
Dichloroacetic Acid	100%	100%	100%	100%	100%	100%
<i>E. coli</i>	100%	100%	97%	100%	100%	99.74%
Trichloroacetic Acid	100%	100%	100%	100%	100%	100%
Trihalomethanes	100%	100%	100%	100%	100%	100%
Turbidity	100%	100%	100%	100%	100%	100%

Table 21: Risk Management Plan Opportunity for Improvements

	Auditable Element	Grading	Evidence Considered
1	Risk Management Activities		
1.2	Identification of risk SDWA 9(1)(b)	Compliant OFI 1 Breadth: Yes Effective: Yes	<p>Factors considered for this auditable element</p> <p>To assess compliance with the requirements of this auditable element, we sought evidence that:</p> <ul style="list-style-type: none"> • The risks considered in the RMP were reasonably consistent with the system description and our experience of risks that are generally encountered in similar systems; • The RMP included risks that must be considered under regulation 6(2); and • A recognised approach or framework has been applied to identify the risks to the system. <p>Compliance Assessment</p> <p>OFI 1: We recommend that the 2000 catchment assessment be updated.</p> <p>Gippsland Water Action: A review of the 2000 catchment risk assessment is currently being undertaken. This review will incorporate the following elements:</p> <ul style="list-style-type: none"> • develop a GIS based catchment risk assessment system. (2011/12); • collect and import data layers into the GIS (2012); • commence risk assessment on catchment basis (2012-2013).. <p>Current Status</p> <ul style="list-style-type: none"> • gap analysis has been undertaken and gaps in GIS data identified; • an assessment of the existing data has been undertaken, which indicates that suitable (partial) data already exists at GW. This data has now been validated for use; • prioritising spend to address the data gaps identified, based on Risk Management requirements and high risk catchment analysis (Cannon 2000); • determining gaps around catchment risk and use; • expanding catchment to include areas required which are outside the GW service area; • data initially collected is now being utilised as part of the GW planning referral processes; • collect and import data layer Gaps into the GIS (2012); • commence risk assessment on catchment basis (2012-2013). <p>GW Status</p> <p>Ongoing</p>
1.4	Development and implementation of	Compliant	Factors considered for this auditable element

	Auditable Element	Grading	Evidence Considered
	preventive strategies SDWA 9(1)(d) Reg 6(1)(b) Audit Guidance Note on reg 6(1)(b) p 24 Audit Guidance Note Appendix 7	OFI 2 OFI 3 OFI 4 OFI 5 OFI 6 OFI 7 Breadth: Yes Effective: Yes	<p>Our reading of the Audit Guidance Note suggests that there is a degree of duplication between the requirements of this auditable element and auditable element 2.3. We have taken the approach that this auditable element assesses whether activities or measures were developed and undertaken to manage risks and whether these activities or measures would be expected to be effective. The effectiveness criterion suggests to us that an assessment of verification should be included. Auditable element 2.3 will assess whether these measures were included as contents of the RMP. As a consequence of our interpretation, we have included the assessment of compliance with the requirements of Appendix 7 of the Audit Guidance Note in this auditable element.</p> <p>Therefore, to assess compliance with the requirements of this auditable element, we sought evidence that:</p> <ul style="list-style-type: none"> • appropriate preventive measures have been developed and put in place to manage identified risks; • the measures in the plan would be expected to effectively manage the identified risks. <p>Compliance Assessment</p> <p>Compliance Grading</p> <p>Taking the above evidence into account, we consider that Gippsland Water is compliant with this auditable element, that the element is being implemented across relevant parts of the organisation (breadth) and that the element is effective in achieving the desired effect or outcome (effective).</p> <p>OFI 2: We recommend that Gippsland Water should resume consultation with aerial spray operators to be better informed when hazardous chemicals are being used in catchment areas.</p> <p>OFI 3: We recommend that Gippsland Water better define the circumstances in which the Planning Group takes advice when undertaking assessments of planning permits in catchment areas and develop a process to follow-up with Local Government authorities to check on the implementation of Gippsland Water assessments.</p> <p>OFI 4: We recommend that Gippsland Water review, interpret and implement the Department of Health expectations expressed in Appendix 7 of the Audit Guidance Note.</p> <p>OFI 5: For critical limit values, ensure alignment between the PMP and WTP Risk Control Point Spreadsheet critical limits and the values that are entered at plants.</p> <p>OFI 6: Review the need for installing additional chlorine analysers and/or moving the sampling points for the existing chlorine analysers to enable determination, operational monitoring and demonstration of the primary kill CT.</p> <p>OFI 7: It is recommended that the contractual turnaround and notification times be reviewed and possibly tightened up, at least for a selected subset of parameters and sample locations, to ensure that best practicable turnaround and notification times are in place where appropriate.</p>

	Auditable Element	Grading	Evidence Considered
			<p>Gippsland Water Action (OFI 2):</p> <p>Gippsland Water has initiated contact with plantation company's regarding herbicide program notification process. Gippsland Water will reactivate a relationship with known horticultural spray operators for horticultural spray activities in catchments. It is anticipated that this process will again be operational by December 2012.</p> <p>Gippsland Water Action (OFI 3):</p> <p>Gippsland Water will develop an internal procedure/guidelines which define the circumstances under which the Planning Group seek advice (December 2012).</p> <p>Efforts to develop the process of follow-up with Local Government and SRW, as a co-referral authority will continue.</p> <p>Gippsland Water Action (OFI 4):</p> <p>Gippsland Water is currently undertaking the following actions:</p> <ul style="list-style-type: none"> • a review of currently being undertaken with respect to existing alarms, future alarms and site improvements. The outcomes of this review will assist in the development of the site specific improvement plans as well as the development of Gippsland Water's Water Plan #4. (August 2012) • Gippsland Water intends to undertake further discussions with the Department with regard to the interpretation of the requirements as detailed in Appendix #7. (December 2012) • the implementation of a number of the elements has already occurred, with any remaining items detailed and scheduled in site specific Site Improvement Plans. The schedule has been develop in consideration of the Risk Management Plans and Catchment Risk Assessments. (On-going) <p>Gippsland Water Action (OFI 5):</p> <p>Gippsland Water is currently undertaking a document/system review with regard to the alignment of the Process Management Plans, Critical Limits and Control System and Operating Systems (including SCADA). This process is due for completion in September 2012.</p>

	Auditable Element	Grading	Evidence Considered
			<p>Gippsland Water Action (OFI 6):</p> <p>The requirement to install additional chlorine instrumentation will be assessed at each Water Treatment Plant. Equipment requirement will be assessed on a risk basis, with required works added to the individual Site Specific Improvement Plan, as discussed under OFI 4.</p> <p>Gippsland Water Action (OFI 7):</p> <p>The current Analytical Services Contract (GW345) expires in October 2014.</p> <p>Gippsland Water has reviewed and updated the notification process to specifically include fluoride in addition to the selected subset of parameters monitored as per schedule 2 of the Safe Drinking Water Regulations 2005.</p> <p>Gippsland Water assesses the contractor performance on an on-going basis by monitoring the turn around times and exceedance notifications provided as key performance indicators. This is reported on a monthly basis, with discussions held with the contractor regularly. The contract turnaround times and exceedance notifications in place were developed as part of the contract performance requirements.</p> <p>Gippsland Water consider the turnaround times and exceedance notifications currently in place are the best practicable to meet our operational, performance and regulatory requirements.</p> <p>Any issues relating to current performance are dealt with through the contract framework in place. The turnaround times stipulated in the contract were specifically developed around the SDWA notification requirements in mind and the performance of the contractor to date has exceeded these requirements.</p> <p>Gippsland Water will continue to monitor performance until the end of the contract period (October 2014). Ongoing review of exceedance notifications and turnaround times will be undertaken based on best practice and water industry standards with contract variations issued where deemed necessary.</p> <p>Gippsland Water Status</p> <p>Ongoing</p>
3.2	(b) The risks arising from an incident or event that may cause the organisms,	Compliant OFI 8 Breadth:	<p>Factors considered for this auditable element</p> <p>To assess compliance with the requirements of this auditable element, we sought evidence that the risks from an incident or a transfer have been addressed</p>

	Auditable Element	Grading	Evidence Considered
	<p>substances and matters referred to in paragraph (a) to enter or be present in the water supplied by the Water Storage Manager;</p> <p>Reg 6(2)(b)</p> <p>(c) The risk of transfer of the organisms, substances and matters referred to in paragraph (a) in water being supplied by the Water Storage Manager.</p> <p>Reg 6(2)(c)</p>	<p>Yes</p> <p>Effective:</p> <p>Yes</p>	<p>Compliance Assessment</p> <p>The risk assessment for water quality considers all risks associated with water supplied to WTPs. This includes risks arising from an incident or event that may cause hazards to be present in or transferred in water provided by a water storage manager.</p> <p>We have one issue with the integration of the water quality risk management process into the general ISO 14001 system. The result of this integration is that the term Aspects and Impacts have been made synonymous with the terms Hazards and Risks, respectively. One consequence of this integration is that some of the detail normally found in drinking water quality risk assessments is not explicitly identified. For instance, for many of the hazards identified at section 6(2)(a) of the SDWR, e.g. from radiological parameters, are not specifically and explicitly assessed for each water supply system. We have included an opportunity for improvement to address this matter.</p> <p>Compliance Grading</p> <p>Taking the above evidence into account, we consider that Gippsland Water is compliant with this auditable element, that the element is being implemented across relevant parts of the organisation (breadth) and that the element is effective in achieving the desired effect or outcome (effective).</p> <p>OFI 8 – We recommend that Gippsland Water revise the system specific risk assessments to explicitly include the hazards identified under section 6(2)(a) of the SDWR.</p> <p>GW Action (OFI 8):</p> <p>Gippsland Water have updated the Drinking Water Quality Manual and the Risk (Aspect) /Hazard (Impact) register to expand and explicitly include the hazards identified under section 6(2)(a) of the SDWR.</p> <p>GW Status</p> <p>Complete April 2012</p>

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Figure 12: Safe Drinking Water Regulations Risk Management Plan Audit Certificate March 2012



Schedule 1

Regulation 6

Safe Drinking Water Regulations 2005

RISK MANAGEMENT PLAN AUDIT CERTIFICATE

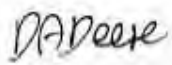
Certificate Number: 66

Audit period: 1st April 2010 to 29th March 2012

To: Lynley Keene, Central Gippsland Region Water Authority, Hazelwood Road,
PO Box 348, Traralgon, 3844.

Australian Business Number (ABN): 75 830 750 413

I, Dr Daniel Deere, after conducting a risk management plan audit of the water supplied by Central Gippsland Region Water Authority, am of the opinion that Central Gippsland Region Water Authority 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: _____

Date: 30th April 2012

Page 1 of 1

9 UNDERTAKINGS UNDER SECTION 30 OF THE SDWA

Gippsland Water has no undertakings relevant to the 2011-12 reporting year.

10 EXEMPTIONS UNDER SECTION 20 OF THE SDWA

Gippsland Water has no exemptions relevant to the 2011-12 reporting year.

11 VARIATION IN AESTHETIC STANDARDS

Gippsland Water has no variations in aesthetic standards sought under section 19 of the SDWA.

12 REGULATED WATER

Gippsland Water does not manage any regulated water supplies.

13 GLOSSARY OF TERMS

ADWG	<i>Australian Drinking Water Guidelines 2004</i> prepared by National Health and Medical Research Council.
DH	Department of Health formerly known as DHS (Department of Human Services)
Detection limit	The lowest concentration of analytical parameter in the sample that can be detected by the process laboratory.
Drinking Water Supply systems	Towns supplied with water from a common water source (WTP, supply mains and reticulation pipe-work).
<i>E. coli</i>	<i>Escherichia coli</i> .
Locality	Under the SDWR, a specified area that is supplied with drinking water by a water supplier.
mg/L	Milligram per litre.
NTU	Nephelometric Turbidity Units.
Properties	A registered customer connection to the drinking water supply.
RMP	Risk Management Plan
SCADA system	Supervisory control and data acquisition system
SDWA	<i>Safe Drinking Water Act 2003</i> Act No.46/2003.
SDWR	Safe Drinking Water Regulations 2005 S.R No.88/2005.
Source Water	Raw water supply for town, prior to treatment.
THM	Trihalomethane.
WTP	Water Treatment Plant.
100mL	100 millilitres.
<	Less than.
>	Greater than.
≤	Less than or equal to.
≥	Greater than or equal to.
<1 MPN/100ml	Reporting for <i>E. coli</i> where the detection limit is less than 1 most probable number of <i>E. coli</i> organism per 100ml.

14 FURTHER INFORMATION

Customers and members of the public may access drinking water quality data by contacting Gippsland Water on 1800 066 401 or visiting www.gippswater.com.au.

15 REFERENCES

National Health and Medical Research Council. *Australian Drinking Water Guidelines 2011*.
Web address www.nhmrc.gov.au

Department of Health *2011-12 Annual report format - Drinking Water Regulation Guidance Note 12 June 2010*

Safe Drinking Water Act 2003 No.46/2003

Safe Drinking Water Regulations 2005 S.R No.88/2005

Code of Practice for Fluoridation of Drinking Water Supplies *Health (Fluoridation) Act 1973* Department of Human Services (March 2009)

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APPENDIX 1: RAW WATER MONITORING

Locality	Source water	Nature of Other Raw Water Monitoring Programs		
		Weekly/Fortnightly	Monthly	Annual / Quarterly
Morwell Churchill Yinnar Jumbuk Traralgon South / Hazelwood North	Moondarra Res via Tyers River	Physicals <ul style="list-style-type: none"> • Absorbance (254nm) • Colour True (465nm) • Dissolved Oxygen • SUVA (245nm) • Turbidity • Electrical Conductivity @25°C • pH 	Physicals <ul style="list-style-type: none"> • Alkalinity Bicarbonate as CaCO₃ • Alkalinity Total as CaCO₃ • Dissolved Organic Carbon (DOC) • Total Organic Carbon (TOC) • Total Dissolved Solids (TDS) • SUVA (245nm) • Chlorophyll a 	Physicals* <ul style="list-style-type: none"> • Total Dissolved Solids (TDS) • Suspended Solids
Traralgon				
Tyers/Glengarry Rosedale Cowwarr Toongabbie				
Maffra	Macalister River	Microbiological <ul style="list-style-type: none"> • <i>Escherichia coli</i> • Total Coliforms • Heterotrophic Plate Count 	Chemical Inorganic <ul style="list-style-type: none"> • Ammonia as N • Bromide • Chloride • Fluoride • Nitrate as N • Nitrite as N • Organic Nitrogen as N • Phosphorous, Reactive as P • Phosphorous Total as N • Sulphate • Total Kjeldahl Nitrogen as N • Total Nitrogen as N 	Chemical Inorganic <ul style="list-style-type: none"> • Cyanide • Dissolved Organic Carbon (DOC) • Total Organic Carbon (TOC) • Bromide • Fluoride
Stratford				
Boisdale				
Boolarra	Walkley Creek O'Gradys Creek (supplementary supply)			
Briagolong	Bore (Freestone Creek Aquifer)			
Warragul (including Nilma, Darnum, Drouin East)	Pederson Weir (Tarago River) Tarago Reservoir - (supplementary supply)			Metals* <ul style="list-style-type: none"> • Aluminium Total • Arsenic Total • Selenium • Cadmium Total • Copper Total • Lead Total • Mercury • Zinc Total
Warragul South				
Drouin				
Rokeby/Buln Buln				
Coongulla/ Glenmaggie	Macalister River			Pesticides, Herbicides and Chemical Organics** <ul style="list-style-type: none"> • 2,4,5 T (Herbicide) • 2,4,5 TP (Silvex) • 2,4,6- T • 2,4 D • 2,4 DB • Aldrin • Ametryn • Atrazine • BHC (beta) • BHC (delta) • Bifenthrin

Locality	Source water	Nature of Other Raw Water Monitoring Programs		
		Weekly/Fortnightly	Monthly	Annual / Quarterly
Rawson	Trigger Creek		Metals <ul style="list-style-type: none"> Aluminium Total Arsenic Total Calcium Total Cadmium Total Copper Total Iron Total Iron Soluble Lead Total Mercury Potassium Magnesium Manganese Total Manganese Soluble Selenium Zinc Total Chlorophenols (Sale Bores Only) <ul style="list-style-type: none"> 2,3,4,5 Tetrachlorophenol 2,3,5,6 Tetrachlorophenol 2,4-Dichlorophenol 2,6-Dichlorophenol 2-Chlorophenol 4-Chloro-3-Methylphenol Total Phenols (Halogenated) Pentachlorophenol 2,4,5-Trichlorophenol 2,4,6 Trichlorophenol 	<ul style="list-style-type: none"> Chlordane (alpha) Chlordane (gamma) Chloropyrifos Chlopyralid Coumaphos Cyfluthrin Cypermethrin DDD DDE DDT Deltamethrin Demeton-S Diazinon Dicamba Dichlorprop Dichlorvos Deildrin Dinoseb Endosulfan (alpha) Endosulfan (beta) Endosulfan Sulphate Eldrin Eldrin aldehyde Endrin Ketone ENP Fensulfothion Fenthion Fenvalerate HCB Heptachlor Heptachlor Epoxide Haxazinone Lindane Malathion MCPA MCPB Mecoprop Methoxychlor
Erica				
Heyfield	Thomson River			
Mirboo North	Little Morwell River			
Moe	Tanjil River and Narracan Creek			
Newborough				
Yallourn North				
Trafalgar				
Yarragon				
Neerim South	Tarago River			
Noojee				
Sale/Wurruk	Bore (Boisdale Aquifer)			
Seaspray	Merrimans Creek			
Thorpdale	Easterbrook Creek			
Willow Grove	Tanjil River			

Locality	Source water	Nature of Other Raw Water Monitoring Programs		
		Weekly/Fortnightly	Monthly	Annual / Quarterly
				<ul style="list-style-type: none"> • Monocrotophos • Parathion • Permethrin • Phorate • Picloram • Premeton • Prometryn • Propazine • Prophos • Ronnel (Fenchlorfos) • Simazine • Simetryn • Stirofos • Terbutylazine • Terbutryn • Tetraethyldithiopyrphos • Trichlorinate • Tricopyr • Tukuthion <p><u>Radiological</u></p> <ul style="list-style-type: none"> • Gross Alpha Activity • Gross Beta Activity <p><u>Microbiological</u></p> <ul style="list-style-type: none"> • <i>Cryptosporidium spp</i> • <i>Giardia spp</i>

*Reduced frequency of monitoring in some catchments based on risk profile

** Note all Pesticides, Herbicides and Chemical Organics results were within recommended ADWG limits

Not all parameters were measured at all localities or source waters.

Purpose of Monitoring - Risk Management within Catchment and Raw Water Supply Systems

Comprehensiveness (Frequency) – Weekly, Fortnightly, Monthly, Quarterly and Annual Monitoring or as Risks Identified