Annual Drinking Water Quality Report

2023-24

South Gippsland Water

START SAFE
WORK SAFE
HOME SAFE

Acknowledgement of Traditional Owners

South Gippsland Water proudly acknowledges Aboriginal and Torres Strait Islander peoples as Australia's first inhabitants and Traditional Owners. Our operations span the Traditional Lands of the Bunurong people of the South-Eastern Kulin Nation and the Brataualung people of the Gunaikurnai Nation. We acknowledge and honour the Bunurong and Gunaikurnai as the original custodians of the land and waterways on which we rely.

We pay our deepest respects to Elders, past and present, as well as to those emerging. We acknowledge the enduring cultural, social, and spiritual connections that Aboriginal and Torres Strait Islander people maintain with Country. We recognise and value that the Traditional Owner groups have cared for and protected the lands, waterways, and seas to which they are connected for thousands of generations.

In the spirit of reconciliation, we remain committed to working in partnership with the Bunurong and Gunaikurnai peoples to ensure their ongoing contribution to the future of the water management landscape while maintaining their cultural and spiritual connections.

This artwork is proudly featured on our Yarram Water Tower. It was designed by Gunaikurnai Elder Sandra Patten. It as a visual expression of 'Sitting On Country' where she feels at home and connected.

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1 Introduction from the Managing Director

I am pleased to present South Gippsland Water's annual drinking water quality report for the year ending 30 June 2024. This report fulfills our obligations under section 26 of the *Safe Drinking Water Act 2003* (the Act) by providing a comprehensive overview of our water quality performance and management practices.

At South Gippsland Water, our commitment to water quality is unwavering. We maintain a robust drinking water management system aligned with the framework provided in the *Australian Drinking Water Guidelines*[1]. The system oversees all aspects of safe drinking water supply, including water treatment, incident response, and operational improvements.

Integrated into our drinking water management system is a risk-based, catchment-to-tap monitoring program. The program ensures that the water we supply meets legislative requirements of the Act and associated Safe Drinking Water Regulations 2015 (the Regulations).

Based on the results of the 2023–24 monitoring program, the majority of localities served by South Gippsland Water received water fully compliant with standards prescribed in the Regulations. Through routine monitoring on 2 January 2024, we recorded three non-compliant results with respect to the drinking water quality standard for *Escherichia coli* (*E. coli*). The results related to low-level *E. coli* detections for two samples collected from Poowong and one from Nyora.

Although the definitive cause of the detections remains unclear, torrential rainfall on 26 December (Boxing Day) 2023 is believed to have been a contributing factor. As *E. coli* can be an indicator of contamination, a boil water advisory (BWA) was issued for Poowong, Nyora, and the connected town of Loch in response to these detections. This precaution ensured public health protection while corrective actions were implemented. We apologise for the inconvenience to our customers in these towns and thank them for their patience and support.

In response to the incident, we have taken measures to prevent similar events in the future. This includes improving drainage at the Poowong clear water storage basin and other areas of our supply systems. Additionally, the experience has provided us with valuable insights that will enhance our emergency management plans, resource management, and customer communications. We are committed to applying these learnings to further improve our operations, safeguard water quality, and minimise inconvenience to customers through emergency events.

Another important aspect of our response to this incident was the awarding of the South Gippsland Water Community Resilience Grant of $10,000. The grant is offered as a gesture of good faith, signifying our commitment to customers and service standards in the wake of incidents. Community organisations in Poowong, Loch, and Nyora were invited to apply, with four applications being received. In August, I had the pleasure of presenting the grant to the Poowong Consolidated School, which plans to use it to for purchasing a generator. The region has been plagued by power blackouts in recent years, some extending for several days. A generator will not only help ensure continuity of education for students but allow the school infrastructure to be used by the broader community in times of need.

1 NHMRC, NRMMC (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy.* National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra

The Boxing Day rain also challenged our Fish Creek and Toora water treatment plants, with source waters becoming highly turbid. Through diligent management, drinking water quality remained uncompromised for these supplies. We extend our thanks to the Fish Creek community for responding to our request to reduce non-essential water usage in the immediate aftermath of the torrential rain. This cooperation helped buy time for operators to make necessary adjustments to treatment plant operations and mitigate the effects of the change in source water quality.

In February 2024, like much of the state of Victoria, we experienced another significant storm event. This storm brought severe winds and heavy rain, resulting in power blackouts across the region. As with the Boxing Day event, we activated our emergency response plan, employed careful management, and utilised generators to maintain uncompromised supply of safe drinking water.

Through these events, I continue to be impressed by the preparedness, dedication, and diligent effort of South Gippsland Water staff. Their commitment to ensuring uninterrupted and high-quality services to our customers is both appreciated and a source of immense pride.

Despite these weather-related challenges, we were able to complete or progress some significant improvement projects in 2023–24. These include refurbishment of the Toora 1-megalitre (ML) clear water storage tank, including installation of a new roof. Another notable accomplishment for the year was the completion of 28 water reticulation main renewal projects, with a total of 1.74 km of mains being replaced. Works also commenced on treatment plant and clear water storage upgrades at various sites.

Testament to our commitment to continual improvement, these projects enhance our resilience, reduce the risks of leakages and breaks, and improve operational efficiency. The benefit to our customers is a continuation of clean, safe drinking water long into the future.

While our foremost priority is drinking water safety, we also place immense importance on customer satisfaction. We strive to meet expectations by delivering water that is not only safe but also pleasant to drink, in terms of aesthetic quality. Furthermore, we are committed to offering prompt and helpful service in response to water quality concerns

At South Gippsland Water, we consider it a privilege to serve our community, and take pride in delivering clean, safe drinking water to the region. I trust you will find this report informative and valuable. For further details on any of the topics presented within, please do not hesitate to contact us on 1300 851 636 or via email at sgwater@sgwater.com.au.

Robert Murphy
Managing Director

2 Characterisation of the system

South Gippsland Water supply system

The service area of South Gippsland Water (SGW) covers approximately 4,000 square kilometres of the South Gippsland region, from Wonthaggi in the west to Yarram in the east; see Figure 1: South Gippsland Water water supply area and systems. The total water supply operation for 2023–24 comprised:

- 1,234 square kilometres of total catchment area
- 9 reservoirs/dams and 4 raw water storage basins or tanks
- 8 water treatment plants and water supply systems
- 25 treated water distribution storages
- 18 water pumps
- 750 kilometres of water mains
- 22,361 customer connections across 22 rural centres
- 4,476 megalitres (million litres) of metered water supplied to customers
- A connection pipeline from the Melbourne water grid to the Lance Creek water treatment plant

Information on SGW water sampling localities and supply sources is presented in Table 1.

Figure 1: South Gippsland Water water supply area and systems

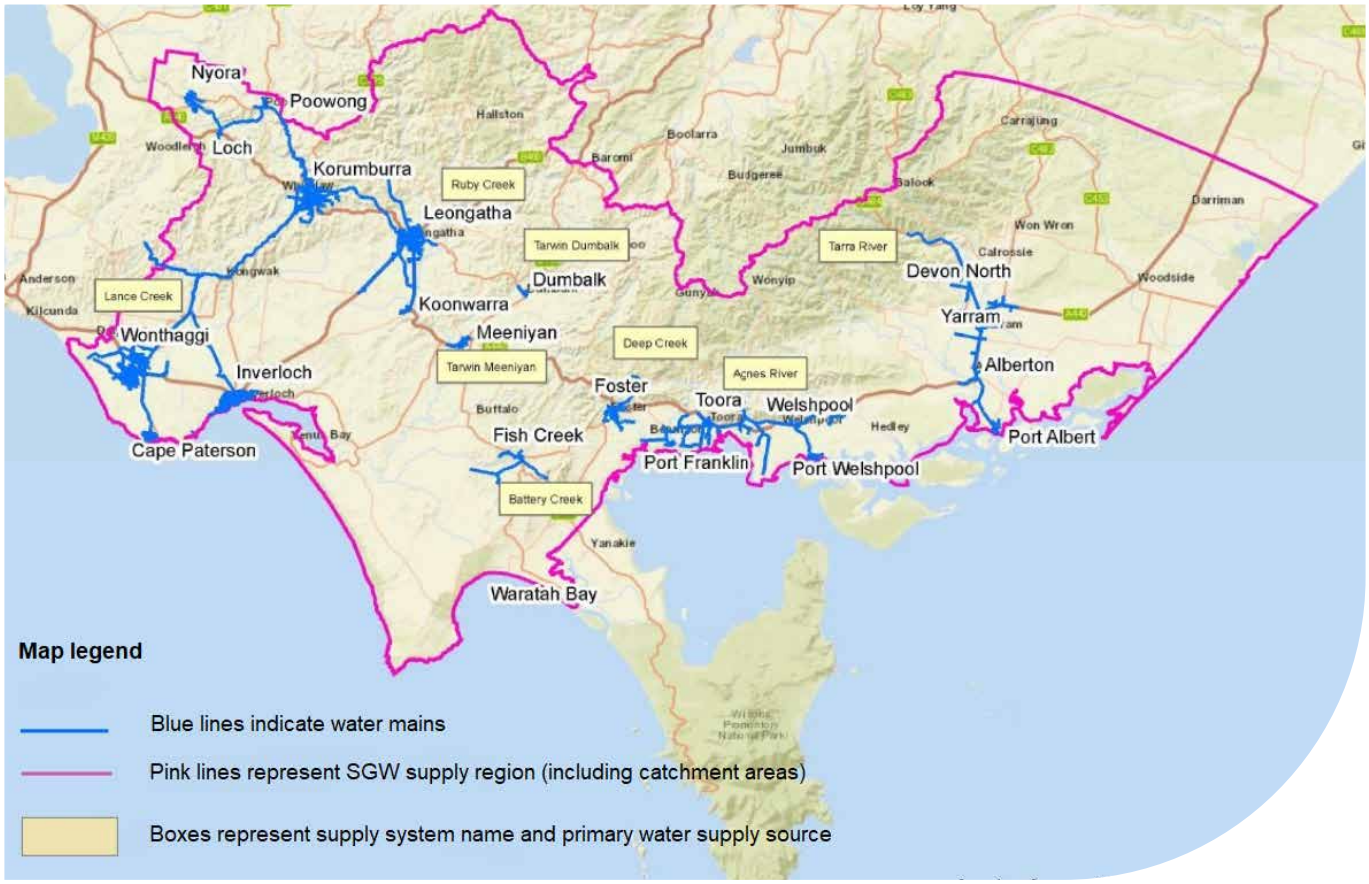


Table 1: SGW water sampling localities and supply sources

Localities supplied	Population serviced[2]	Principal raw water supply sources	Supplementary water supply sources	Raw water storage	Water Treatment Plant
Alberton **Yarram**	710 2,570	Tarra River	Gippsland Basin groundwater aquifer (via bore, Devon North)	Devon North Raw Water Basin	Devon North
Dumbalk	460	Tarwin River (east branch)		Dumbalk Raw Water Tank	Dumbalk
Fish Creek	860	Battery Creek		Battery Creek Reservoir	Fish Creek
Foster	2,040	Deep Creek		Deep Creek Reservoir Foster Dam Foster Raw Water Basin	Foster
Cape-Paterson **Inverloch** **Lance-Creek** **Wonthaggi** **Korumburra** **Loch** **Nyora** **Poowong**	1,110 6,780 100[3] 9,440 4,750 710 1,640 720	Lance Creek Reservoir	Potable water also received from Cardinia Reservoir and the Victorian Desalination Plant	Lance Creek Reservoir	Lance Creek
Koonwarra **Leongatha**	370 6,840	Ruby Creek		No.1 Reservoir No. 2 Reservoir No. 3 Reservoir (Hyland) No. 4 Reservoir (Western)	Leongatha
Meeniyan	840	Tarwin River		Meeniyan Raw Water Basin	Meeniyan
Port-Franklin **Port-Welshpool** **Toora**	170 690 820	Agnes River		Cooks Dam	Toora
Total	**41,680**				

2 Population served based on ABS 2021 Census data. The ABS method of population calculation is based on the Australian Statistical Geography Standard Statistical Level 2 data and may not always reflect the exact water district.

3 Estimate only

3 Source water systems and catchment management

Importance of catchment management

As part of SGW's multiple barrier approach to ensuring safe drinking water, we are vigilant in monitoring for potential hazards in all our water supply catchments. This approach aligns with guiding principles of the *Australian Drinking water Guidelines 2011* (ADWG), which states that "prevention of contamination provides greater surety than removal of contaminants by treatments, so the most effective barrier is protection of source waters to the maximum degree practicable."

Challenges in open catchments

Our reliance on open catchments for sourcing water presents a distinct challenge. An open catchment refers to an area where rainfall is collected on land that is privately-owned. Unlike a closed (or "protected") catchment, there is little to no restriction on land use or public access. In open catchments, complete protection of source water from run-off, including pollutants from agricultural activities, is not always achievable. Consequently, a central aspect of our role as a water supplier is to improve catchments to the fullest extent possible, both through our direct actions and via collaboration with other stakeholders.

Management Programs

Where catchment hazards cannot be prevented, they are managed with robust and reliable barriers. Examples of these measures are documented in our Drinking Water Management System. The catchment management program involves coordination of activities, including catchment surveillance, river health monitoring, land use planning assessment, and Source Water and Health-Based Target (HBT) reporting. In addition, we actively engage in tree-plantings and weed control, while also promoting the importance of source water protection within the South Gippsland community through stakeholder engagement programs.

Catchment improvement projects

Noteworthy for the 2023–24 reporting period, is the continuation of a significant project focussed on the Lance Creek water supply catchment. The project aims to build upon prior assessments and identify measures to mitigate the impact of several key concerns, including:

- Occurrence of nuisance and potentially harmful cyanobacterial (blue-green algal) blooms
- Release of iron and manganese from sediments within the reservoir
- Legacy use of copper sulphate as an algaecide

The findings from these investigations will inform management options and guide improvement strategies in anticipation of a future characterised by changing climate conditions and heightened pressures on catchments.

Regional Catchment Management Strategy

SGW actively supports the Victoria State Government's *Our Catchments, Our Communities* project through Catchment Partnership Agreements with both the West and East Gippsland Catchment Management Authorities. The agreements align with Victorian Government commitments to land, water, and biodiversity management, including the West Gippsland Regional Catchment Strategy 2021–2027.

Our collaboration with the catchment management authorities and other stakeholders aims to harmonize catchment management with our mission of providing environmentally sustainable, safe, and high-quality drinking water to our customers. We are actively engaged in initiatives such as the SGW H2O Grants, which support riparian fencing and gully reforestation. Our ongoing support extends to other programs, such as Corner Inlet Connections Project, and recognizes the cultural significance of Traditional Landowners, the Gunaikurnai and the Bunurong communities.

Raw water sampling and analysis program

Monitoring of untreated source water is performed regularly at the inlets to all SGW water treatment plants. Reservoir and upstream of reservoir sites are also sampled on periodic or as-required basis. A summary of testing parameters and sampling frequencies is provided in Table 2.

Table 2: Raw water monitoring at SGW water treatment plants

Parameter	Minimum sampling frequency
Escherichia coli	Weekly
Total Coliforms	Weekly
Cryptosporidium	Event-based
Giardia	Event-based
Cyanobacteria (Blue-green algae)	Weekly (external/ internal)
Algae by-products (MIB/Geosmin/Saxitoxin)	Event-based
Alkalinity	Monthly
Aluminium	Quarterly
Calcium	Quarterly
Copper	Quarterly
Dissolved Organic Carbon	Quarterly
Manganese	Quarterly
Nitrogen compounds	Quarterly
Phosphorus compounds	Quarterly
Total Organic Carbon	Quarterly
Turbidity	Weekly
Pesticides	Annually/Biannually/ Event-based
Radionuclides	Every 5 years: Sampling conducted in Nov. 2021
PFAS and PFOS	Every 5 years (under review)

4 Regulations and standards

In Victoria, the provision of drinking water to the public is governed by a comprehensive regulatory framework. Administered by the Victorian Government's health department, the framework includes the *Safe Drinking Water Act 2003* (the Act) and the Safe Drinking Water Regulations 2015, which are enacted under the Act. For fluoridated water supplies, the *Health (Fluoridation) Act 1973,* supported by the Code of practice for fluoridation of drinking water supplies (second edition) also apply.

While not a law or regulation, the *Australian Drinking Water Guidelines 2011* forms part of the overall framework by defining what constitutes safe drinking water and how water quality risks should be managed.

Components of the legislative framework are described in more detail below.

Safe Drinking Water Act 2003[4]

The *Safe Drinking Water Act 2003*, as enacted by the Parliament of Victoria, is the over-arching law that governs the supply of safe drinking water to the public.

In outline, this Act—

(a) 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; and

(b) provides for the auditing of those plans by approved auditors; and

(c) requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations; and

(d) requires water suppliers to disclose to the public information concerning the quality of drinking water; and

(e) provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors; and

(f) requires the reporting of known or suspected contamination of drinking water to the Secretary to the Department of Health; and

(g) empowers the Secretary to enforce this Act.

4 https://www.legislation.vic.gov.au/in-force/acts/safe-drinking-water-act-2003/015

Safe Drinking Water Regulations 2015[5]

The Safe Drinking Water Regulations are made under section 56 of the *Safe Drinking Water Act 2003.*

The objective of the Regulations is to make further provision for the supply of safe drinking water by—

(a) setting out further matters to be addressed in risk management plans and the risks to be addressed in those plans; and

(b) specifying the documents to be made available for inspection in a risk management plan audit; and

(c) specifying the issues relating to the quality of drinking water and regulated water that are to be dealt with by a water supplier and water storage manager in an annual report; and

(d) providing for other matters required to be prescribed under the *Safe Drinking Water Act 2003.*

Health (Fluoridation) Act 1973[6]

The *Health (Fluoridation) Act* is the law governing fluoridation in Victoria. Fluoridation is the controlled introduction of fluoride into drinking water supplies for the purpose of public dental health protection.

The Act sets out provisions for the fluoridation process, including responsibilities of water authorities, monitoring of fluoride levels, and compliance with established standards for the fluoridation of water supplies. Additionally, it outlines procedures for consultation with local communities and addresses issues related to exemptions and discontinuation of fluoridation.

Code of practice for fluoridation of drinking water supplies (second edition) – *Health (Fluoridation) Act 1973*[7]

The Code of practice for fluoridation of drinking water supplies (second edition) supports the *Health (Fluoridation) Act.* It specifies the requirements for the safe design and effective operation of a fluoridation plant.

Australian Drinking Water Guidelines 6 2011[8]

The *Australian Drinking Water Guidelines 2011* (ADWG) serves as the authoritative reference for the Australian water industry by defining the standards for high-quality water and how to achieve them. Developed by the National Health and Medical Research Council (NHMRC) in collaboration with the National Resource Management Ministerial Council, the ADWG is subject to rolling review by the NHMRC to ensure it reflects the latest accepted science.

The ADWG offers detailed guidance on identifying and managing potential hazards to the quality of drinking water. This includes a framework to guide water suppliers in the development and continuous review of drinking water risk management plans. The ADWG also provide a comprehensive set of health-based and aesthetic water quality standards for drinking water parameters. While not mandatory by themselves, the health-based standards are the benchmarks for what constitutes safe drinking water with respect to short- and long-term risks in the Australian context.

5 https://www.legislation.vic.gov.au/in-force/statutory-rules/safe-drinking-water-regulations-2015/001
6 https://www.legislation.vic.gov.au/in-force/acts/health-fluoridation-act-1973/020
7 https://www.health.vic.gov.au/water/water-fluoridation-legislation
8 https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines

5 Water treatment and quality management systems

Water treatment process overview

Rainwater, in its natural state, is generally pure as it falls from the sky. Yet, as it flows across land and collects in streams and rivers, it can gather dirt, minerals, organic matter, microorganisms, and other contaminants. This surface water requires purification and disinfection to make it safe for drinking. The conventional water treatment process is designed to remove these impurities and typically involves several key steps: raw water collection and settling, coagulation and flocculation, clarification, filtration, and disinfection. The following section outlines these main components, providing a general overview of how water is treated to make it safe for human consumption.

Raw water collection and settling

The water treatment process typically begins with the collection of rainwater from runoff and streams in a reservoir. Water collected in a reservoir is referred to as "raw water" but may also be called "source water" or "untreated water".

The reservoir serves as a settling basin where debris and large particulate matter sink to the bottom through natural gravitational forces. Some reservoirs may also incorporate aeration devices designed to oxidise and solidify dissolved substances in the water.

Lance Creek water treatment plant

Coagulation and flocculation

As the raw water is piped from the reservoir to the water treatment plant, chemical agents are introduced. These agents facilitate the aggregation of small particles into larger, insoluble masses in a process known as coagulation and flocculation.

Clarification

The resulting masses, referred to as floc, are subsequently separated from the water in the process of clarification. Clarification can occur through either gravitational settling (sedimentation clarification) or flotation of floc (dissolved air flotation or "DAF" clarification), depending on the specific water treatment method employed.

Filtration

The now clarified water then percolates through large filter beds composed of layers of granular material, including sand and gravel. The filter beds serve to further purify the water by removing remaining floc and small particles, including microorganisms.

Disinfection

The final and crucial stage in the water treatment process is disinfection. This typically involves the addition of chlorine-based disinfectants, but other chemical agents or ultra-violet (UV) light may also be used. These disinfectants eliminate any remaining microorganisms, ensuring that water supplied to customers is safe for consumption.

A summary of the specific processes and treatment agents used at SGW water treatment plants is provided in Table 3 and Table 4.

Changes in water treatment and supply conditions

There were no changes to water treatment processes or supply conditions for SGW in the 2023–24 reporting period.

Water treatment monitoring and control

The water treatment process is subject to continual monitoring and control by inline SCADA (supervisory control and data acquisition) systems. SCADA systems prevent the production of out-of-specification water at all stages of the process by alerting staff to potential issues and automatically shutting down plant operation when required.

To verify correct SCADA functioning and plant operation, a range of manual checks are routinely performed by water treatment plant operators. These include tests for specific water quality parameters, and verification of on-line monitoring and chemical dosing equipment.

Water treatment plant operators also carry out jar tests in treatment plant laboratories. Jar tests allow for simulation of plant conditions so that adjustments in treatment chemical dosage can be made. This enables optimisation of the treatment process in response to seasonal changes in raw water quality and other factors.

Water treatment issues

Turbulent source water following the severe storm event of 26 December 2023 caused treatment issues at the Fish Creek and Toora water treatment plants; however, there were no related exceedances of drinking water quality standards. The storm event and related challenges are discussed further in section 6 of this report: Emergency, incident and event management.

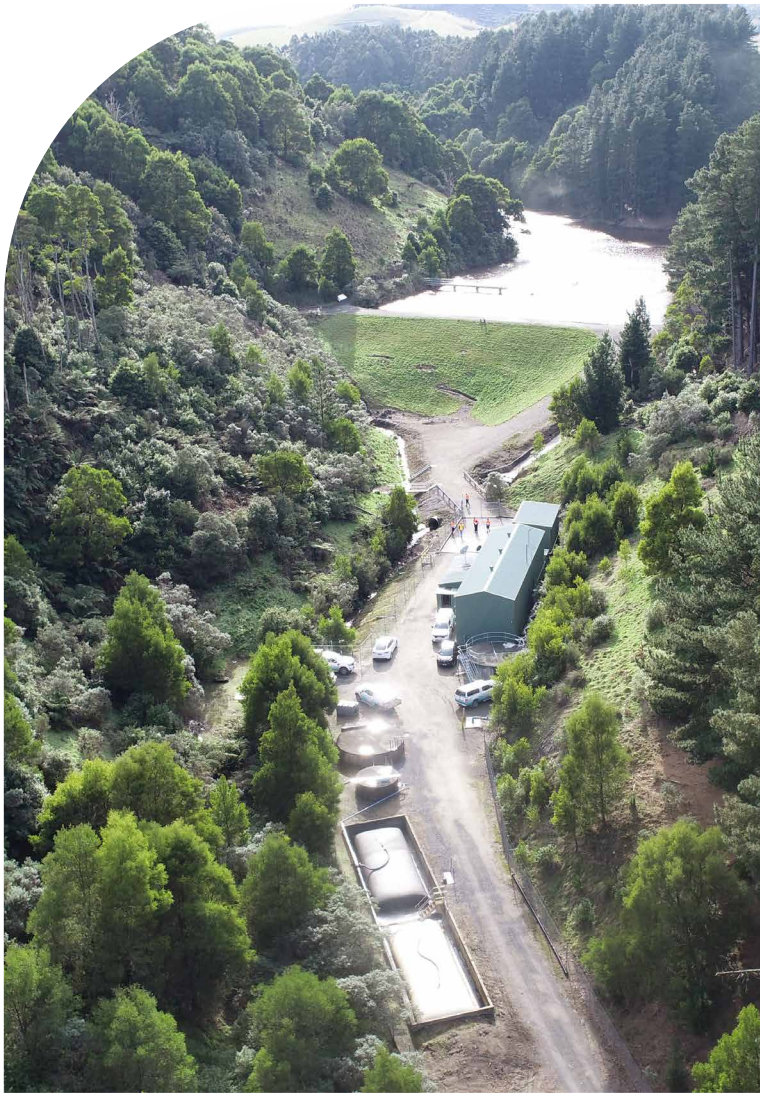


Table 3: Processes and chemicals used to treat and disinfect water supplied by SGW in 2023–24

Water Treatment Plant (WTP)	Localities supplied	Treatment process	Treatment frequency	Added substances
Devon North WTP	**Alberton Yarram**	Cyanobacteria control	As required	Copper sulphate pentahydrate
		Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	As required	Sodium carbonate
		Manganese oxidation	As required	Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium chlorohydrate
		Dissolved air flotation clarification	Regular	Air
		Filtration by granular medium	Regular	-
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of waste-water	Regular	-
Dumbalk WTP	**Dumbalk**	Pre-treatment pH correction	Regular	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate
		Coagulation and flocculation	Regular	Aluminium chlorohydrate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Ultraviolet (UV) disinfection	Regular	-
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Volatile organics removal by aeration	Regular	-
		Dewatering of wastewater	Regular	Anionic polyacrylamide
Fish Creek WTP	**Fish Creek**	Pre-treatment pH correction	Regular	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate / Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	Anionic polyacrylamide
		Post treatment pH correction	Regular	Sodium carbonate
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Volatile organics removal by aeration	Regular	-
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of wastewater	Regular	-
Foster WTP	**Foster**	Cyanobacteria control	As required	Copper sulphate pentahydrate
		Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	Regular	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate / Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Post treatment pH correction	Regular	Sodium carbonate
		Primary chlorination disinfection	Regular	Chlorine (gas)
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of wastewater	Regular	-

Table 3: Processes and chemicals used to treat and disinfect water supplied by SGW in 2023–24 (continued)

Water Treatment Plant (WTP)	Localities supplied	Treatment process	Treatment frequency	Added substances
Lance Creek WTP	**Cape Paterson Inverloch Lance Creek Wonthaggi Korumburra Poowong Loch Nyora**	Cyanobacteria control	As required	Copper sulphate pentahydrate
		Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	As required	Sodium hydroxide / hydrochloric acid
		Coagulation and flocculation	As required	Aluminium Chlorohydrate
		Dissolved air flotation clarification	Regular	Air
		Filtration by granular medium	Regular	-
		Post treatment pH correction	Regular	Sodium hydroxide
		Fluoridation	Regular	Hexafluorosilicic acid
		Primary chlorination disinfection	Regular	Chlorine (gas)
		Secondary chloramination disinfection	Regular	Chlorine (gas) and ammonia
		Dewatering of wastewater	Regular	Anionic polyacrylamide
Leongatha WTP	**Koonwarra Leongatha**	Cyanobacteria control	As required	Copper sulphate pentahydrate
		Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	Regular	Sodium hydroxide
		Manganese oxidation	As required	Potassium permanganate
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Ultraviolet (UV) disinfection	Regular	-
		Post treatment pH correction	Regular	Sodium hydroxide
		Primary chlorination disinfection	Regular	Chlorine (gas)
		Secondary chlorination disinfection	Regular	Chlorine (gas)
		Dewatering of wastewater	Regular	-
Meeniyan WTP	**Meeniyan**	Manganese oxidation	As required	Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium Chlorohydrate
		Sedimentation clarification	Regular	Anionic polyacrylamide
		Filtration by granular medium	Regular	-
		Primary chlorination disinfection	Regular	Sodium hypochlorite
		Ultraviolet (UV) disinfection	Regular	-
		Volatile organics removal by aeration	Regular	-
		Secondary chlorination disinfection	Regular	Sodium hypochlorite
		Dewatering of wastewater	Regular	Anionic polyacrylamide
Toora WTP	**Port Franklin Port Welshpool Toora**	Taste and odour control	As required	Powdered activated carbon
		Pre-treatment pH correction	As required	Sodium carbonate
		Manganese oxidation	As required	Potassium permanganate / Sodium hypochlorite
		Coagulation and flocculation	Regular	Aluminium sulphate
		Sedimentation clarification	Regular	-
		Filtration by granular medium	Regular	-
		Ultraviolet (UV) disinfection	Regular	-
		Post treatment pH correction	Regular	Sodium carbonate
		Chlorination disinfection	Regular	Chlorine (gas)
		Dewatering of wastewater	Regular	-

Table 4: Processes and chemicals used to treat supplementary supply from Melbourne Water to Lance Clear Water Storage

Source/water catchment	Storage/transfer	Treatment process	Treatment frequency	Added substances
Transfer from Silvan Reservoir without being treated at Silvan WTP	Cardinia Reservoir	Disinfection	Regular	Chlorine gas (Cl2) / Sodium hypochlorite
		Fluoridation	Regular	Fluorosilicic acid (FSA)
		pH Correction	Regular	Hydrated lime (Calcium oxide)
		Secondary disinfection	Regular	Sodium hypochlorite
Bass Strait sea water via Desalination Plant offtake	Direct supply to Cardinia Reservoir	Coagulation	Regular	Ferric sulphate, sulfuric acid, PolyDADMAC*
		Filtration	Regular	-
		Reverse osmosis (salt removal)	Regular	Antiscalant, Sodium hydroxide, Sodium bisulfite
		Reverse osmosis cleaning	As required	Caustic soda, detergent, acid
		Remineralisation	Regular	Hydrated lime (Calcium oxide), Carbon dioxide
		Fluoridation	Regular	Fluorosilicic acid (FSA)
		Disinfection	Regular	Chlorine gas (Cl2)
		Membrane preservation	As required	Sodium bisulfite
		Sludge thickening/dewatering	Regular	Polyacrylamide
		Membrane preservations	Regular	Sodium bisulphite
Melbourne Water Delivery Point 5 (DP5) of desalination pipeline	Transfer pipeline from DP5 to Lance Creek clear water storage tank	pH correction	Regular	Hydrochloric acid, Sodium hydroxide
		Disinfection	Regular	Chlorine gas (Cl2)

* Polydiallydimethylammonium chloride

Quality management systems and continual improvement

Programs and practices

SGW's risk management approach is grounded in the Framework for Management of Drinking Water Quality as described in the *Australian Drinking Water Guidelines.* Integral to our drinking water risk management system are a range of ongoing programs and practices. These are designed to maintain the optimal operation of water treatment plants and water supply distribution systems. Notable examples include:

- **Filter management program:** ensuring effective and efficient filtering at water treatment plants.
- **Backflow prevention program:** safeguarding against distribution system contamination risks.
- **Regular storage inspections and site security checks:** ensuring structural integrity of storages and fencing.
- **Procedures for hygienic mains repair:** ensuring sanitary work practices.
- **Water mains cleaning programs:** proactive flushing and scouring to remove sediment accumulations.
- **Hydrant replacement program:** upgrading legacy ball hydrants to spring-loaded ones for enhanced supply system security.
- **Watermains renewal program:** Upgrading and maintaining critical infrastructure to prevent leaks and breaks.
- **Contingency and resilience planning:** preparing for a changing climate, and unforeseen risks.

Another essential aspect of our drinking water risk management system is a commitment to continual improvement, aiming to achieve excellence in water delivery. This dedication extends to the ongoing development of our operations and quality assurance staff through training, seminars, journal subscriptions, and membership in peak industry bodies, such as the Water Industry Operators Association (WIOA). These efforts ensure our staff remain up-to-date with drinking water-related research, technological advancements, and industry best practice.

Training highlights and trainee program

Formal training from accredited providers is undertaken by our water treatment operators upon employment, ensuring they possess the necessary qualifications (if not already certified). In the 2023–24 period, one water treatment operator completed Certificate III in Water Industry Treatment training, while two others commenced the course. Another member of the team began further studies in a Diploma of Water Operations.

SGW is also committed to attracting young people to the industry through our Operations Trainee Program. Trainees specialise in either treatment or maintenance aspects of the business, gaining diverse experience across the organisation, including water quality monitoring. Two trainees commenced employment under this program in 2023–24.

Renewals and improvement projects

During the 2023–24 reporting period, SGW advanced several capital improvement projects. The refurbishment of the 1-megalitre (ML) clear water storage (CWS) tank at Toora, including installation of a new roof, was completed, while preparatory work for the replacement of the geomembrane lining and cover at the Foster CWS basin commenced.

In addition to planning for the refurbishment of filters at the Foster and Toora water treatment plants, the year also saw the start of an evaluation process to upgrade the powdered activated carbon (PAC) dosing systems at these plants. Once completed, the PAC dosing system upgrades will allow for greater control of cyanobacterial compounds that affect water taste and odour.

Design work for a significant upgrade at the Lance Creek water treatment plant also began in 2023–24. The upgrade will include the construction of an additional clear water storage tank—essential for maintaining supply of clean, safe drinking water to our largest system and supporting growth in the region.

Further details on these and other projects are provided in Table 5. Projects planned for the 2023–28 pricing period are also included in Table 5.

Table 5: Capital improvement projects – water treatment and supply

Site	Improvement project	Water quality/supply benefit	Expected completion year	Approximate expenditure $	Status
Foster CWS Basin	Renewal of geomembrane lining and cover	Continued protection of potable water in basin	Mid 2025	$900,000	Commenced
Foster WTP	Renewal of filters	Continued effective water treatment	2026	$950,000	Commenced
Foster WTP	Upgrade of PAC dosing system	Improved control of cyanobacterial taste and odour compounds	2028	Not available	Commenced
Lance Creek WTP	Upgrades and installation of additional CWS Tank	Improved security of supply into the future	To be determined	Not available	Design process commenced
Lance Creek WTP	DAF renewal and polymer system upgrade	Improved flocculation	2025	Not available	Not started
Leongatha raw water transfer main	Pipe refurbishment and renewal	Improved security of source water supply to WTP by reducing risk of age-related breakage of raw water transfer main	2025	$1,710,000	Commenced
Leongatha raw water supply system	Management improvement project	Improved accessibility of main for inspection and repair. Improved overall management of Leongatha raw water supply system	2024	Not available	In progress
Meeniyan WTP	Individual filter turbidity monitoring and control	Improved filtration monitoring and control of treatment process	2024	$130,000	In progress
Poowong water tower	Reconfiguration and upgrade to reduce residency time of water	Improved maintenance of monochloramine residual to protect water in tank, without need for operational intervention (flushing/scouring)	2028	Not available	In progress
Toora WTP	Renewal of the 1-ML CWS tank, including complete roof replacement	Continued protection of potable water in tank.	2024	$145,000	Completed 2024
Toora WTP	Renewal of filters	Continued effective water treatment	2026	Not available	Commenced
Toora WTP	Upgrade of PAC dosing system	Improved control of cyanobacterial taste and odour compounds	2028	Not available	Commenced

Refurbishment of Toora 1-ML CWS Tank, including new roof

6 Emergency, incident, and event management

Incidents reported under the *Safe Drinking Water Act*

Section 18 *Safe Drinking Water Act 2003* (the Act) requires a water supplier to notify the Department of Health (the department) when it becomes aware 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.

There were three issues requiring a section 18 notification for SGW in the 2023–24 reporting period.

Section 22 of the Act requires a water supplier to immediately notify the department of any circumstances where it is suspected or believed that drinking water supplied to the public may be the cause of an illness, pose a risk to human health, or cause widespread public complaint.

In accordance with this requirement, three incidents were reported to the department in the 2023–24 reporting period.

A summary of the reported events is provided in Table 6. Detailed discussions can be found on subsequent pages.

Table 6: Summary of events reported in accordance with the *Safe Drinking Water Act 2003*

Water sampling locality affected	Type of notification	Date of incident	Location of incident	Basis of notification	Nature of incident and immediate actions	Investigation and compliance outcomes
Poowong	Section 22 (x1) Section 18 (x2)	2/1/2024 to 12/1/2024	Poowong clear water Storage Basin and Poowong water supply system	Potential public health concern in relation to drinking water quality	Detection of *E. coli* in two routine samples taken from two sites in Poowong Boil water advisory issued to customers while the basin and system flushed and resampled	Investigation found no definitive cause, however, possibility of ingress at the Poowong CWS Basin due to very heavy rain suspected Two non-compliances with respect to the drinking water quality standard for *E. coli* recorded for Poowong
Nyora	Section 22 (x1) Section 18 (x1)	2/1/2024 to 12/1/2024	Nyora standpipe	Potential public health concern in relation to drinking water quality	Detection of *E. coli* in a routine sample taken from Nyora standpipe outlet Boil water advisory issued to customers while supply system flushed and resampled	Investigation found no definitive cause, however, possibility of ingress at the supplying Poowong CWS Basin due to very heavy rain was suspected One non-compliance with respect to the drinking water quality standard for *E. coli* recorded for Nyora
Wonthaggi	Section 22 (x1)	8/1/2024 to 9/1/2024	Wonthaggi water tower	Potential public health concern in relation to drinking water quality	Detection of *E. coli* in a routine sample taken from the Wonthaggi water tower outlet Inspection of standpipe and connected infrastructure carried out, followed by resampling of Wonthaggi, and connected supply systems	Investigation found result was a 'false positive sample' as defined in the Safe Drinking Water Regulations and did not represent the water supply No non-compliance recorded for Wonthaggi

Escherichia coli detections in Poowong and Nyora

Incident overview

On 3 January 2024, SGW received laboratory notification of three *Escherichia coli* (*E. coli*) detections for routine samples collected on the previous day, 2 January 2024. The detections were for the Poowong clear water storage (PCWS) outlet, a registered customer tap sampling site in the township of Poowong, and the outlet of Nyora Standpipe, which is supplied from the PCWS.

The detections were immediately reported to the Department of Health in accordance with section 22 of the Act in relation to potential public health concerns. A boil water advisory (BWA)[9] was subsequently issued for customers in Poowong, Nyora, and the connected town of Loch while the supply system was flushed and resampled.

Immediate corrective actions

An Incident Management Team (IMT) comprising trained SGW staff was established to coordinate corrective actions and investigations. These included:

- Activation of SGW's Emergency Management plan
- Notification to the Department of Energy, Environment and Climate Action (DEECA) in accordance with Emergency Management Victoria protocols
- Preparation of communication plans to inform customers
- Mobilisation of field staff to commence flushing of the supply system
- Deployment of alternative water supply tankers to town centres
- Review of water quality data trends and asset inspection programs

Customer communications

Issue of the BWA to customers commenced in the afternoon of 3 January 2024 via the following means:

- social media, including:
  - Facebook
  - Instagram
- news media, including:
  - ABC Gippsland radio broadcast
  - South Gippsland Sentinel Times
  - WIN television News service
- Alert on SGW website
- SMS (short message service) text messaging
- email
- Alert via Vic Emergency mobile phone application (app).

Businesses and vulnerable customers were contacted verbally via telephone as a matter of high priority. Electronic signs at the entrances to towns were also used to inform customers and town visitors of the BWA.

Regular updates in relation to continuation of the BWA and progress of corrective actions were provided to customers via SMS text messaging, social media, and news media. Additionally, alternative water supply tanker sites were staffed to assist customers and respond to queries.

Signage to inform of BWA at entrance to Loch

Temporary water supply trailer at Loch

9 A Boil Water Advisory or "BWA" is a direction for customers to boil water prior to consumption. Boiling ensures drinking water safety by killing any microorganisms ("germs") that may be present.

Verification sampling and rescindment of BWA

Following completion of flushing programs to remove potentially contaminated water from the system, two comprehensive sets of verification samples were collected a day apart on 10 and 11 of January 2024. The samples represented water supply across the Poowong, Loch, and Nyora system and were analysed for a range of parameters, including *E. coli,* turbidity, and disinfectant residual. *E. coli* was not detected in any of the samples and all other results were within typical and acceptable ranges, indicating that water was safe to drink.

The BWA was lifted following receipt of the second set of verification results on 12 January 2024. Customers were informed via the channels noted previously, including the Vic Emergency mobile phone app.

Possible cause and preventative measures

Investigation into the possible cause of the *E. coli* detections commenced upon receipt of the initial non-conforming results and included inspection of both the PCWS and the Nyora Standpipe. While no definitive cause was determined, it is believed that extremely heavy rain in the week commencing 26 January 2023 was a likely contributing factor.

It is suspected that small volume ingress of rainwater at the rim of the PCWS where the geomembrane liner and cover are joined may have occurred. While no obvious gaps were observed, the possibility of microchannels allowing rainwater to drip into the basin remains under consideration.

To prevent recurrence of a similar incident, drainage around the basin has now been improved to prevent inundation during very heavy rainfall events. Installation of cameras and alarming of sump pumps are also being evaluated as possible preventative actions. Drainage at other SGW geomembrane lined CWS basins has also been reviewed and actioned where appropriate.

Escherichia coli detections in Wonthaggi

Incident overview

E. coli was detected in a routine sample collected from the Wonthaggi water tower outlet on 8 January 2024. The Department of Health was immediately notified per requirements of the Act upon receipt of the result on 9 January 2024.

In accordance with the Act and SGW's drinking water risk management plan, a thorough investigation was conducted. This included confirmation of effective water treatment and disinfection processes at the supplying Lance Creek water treatment plant, inspection of clear water storages, and review of recent distribution system works.

Investigation and resampling

There were no abnormalities found that could have led to contamination of the water supply with *E. coli.* It was noted, however, that at the time of sampling on 8 January 2024, there had been unrelenting heavy rainfall. Contamination of the sample during the sampling process due to splashback of rainwater from the ground or external walls of the tower was considered as a possible cause of the detected *E. coli.*

An extensive monitoring program was implemented in the afternoon of 9 January 2024, with samples being collected from 14 potable water sites across the water sampling localities of Lance Creek, Wonthaggi, and Cape Paterson. Analysis results were received from the external contracted laboratory on 10 January 2024. There were no further *E. coli* detections for any of the samples collected, nor was there evidence of excessive disinfectant demand, or other indicators of poor water quality.

Since no contributing factors could be identified, it was concluded that the *E. coli* detection for the Wonthaggi Water Tower outlet site was a 'false positive sample' result, as defined in the the Regulations. The detection was deemed not representative of the water being supplied to Wonthaggi or the connected localities of Lance Creek and Cape Paterson.

Although the *E. coli* detection was not definitively linked to the weather at the time of sampling, contingency measures are currently being added to the sampling schedule. These will allow for sampling to be avoided during adverse conditions, minimising the risk of contamination from external factors.

Other events

Situations not reportable under section 22 of the Act which impacted or had the potential to adversely affect water quality are described below.

December storm event and treatment challenges

On 26 December 2023, severe thunderstorms swept across eastern Australia, leading to widespread flash flooding. The heavy rainfall resulted in substantial inflows into catchments, creating turbulent conditions that significantly increased the turbidity of the source waters supplying the Fish Creek and Toora water treatment plants.

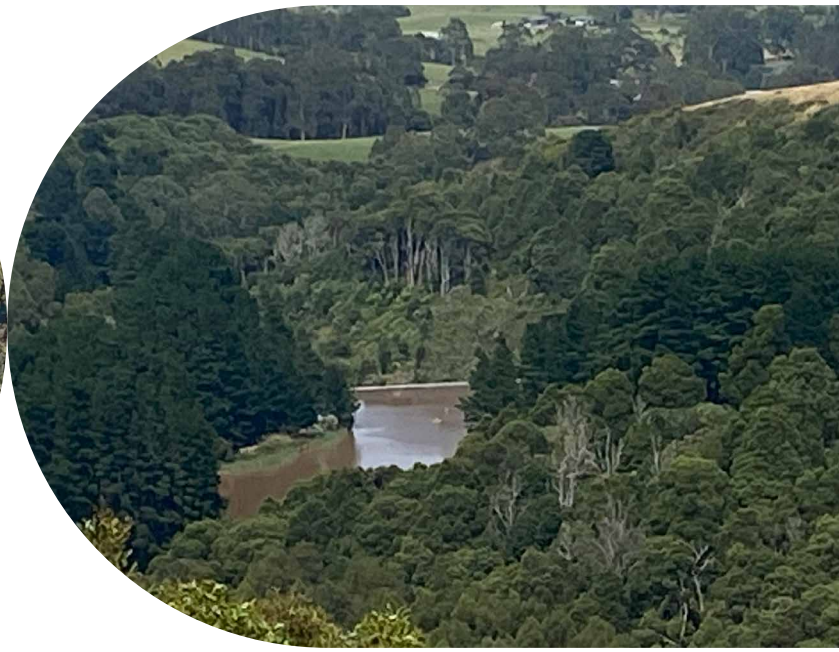
Operations at both treatment plants were adjusted to address the sudden changes in source water quality. This included altering chemical dosages, reducing water treatment rates, and increasing the frequency of filter backwashing. These adjustments required simulating plant conditions through laboratory jar tests to experiment with dosage rates and optimise treatment processes. The adjustments, which required repeated modifications, took time to implement. Coupled with the slower overall rate of treated water production, clear water storage volumes for Fish Creek's supply declined to below full-capacity levels. While adequate volume for two days' supply remained, a request to reduce non-essential water usage was issued to the Fish Creek community via social media on 28 December 2023, as a precautionary measure. Full recovery of storage volumes was achieved the following day, on 29 December 2023.

February severe storm event and power outages

The region experienced another major storm event on 13 February 2024. This storm brought extremely severe winds and heavy rain, resulting in widespread power outages. Emergency management response, including use of electrical generators, saw no related treatment or drinking water quality issues.

Battery Creek Reservoir (Fish Creek) before Boxing Day deluge

Battery Creek Reservoir (Fish Creek) after Boxing Day deluge (images courtesy of Damien Stefani)



Notification under the Code of Practice for Fluoridation of Drinking Water

On 21 June 2024, the pre-clear water storage fluoride analyser at Lance Creek water treatment plant recorded a temporary increase in fluoride concentration to a level of 1.7 mg/L for a period of less than one minute. The short-term fluoride increase (or "spike") above the control level of 1.5 mg/L was reported to the Department of Health later that afternoon, in accordance with section 7.2 of the Code of the Practice for Fluoridation of Water Supplies (the Code). Fluoride dosing operation was shut down while the matter was investigated.

Investigation found that the spike did not represent the true fluoride concentration. It could instead be attributed to inaccurate measurement resulting from the pH of the filtered water exceeding the acceptable operating range of the fluoride analyser. The pH increase was traced back to an issue with the caustic soda dosing system. The issues were rectified, allowing fluoride dosing to resume.

During the investigation, the Department of Health made a number of observations and recommendations to ensure SGW's full compliance with the Code. These related to non-compliances regarding the timeliness of notifications, the automatic shutdown delay time for the pre-clear water storage fluoride analyser, and the maximum capacity setpoint for the fluoride dosing pumps. All matters were addressed with evidence being submitted to the department for review.

Following the incident, SGW has implemented several actions based on lessons learned, including providing additional training to operations staff in relation to compliance with the Code.

7 Drinking water quality standards

During the 2023–24 reporting period, SGW implemented water quality monitoring programs consistent with requirements of the Act and the Regulations.

Schedule 2 of the Regulations stipulates the sampling frequency and water quality standard for three water quality parameters: *E. coli,* trihalomethanes (total), and turbidity. These mandatory samples must be collected from the drinking water supply at relevant frequencies and analysed for performance against the water quality standards as shown in Table 7.

Analysis results – Schedule 2 parameters

The results of analysis for Schedule 2 parameters for 2023–24 are summarised in Tables 8 to 10.

Note: Section 23 of the Act requires that a water supplier make available for inspection by the pubic the results of any water quality monitoring program that is conducted on any drinking water it supplies. Customers and members of the public may access drinking water quality data by telephoning SGW Customer Service on 1300 851 636, or by emailing sgwater@sgwater.com.au.

Table 7: Drinking water quality standards and required sampling frequencies as defined in Schedule 2 of the Regulations

Parameter and relevant sampling frequency for each water sampling locality	Quality standard for each water sampling locality
***Escherichia coli* (*E. coli*)** One sample per week	All samples of drinking water collected are found to contain no *Escherichia coli* per 100 millilitres of drinking water, with the exception of any false positive sample. For the purposes of this quality standard, *a false positive sample* means a sample that is found, after an analysis conducted in accordance with regulation 14, to contain *Escherichia coli* per 100 millilitres of drinking water, if--- **a)** following the analysis, the water supplier has conducted an investigation, which has been conducted in accordance with any guidelines issued by the Secretary in relation to such investigations, including any timeframes for commencement and completion of the investigations, to ascertain whether the results for the analysis are representative of water in the relevant sampling locality; and **b)** the water supplier has reported the results of the investigation to the Secretary in relation to such reports, including any timeframes for provision of the report; and **c)** the investigation has concluded that the results of the analysis conducted in accordance with regulation 14 were not representative of the water in the relevant water sampling locality because the investigation established that— **(i)** all other factors that would indicate the presence of *Escherichia coli* are not present in that water in the water sampling locality at the time of the investigation; and **(ii)** the drinking water treatment process applied, or other specified actions taken by the water supplier, are such as would be reasonably expected to have eliminated the presence of *Escherichia coli* in the water sampling locality at the relevant time; and **(iii)** all plant and infrastructure associated with the water treatment process were operating to specification at all relevant times; and **(iv)** there were no issues arising from degradation of plant or infrastructure in or around the relevant water sampling locality that could reasonably be suspected to have contributed to the presence of *Escherichia coli* in the drinking water in that water sampling locality. A sample analysed in accordance with regulation 14 that is found, on that analysis, to contain *Escherichia coli* per 100 millilitres of drinking water is not a false positive sample unless all of the circumstances in paragraphs (a), (b) and (c) apply.
Total Trihalomethanes One sample per month	Less than or equal to 0.25 milligrams per litre of drinking water
Turbidity One sample per week	The 95th percentile of results for samples in any 12-month period must be less than or equal to 5.0 Nephelometric Turbidity Units

E. coli

E. coli is an enteric (gut) bacterium. Its presence in water may indicate contamination with human or animal faecal matter and associated microorganisms and viruses – some of which may be pathogenic (illness-causing). For the quality standard for each water sampling locality to be met with respect to *E. coli,* then all samples of drinking water collected must have been found to contain no *E. coli* per 100 millilitres of drinking water, with the exception of any false positive samples (refer to Table 7 for definition of "false positive sample").

E. coli results for 2023–24

Monitoring for *E. coli* for the 2023–24 reporting period was conducted in accordance with requirements of the Regulations and SGW's risk-based monitoring program. The program specifies which sites are to be sampled and at what frequencies.

Samples for *E. coli* analysis are collected weekly from a range of different sampling sites and locations, including dedicated customers tap (water meter) sites, clear water storages, and process water from water treatment plants. Other sites in distribution systems, such as upstream and downstream of secondary disinfection dosing units, and at the inlets and outlets of clear water storage tanks and basins are also sampled on a weekly basis.

One *E. coli* result for Korumburra was not recorded for the week of 3 July 2023. This was for the Mine Road Standpipe site. From investigation, it could not be definitively determined whether the sample was missed by the sampler or taken but not analysed by the external contracted laboratory. Corrective actions were implemented with the laboratory to improve checking and notification protocols to help ensure SGW's compliance with regulation 13(a) and regulation 14 of the Regulations.

Compliance with the water quality standard for *E. coli* is based on monitoring of drinking water as it is supplied to customers. For some localities, this includes the results of distribution clear water storage sample analysis (where there is not a more representative site downstream of the storage) in addition to those from customer tap sample analysis.

There were four *E. coli* detections in 2023–24; these being for two samples taken from Poowong, one from Nyora, and one from Wonthaggi. Investigation of the detections found that the three samples taken from Poowong and Nyora were all non-compliant with the water quality standard. Investigation of the detection for Wonthaggi found the result was a 'false positive sample' as defined in the Regulations. For further discussion of these events, including corrective actions, refer to section 6: Emergency incident and event management.

All other samples collected in 2023–24 were compliant with the drinking water quality standard for *E. coli.* Table 8 (see following page) provides a summary of *E. coli* results.

Total trihalomethanes

Trihalomethanes (THMs) are organic chemical compounds in which three of the four hydrogen atoms of methane (CH_4) are replaced by atoms of chlorine or other halogens, such as bromine. The compounds may be present in drinking water principally because of chlorination or, to a much lesser extent, chloramination. Chlorine forms hypochlorous acid when added to water and can react with naturally-occurring organic material to produce the trihalomethane species trichloromethane (chloroform), bromodichloromethane, dibromochloromethane, and tribromomethane (bromoform).

The *Australian Drinking Water Guidelines 2011* (ADWG) states that, "Based on health considerations, the concentration of trihalomethanes, either individually or in total, in drinking water should not exceed 0.25 mg/L. Trihalomethane concentrations fluctuating occasionally (for a day or two annually) up to 1 mg/L are unlikely to pose a significant health risk. Action to reduce trihalomethanes is encouraged, but must not compromise disinfection, as non-disinfected water poses significantly greater risk than trihalomethanes."

Total trihalomethanes results for 2023–24

For the year ending the 30th of June 2023, testing for trihalomethanes was conducted in accordance with the Regulations and SGW's risk-based monitoring program. All results complied with the drinking water quality standard for trihalomethanes; results are presented in Table 9.

Turbidity

Turbidity is a measurement of the light-scattering property of water which is dependent on the amount, size, and composition of fine suspended matter. The Regulations specify that the 95th percentile of results for samples in any 12-month period must be less than or equal to 5.0 Nephelometric Turbidity Units (NTU).

Turbidity results for 2023–24

Monitoring for compliance with the water quality standard for turbidity was conducted in accordance with the Regulations and SGW's risk-based monitoring program. All localities were compliant with the regulatory drinking water quality standard. Turbidity results are presented in Table 10.

Table 8: *E. coli* results for 2023–24

Standard: All samples of drinking water collected are found to contain no *E. coli* per 100 millilitres of drinking water, with the exception of any false positive sample.

Water sampling locality	Customer tap samples collected per week	Clear Water Storage outlet samples collected per week	Total number of samples collected in compliance period	Maximum result (CFU/100mL)*	Number of detections and (s. 22) investigations#	Number of samples where standard was not met
Alberton	1	-	52	0	0	0
Cape Paterson	1	1	104	0	0	0
Dumbalk	1	1	104	0	0	0
Fish Creek	1	1	104	0	0	0
Foster	1	1	104	0	0	0
Inverloch	2	1	156	0	0	0
Koonwarra	1	-	52	0	0	0
Korumburra	1	3	207†	0	0	0
Lance Creek	1	1	104	0	0	0
Leongatha	2	1	156	0	0	0
Loch	1	1	104	0	0	0
Meeniyan	1	1	104	0	0	0
Nyora	1	1	104	1	1	1§
Poowong	1	2	156	3	1	2§
Port Franklin	1	-	52	0	0	0
Port Welshpool	1	-	52	0	0	0
Toora	1	2	156	0	0	0
Wonthaggi	2	1	156	6	1	0
Yarram	2	2	208	0	0	0

* Units for *E. coli* analysis are "Colony forming units per millilitre" (CFU/100mL)

† One result was not recorded for Korumburra in July 2023; Refer to text (previous page) for information

\# See section 6:' Emergency incident and event management' for discussion of investigations

§ See below and 'Emergency incident and event management' for discussion

Drinking water quality standard not met and actions undertaken

Two samples for Poowong and one from the connected locality of Nyora collected on 2 January 2024 were found to be non-compliant with the drinking water quality standard for *E. coli.* Corrective actions included issue of a boil water advisory while the supply system was flushed and resampled. For full discussion, refer to discussion (previous page) and section 6: Emergency incident and event management.

Table 9: Trihalomethanes (total) results for 2023–24

Standard: Total trihalomethanes less than or equal to 0.25 milligrams per litre of drinking water

Water sampling locality	Customer tap samples collected per month	Clear Water Storage outlet samples collected per month	Total number of samples collected in compliance period	Average result (mg/L)	Maximum result (mg/L)	Number of samples where standard was not met
Alberton	1	0	12	0.067	0.160	0
Cape Paterson	1	0	12	0.072	0.085	0
Dumbalk	1	0	12	0.063	0.095	0
Fish Creek	1	1	24	0.149	0.220	0
Foster	1	0	12	0.086	0.110	0
Inverloch	1	0	12	0.073	0.082	0
Koonwarra	1	0	12	0.117	0.150	0
Korumburra	1	0	12	0.071	0.088	0
Lance Creek	1	0	12	0.077	0.089	0
Leongatha	1	0	12	0.105	0.140	0
Loch	1	0	12	0.056	0.068	0
Meeniyan	1	0	12	0.102	0.120	0
Nyora	1	0	12	0.066	0.081	0
Poowong	1	0	12	0.065	0.088	0
Port Franklin	1	0	12	0.081	0.100	0
Port Welshpool	1	0	12	0.061	0.090	0
Toora	1	0	12	0.064	0.085	0
Wonthaggi	1	0	12	0.074	0.083	0
Yarram	1	0	12	0.050	0.094	0

Table 10: Turbidity results for 2023–24

Standard: The 95th percentile of results for samples in any 12-month period must be less than or equal to 5.0 Nephelometric Turbidity Units (NTU)

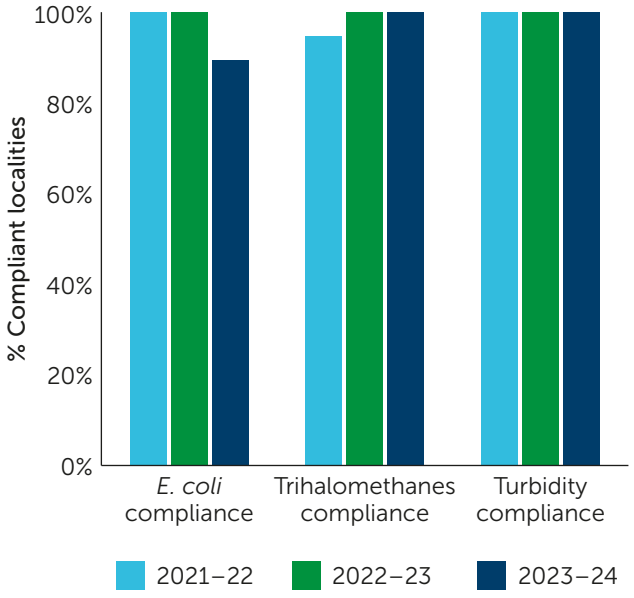
Water sampling locality	Customer tap sampling frequency (No. samples per week)	Total number of samples collected in compliance period	Maximum turbidity in a sample (NTU)	Maximum 95th percentile of turbidity results in any 12 months (NTU)	Number of 95th percentile of results in any 12 months above standard
Alberton	1	52	0.2	0.2	0
Cape Paterson	1	52	0.3	0.1	0
Dumbalk	1	52	0.2	0.1	0
Fish Creek	1	52	0.3	0.1	0
Foster	1	52	<0.1	0.2	0
Inverloch	2	104	0.4	0.1	0
Koonwarra	1	52	0.5	0.1	0
Korumburra	1	52	0.2	0.2	0
Lance Creek	1	52	0.6	0.2	0
Leongatha	2	104	0.6	0.2	0
Loch	1	52	0.6	0.2	0
Meeniyan	1	52	0.2	0.1	0
Nyora	1	52	0.2	0.1	0
Poowong	1	52	0.3	0.1	0
Port Franklin	1	52	0.3	0.2	0
Port Welshpool	1	52	0.8	0.2	0
Toora	1	52	0.3	0.3	0
Wonthaggi	2	104	0.7	0.1	0
Yarram	2	104	0.3	0.1	0

Comparison of results for Schedule 2 parameters over three years

A comparison of compliance with water quality standards specified in Schedule 2 of the Safe Drinking Water Regulations 2015 in the 2023–24 period with that of the previous two fiscal years is presented in Figure 2. Consistent compliance across all SGW water sampling localities is illustrated and in measure with the water quality standard listed for turbidity. A single exceedance of the drinking water quality standard for trihalomethanes in Fish Creek reduced the percentage of compliant localities to 94.7 for the 2021–22 period. Refer to the 2021–22 Annual Drinking Water Quality Report for details.

Non-compliance with the drinking water quality standard for *E. coli* for Loch and Nyora has seen a decrease in percentage compliance for 2023–24 with respect to the previous two reporting periods.

Figure 2: Percentage of localities where the drinking water complied with the water quality standards for *E. coli,* trihalomethanes, and turbidity for the entire reporting period.



Other analysis results

As part of SGW's drinking water quality management system, water quality parameters with potential to affect human health are monitored. These parameters are measured against standard values defined in the ADWG. Parameters are also measured against aesthetic quality guidelines, where provided in the ADWG.

In 2023–24, all health-based guidelines of the ADWG were met. There were exceedances of ADWG aesthetic guidelines for aluminium in Meeniyan (discussed in text below), and pH in Yarram and Alberton (discussed in 'Aesthetics' section).

As many of the parameters monitored do not change significantly over time or through water supply systems, frequent monitoring is not required. Results are summarised in Tables 11 to 26 (see following page) and discussed in text below.

Analysis results – other water quality standards (algal toxin, pathogen, chemical or substance that may pose a risk to human health)

Aluminium (total)

Aluminium may be present in drinking water where aluminium salts are used as coagulants in water treatment processes to destabilise particles in water. Water quality performance with respect to aluminium was measured against the ADWG aesthetic guideline value of 0.2 mg/L. As stated in the ADWG, "no health-based guideline is set for aluminium at this time, but this issue will be kept under review." A summary of aluminium (total) results is presented in Table 11.

As can be seen in Table 11, there was one exceedance of the aesthetic guideline recorded for Meeniyan. This sample was taken in April 2024 and found to have a total aluminium concentration of 0.26 milligrams per litre (mg/L). In response, chemical dosing regimens and plant operation at Meeniyan water treatment plant were adjusted to optimise treatment and minimise aluminium in drinking water.

Arsenic

Arsenic is a naturally-occurring element which can be introduced to water through dissolution of minerals and ores, or from industrial effluent, atmospheric deposition, drainage from old gold mines or the use of some types of sheep dip. The ADWG specify that, from a health perspective, the concentration of arsenic should not exceed 0.01 mg/L. Water supplied by SGW complied with the ADWG guideline value for arsenic, with all results indicating levels were below detection limits; refer to Table 12.

Copper

Copper is naturally distributed in rocks and soils. It may also be present in drinking water where aggressive waters of low pH and hardness induce corrosion of copper pipes. The ADWG specify that the concentration of copper should not exceed 1 mg/L based on aesthetic considerations, and 2 mg/L based on health considerations. Water supplied by SGW complied with both the aesthetic-based and health-based guideline values for copper; refer to Table 13.

Lead

Lead may be detected in drinking water as a result of dissolution from natural sources or from household plumbing systems containing lead. The ADWG specify that, from a health perspective, the concentration of lead should not exceed 0.01 mg/L. Water supplied by SGW complied with the ADWG guideline value; refer to Table 14.

Manganese

Manganese may be present in source waters as a result of dissolution form natural sources. Concentrations may be reduced in drinking water by converting soluble forms of the element to insoluble precipitates followed by physical removal using filtration. The ADWG specify that the concentration of manganese should not exceed 0.1 mg/L based on aesthetic considerations, and 0.5 mg/L based on health considerations. Drinking water supplied by SGW complied with both the aesthetic and health guidelines for manganese; refer to Table 15.

SGW water sampling officers

Table 11: Aluminium (total) results for 2023–24

Water sampling locality	Customer tap samples collected per month	Total number of samples	ADWG aesthetic guideline (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Alberton	1	12	≤0.2	<0.01	0.04	0
Cape Paterson	1	12	≤0.2	0.02	0.03	0
Dumbalk	1	12	≤0.2	<0.01	0.02	0
Fish Creek	1	12	≤0.2	0.03	0.04	0
Foster	1	12	≤0.2	<0.01	0.01	0
Inverloch	1	12	≤0.2	<0.01	0.02	0
Koonwarra	1	12	≤0.2	<0.02	0.02	0
Korumburra	1	12	≤0.2	0.02	0.04	0
Lance Creek	1	12	≤0.2	<0.01	0.03	0
Leongatha	1	12	≤0.2	0.02	0.07	0
Loch	1	12	≤0.2	0.02	0.04	0
Meeniyan	1	12	≤0.2	0.07	0.26	1*
Nyora	1	12	≤0.2	0.02	0.03	0
Poowong	1	12	≤0.2	0.02	0.03	0
Port Franklin	1	12	≤0.2	0.02	0.02	0
Port Welshpool	1	12	≤0.2	0.03	0.10	0
Toora	1	12	≤0.2	0.02	0.04	0
Wonthaggi	1	12	≤0.2	0.02	0.03	0
Yarram	1	12	≤0.2	<0.01	0.03	0

* Refer to text (previous page) for discussion of aluminium aesthetic guideline exceedance for Meeniyan.

Table 12: Arsenic results for 2023–24

Water treatment plant / system	Customer tap samples collected per year	Total number of samples	ADWG health guideline (mg/L)	Result (mg/L)	Number of samples where guideline was not met
Alberton	1	1	≤0.01	<0.001	0
Cape Paterson	1	1	≤0.01	<0.001	0
Dumbalk	1	1	≤0.01	<0.001	0
Fish Creek	1	1	≤0.01	<0.001	0
Foster	1	1	≤0.01	<0.001	0
Inverloch	1	1	≤0.01	<0.001	0
Koonwarra	1	1	≤0.01	<0.001	0
Korumburra	1	1	≤0.01	<0.001	0
Lance Creek	1	1	≤0.01	<0.001	0
Leongatha	1	1	≤0.01	<0.001	0
Loch	1	1	≤0.01	<0.001	0
Meeniyan	1	1	≤0.01	<0.001	0
Nyora	1	1	≤0.01	<0.001	0
Poowong	1	1	≤0.01	<0.001	0
Port Franklin	1	1	≤0.01	<0.001	0
Port Welshpool	1	1	≤0.01	<0.001	0
Toora	1	1	≤0.01	<0.001	0
Wonthaggi	1	1	≤0.01	<0.001	0
Yarram	1	1	≤0.01	<0.001	0

Table 13: Copper results for 2023–24

Water treatment plant / system	Customer tap samples collected per quarter	Total number of samples	ADWG aesthetic guideline (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Alberton	1	4	≤2	<0.001	0.001	0
Cape Paterson	1	4	≤2	0.007	0.009	0
Dumbalk	1	4	≤2	0.004	0.007	0
Fish Creek	1	4	≤2	0.004	0.006	0
Foster	1	4	≤2	0.008	0.012	0
Inverloch	1	4	≤2	0.009	0.016	0
Koonwarra	1	4	≤2	0.010	0.016	0
Korumburra	1	4	≤2	<0.008	0.002	0
Lance Creek	1	4	≤2	0.013	0.018	0
Leongatha	1	4	≤2	0.008	0.011	0
Loch	1	4	≤2	0.008	0.015	0
Meeniyan	1	4	≤2	0.011	0.019	0
Nyora	1	4	≤2	0.007	0.009	0
Poowong	1	4	≤2	0.009	0.015	0
Port Franklin	1	4	≤2	0.002	0.003	0
Port Welshpool	1	4	≤2	0.011	0.032	0
Toora	1	4	≤2	0.007	0.012	0
Wonthaggi	1	4	≤2	0.007	0.013	0
Yarram	1	4	≤2	0.002	0.003	0

Note: Samples are taken for analysis from the reticulation system. Copper levels may be higher at the customers' internal taps if copper plumbing is used in the domestic system. Customers experiencing blue copper staining of fixtures or discolouration of water are advised to call SGW Customer Service on 1300 851 636.

Table 14: Lead results for 2023–24

Water sampling locality	Customer tap samples collected per quarter	Total number of samples	ADWG health guideline (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where standard was not met
Alberton	1	4	≤0.01	<0.001	<0.001	0
Cape Paterson	1	4	≤0.01	<0.001	<0.001	0
Dumbalk	1	4	≤0.01	<0.001	<0.001	0
Fish Creek	1	4	≤0.01	<0.001	<0.001	0
Foster	1	4	≤0.01	<0.001	<0.001	0
Inverloch	1	4	≤0.01	<0.001	<0.001	0
Koonwarra	1	4	≤0.01	<0.001	<0.001	0
Korumburra	1	4	≤0.01	<0.001	<0.001	0
Lance Creek	1	4	≤0.01	<0.001	<0.001	0
Leongatha	1	4	≤0.01	<0.001	<0.001	0
Loch	1	4	≤0.01	<0.001	<0.001	0
Meeniyan	1	4	≤0.01	<0.001	<0.001	0
Nyora	1	4	≤0.01	<0.001	<0.001	0
Poowong	1	4	≤0.01	<0.001	<0.001	0
Port Franklin	1	4	≤0.01	<0.001	<0.001	0
Port Welshpool	1	4	≤0.01	<0.001	<0.001	0
Toora	1	4	≤0.01	<0.001	<0.001	0
Wonthaggi	1	4	≤0.01	<0.001	<0.001	0
Yarram	1	4	≤0.01	<0.001	<0.001	0

Table 15: Manganese results for 2023–24

Water sampling locality	Frequency of sampling (samples per month)	Total number of samples	ADWG health guideline (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where standard was not met
Alberton	1	12	≤0.5	0.003	0.010	0
Cape Paterson	1	12	≤0.5	0.002	0.004	0
Dumbalk	1	12	≤0.5	0.002	0.009	0
Fish Creek	1	12	≤0.5	0.001	0.002	0
Foster	1	12	≤0.5	0.001	0.002	0
Inverloch	1	12	≤0.5	<0.002	0.003	0
Koonwarra	1	12	≤0.5	0.004	0.005	0
Korumburra	1	12	≤0.5	0.002	0.005	0
Lance Creek	1	12	≤0.5	<0.002	0.006	0
Leongatha	1	12	≤0.5	0.006	0.010	0
Loch	1	12	≤0.5	0.002	0.005	0
Meeniyan	1	12	≤0.5	<0.002	0.006	0
Nyora	1	12	≤0.5	0.002	0.004	0
Poowong	1	12	≤0.5	0.002	0.004	0
Port Franklin	1	12	≤0.5	0.005	0.015	0
Port Welshpool	1	12	≤0.5	0.017	0.130	0
Toora	1	12	≤0.5	0.010	0.041	0
Wonthaggi	1	12	≤0.5	0.002	0.004	0
Yarram	1	12	≤0.5	<0.002	0.006	0

Chlorine disinfection residual (free or total chlorine)

SGW uses both chlorine and chloramine disinfection. Chlorine dissociates in water to form 'free chlorine', which consists of aqueous molecular chlorine, hypochlorous acid and hypochlorite ion. Free chlorine is monitored in the reticulation systems of chlorinated supplies on a (minimum) weekly basis during routine sampling.

For the chloraminated supplies, 'total chlorine' is monitored. Total chlorine is the sum of chlorine in combined form (with ammonia and other nitrogenous or organic compounds) and free chlorine.

Based on health considerations, the ADWG guideline value for total chlorine in drinking water is 5 mg/L. There is no specific guideline for free chlorine; however, in chlorinated systems the level of free chlorine approximates or is lower than the level of total chlorine. As both total and free chlorine levels are well below 5 mg/L, all localities can be assumed to be compliant with the water quality guideline for total chlorine; refer to Table 16 and Table 17.

Missing chlorine residual results:

Four instances of free chlorine residual results not being recorded for customer tap sites occurred in 2023–24. These were for Alberton (on three separate occasions) and Fish Creek (on one occasion). Free chlorine is measured in the field by sampling staff during weekly sample collection. Results are noted on sampling chain of custody (COC) forms, with values being recorded by the external contracted laboratory, for inclusion in analysis reports and data files.

Upon review and discussion with sampling staff, it was determined that the missing free chlorine results were due to the values not being recorded on the COC forms, rather than a failure to measure them. Laboratory checking protocols did not alert SGW on these occasions. Sampling procedures, including requirement to check COCs are completed correctly, have been reinforced with SGW sampling staff in response to this matter. Corrective actions with respect to checking and alert protocols with the external contracted laboratory have also been initiated.

Cyanogen chloride

Cyanogen chloride is a by-product of chloramination that is formed through the reaction between organic precursors with hypochlorous acid in the presence of the ammonium ion. Based on health considerations, the ADWG specify that the concentration of total cyanogenic compounds in drinking water should not exceed 0.08 mg/L.

Monitoring of the chloraminated Lance Creek system confirmed that water supplied by SGW complied with the guideline value for cyanogen chloride, with all results indicating levels were below the detection limit; refer to Table 18.

Nitrosodimethylamine (NDMA)

N-Nitrosodimethylamine (NDMA) is produced as a by-product of the chloramination of drinking water due to the oxidation of natural organic matter by chlorine in the presence of ammonia. The ADWG specify that, based on health considerations, the concentration of NDMA in drinking water should not exceed 0.0001 mg/L (100 ng/L).

Monitoring of chloraminated systems for NDMA was conducted annually, with results indicating water supplied by SGW complied with the guideline value for NDMA; refer to Table 19.

Nitrate and nitrite

Nitrates and nitrites are naturally-occurring oxides of nitrogen. Nitrite is rapidly oxidised to nitrate and is seldom present in well-oxygenated or chlorinated supplies. Chloramination disinfection can lead to nitrate and nitrite formation in the distribution system due to the action of nitrifying bacteria. The ADWG specify that, from a health perspective, the concentrations of nitrate and nitrite should not exceed 50 mg/L and 3 mg/L respectively.

Monitoring for oxidised nitrogen (nitrate plus nitrite) was conducted on a quarterly basis in chlorinated SGW systems in 2023–24. The standard of 50 mg/L for nitrate was used to measure water quality performance for oxidised nitrogen given nitrite's rapid conversion to nitrate. Based on nitrification risk, more frequent specific analysis for both nitrate and nitrite was conducted in the chloraminated localities. All the chloraminated localities complied with the specific guideline values for nitrate and nitrite; refer to Tables 20, 21, and 22.

Table 16: Free chlorine for 2023–24 (chlorinated localities)

Water treatment plant / system	Minimum customer tap samples collected per week	Total number of samples	Minimum result (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline (for Total chlorine) was not met
Alberton	1	49*	0.14	0.93	1.43	0
Dumbalk	1	52	0.08	0.47	0.87	0
Fish Creek	1	51*	0.52	0.72	1.30	0
Foster	1	52	0.00	0.44	0.96	0
Koonwarra	1	52	0.00	0.02	0.15	0
Leongatha	2	104	0.00	0.63	1.21	0
Meeniyan	1	52	0.02	0.51	1.23	0
Port Franklin	1	52	0.00	0.51	0.91	0
Port Welshpool	1	93	0.13	0.90	1.26	0
Toora	1	52	0.42	0.86	1.22	0
Yarram	2	104	0.57	1.11	1.47	0

* Three field chlorine results for Alberton and one for Fish Creek were not recorded. See text (previous page) for discussion

Table 17: Total chlorine for 2023–24 (chloraminated localities)

Water treatment plant / system	Minimum customer tap samples collected per week	Total number of samples	Minimum result (mg/L)	Average result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Cape Paterson	1	52	0.04	0.87	2.10	0
Inverloch	2	104	0.90	1.94	2.80	0
Korumburra	1	62	0.15	1.81	2.80	0
Lance Creek	1	52	1.70	2.64	3.60	0
Loch	1	52	0.06	0.60	2.40	0
Nyora	1	52	0.04	1.06	2.70	0
Poowong	1	52	0.04	1.04	2.16	0
Wonthaggi	2	104	0.06	1.64	3.00	0

Table 18: Cyanogen chloride results for 2023–24 (chloraminated systems)

Water treatment plant / system	Locality supplied	Samples collected per year*	Total number of samples	ADWG health guideline (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Lance Creek	Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi	3	3	≤0.08	<0.05	0

Table 19: NDMA for 2023–24 (chloraminated systems)

Water treatment plant / system	Locality supplied	Samples collected per year*	Total number of samples	ADWG health guideline (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Lance Creek	Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi	3	3	≤0.0001	<0.000005	0

* Samples for cyanogen chloride and NDMA analysis are taken from the localities of Cape Paterson, Nyora, and Poowong only. These localities represent the outer reaches of the Lance Creek distribution system and maximum potential for development of disinfection by-products due to extended residence time within the system.

Table 20: Oxidised nitrogen (nitrate +nitrite) for 2023–24 (chlorinated supplies)

Water treatment plant / system	Localities supplied	Sampling frequency (samples per quarter)	Total number of samples	Minimum result (mg/L)	Maximum result (mg/L)	Number of samples where standard was not met
Devon North	Alberton Yarram	1	4	0.33	0.60	0
Dumbalk	Dumbalk	1	4	0.14	0.73	0
Fish Creek	Fish Creek	1	4	0.37	0.40	0
Foster	Foster	1	4	<0.03	0.05	0
Leongatha	Leongatha Koonwarra	1	4	0.18	0.47	0
Meeniyan	Meeniyan	1	4	0.12	0.77	0
Toora	Port Franklin Port Welshpool Toora	1	4	0.18	1.20	0

Table 21: Nitrate for 2023–24 (chloraminated localities)

Water sampling locality	Minimum samples collected per month	Total number of samples	Minimum result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Cape Paterson	1	12	0.097	0.68	0
Inverloch	1	12	0.088	0.67	0
Korumburra	1	12	0.033	0.64	0
Lance Creek	1	12	0.130	0.67	0
Loch	1	12	0.180	0.65	0
Nyora	1	12	0.180	0.65	0
Poowong	1	12	0.097	0.69	0
Wonthaggi	1	12	0.091	0.67	0

Table 22: Nitrite for 2023–24 (chloraminated localities)

Water sampling locality	Minimum samples collected per month	Total number of samples	Minimum result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Cape Paterson	1	12	0.004	0.084	0
Inverloch	1	12	0.004	0.070	0
Korumburra	1	12	0.003	0.180	0
Lance Creek	1	12	0.002	0.003	0
Loch	1	12	0.003	0.260	0
Nyora	1	12	0.004	0.240	0
Poowong	1	12	0.002	0.005	0
Wonthaggi	1	12	0.002	0.011	0

Fluoride

Naturally-occurring fluoride concentrations in drinking water are dependent on the type of soil and rock through which source water drains. Fluoride may also be added to drinking water supplies as a public health measure for the prevention of dental decay. The ADWG specify that the maximum concentration of fluoride in drinking water should not exceed 1.5 mg/L. Under section 4 (3) of the *Health (fluoridation) Act 1973,* fluoride added to drinking water must not result in an average optimum concentration in excess of one part per million parts of water (1.0 mg/L).

Fluoride monitoring

Monitoring of non-fluoridated drinking water is conducted annually to verify continued low levels of naturally-occurring fluoride, as have been recorded historically. Results of fluoride monitoring for non-fluoridated supplies are provided in Table 23.

For the fluoridated supply system of Lance Creek, monitoring is conducted in accordance with the Code of practice for fluoridation of drinking water supplies (second edition). Refer to Table 24 for results.

Fluoridation obligations

Under the *Health (Fluoridation) Act,* an obligation is imposed on suppliers of fluoridated water to achieve a fluoride dose rate that confers a dental health benefit on consumers. The optimal operating target dose rate is specified by the Department of Health and is based on maximum daily air temperature (which has been shown to correlate closely with water consumption). For the South Gippsland region, the optimal fluoride dosage for conferring a dental health benefit is 0.9 plus or minus 0.1 milligrams per litre (i.e., the target is a range where concentrations of 0.8 to 1.0 milligrams per litre are acceptable). SGW fulfilled this obligation for the 2023–24 reporting period.

Table 23: Fluoride results for non-fluoridated supplies in 2023–24

Water treatment plant / system	Locality supplied	Samples collected per year	Total number of samples collected	ADWG health (mg/L)	Result (mg/L)	No. of samples where guideline was not met
Devon North	**Alberton Yarram**	1	1	≤1.5	<0.05	0
Dumbalk	**Dumbalk**	1	1	≤1.5	0.06	0
Fish Creek	**Fish Creek**	1	1	≤1.5	<0.05	0
Foster	**Foster**	1	1	≤1.5	<0.05	0
Leongatha	**Leongatha Koonwarra**	1	1	≤1.5 ≤1.5	0.06	0 0
Meeniyan	**Meeniyan**	1	1	≤1.5	0.06	0
Toora	**Port Franklin Port Welshpool Toora**	1	1	≤1.5	<0.05	0

Table 24: Fluoride results for fluoridated supply in 2023–24

Water sampling locality	Customer tap samples collected per week	Total number of samples	Fluoridation standard for rolling annual average* (mg/L)	ADWG health guideline (mg/L)	Operating target range (mg/L)	Average result (mg/L)	Maximum result (mg/L)	No. of samples where standard was not met
Cape Paterson	1	52	≤1	≤1.5	0.9±0.1	0.80	0.96	0
Inverloch	1	52	≤1	≤1.5	0.9±0.1	0.81	0.98	0
Korumburra	1	52	≤1	≤1.5	0.9±0.1	0.81	0.96	0
Lance Creek	1	52	≤1	≤1.5	0.9±0.1	0.81	0.96	0
Loch	1	52	≤1	≤1.5	0.9±0.1	0.80	0.94	0
Nyora	1	52	≤1	≤1.5	0.9±0.1	0.80	0.95	0
Poowong	1	52	≤1	≤1.5	0.9±0.1	0.80	0.93	0
Wonthaggi	1	52	≤1	≤1.5	0.9±0.1	0.81	0.96	0

* Note: under s. 5(3) of the *Health (Fluoridation) Act 1973* fluoride added to drinking water must not result in an average optimum concentration in excess of one part fluoride per million parts of water.

Other inorganic chemicals

Inorganic chemicals may be present in water as a result of the natural dissolution of rocks, soils and some plants, or through contamination from industrial and agricultural sources. Materials used to coat pipes and plumbing fittings may also be sources of inorganic chemicals in drinking water. Monitoring of all water supply systems was conducted to verify compliance with ADWG health-related guidelines for chemical concentrations as specified in Table 25.

Other organic chemicals

Potential sources of contamination of the drinking water supply with organic chemicals are industrial effluent, run-off from agricultural land, and the use of pesticides and herbicides. Organic disinfection by-products, such as the chloroacetic acids, can also form as a result of disinfection processes. Consistent with historical data, monitoring of raw water intakes, distribution entry point water or customer tap sites found that levels of organic chemicals were compliant with the ADWG health-related guidelines for the 2023–24 period; refer to Table 26.

Table 25: Other inorganic chemicals for 2023–24

Parameter	Sampling frequency	Number of samples per water system/ locality*	Total number of samples	ADWG guideline value (mg/L)	Maximum results (mg/L)	Number of samples where guideline was not met
Antimony	Annually	one per locality	19	≤0.003	<0.001	0
Barium	Annually	one per locality	19	≤2	0.031	0
Beryllium	Annually	one per locality	19	≤0.06	<0.001	0
Boron	Annually	one per locality	19	≤4	0.08	0
Cadmium	Annually	one per locality	19	≤0.002	<0.0002	0
Chromium	Annually	one per locality	19	≤0.05	<0.001	0
Cobalt	Annually	one per locality	19	-	<0.001	0
Cyanide	Annually	one per system	8	≤0.08	<0.005	0
Mercury	Annually	one per locality	19	≤0.001	<0.0001	0
Molybdenum	Annually	one per locality	19	≤0.05	<0.001	0
Nickel	Annually	one per locality	19	≤0.02	<0.001	0
Selenium	Annually	one per locality	19	≤0.01	<0.001	0
Silver	Annually	one per locality	19	≤0.1	<0.001	0
Sulphate	Quarterly	one per system	32	≤500	78	0
Zinc	Annually	one per locality	19	≤3	0.008	0

* Note: Monitoring may be conducted at the entry point to distribution systems or at customer tap sites in each locality dependent on likelihood of change in level of chemical as it passes through the water supply system.

Table 26: Other organic chemicals for 2023–24

Parameter	Sampling frequency (samples per year per system or locality)	Number of samples per water supply system/locality*	Total number of samples	ADWG Guideline value (mg/L)	Maximum results (mg/L)*	Number of samples where guideline was not met
1,1-dichloroethane	1	One per system	8	a	<0.001	-
1,2-dichloroethane	1	One per system	8	≤0.003	<0.001	0
2,4,5-T	1	One per system	8	≤0.1	<0.00001	0
2,4,5-TP (Silvex / Fenoprop)	1	One per system	8	b	<0.00001	-
2,4,6-T	1	One per system	8	b	<0.0001	-
2,4,6-trichlorophenol	1	One per system	8	≤0.02	<0.001	0
2,4-D	1	One per system	8	≤0.03	0.00007	0
2,4-DB	1	One per system	8	b	<0.00001	-
2,4-DP (Dichlorprop)	1	One per system	8	b	<0.00001	-
2,6-D	1	One per system	8	b	<0.00001	-
4-Chlorophenoxyacetic Acid	1	One per system	8	b	<0.00001	-
Atrazine	1	One per system	8	≤0.02	<0.002	0
Benzene	1	One per system	8	≤0.001	<0.001	0
Benzo(a)pyrene	1	One per system†	4	≤0.00001	<0.000002	0
Total PAH	1	One per system†	4	b	<0.00001	-
Carbon tetrachloride	1	One per system	8	≤0.003	<0.001	0
Chloroacetic acid	1	One per locality	19	≤0.15	<0.005	0
Clopyralid	1	One per system	8	≤2	0.00019	0
Dicamba	1	One per system	8	≤0.1	<0.00001	0
Dichloroacetic acid	1	One per locality	19	0.1	0.017	0
Fluoroxypyr	1	One per system	8	b	<0.00001	-
Glyphosate	1	One per system	8	≤1	0.05	0
MCPA	1	One per system	8	≤0.04	0.00039	0
MCPB	1	One per system	8	b	<0.00001	-
Mecoprop	1	One per system	8	b	<0.00001	-
Metsulfuron methyl	1	One per system	8	≤0.04	<0.005	0
Pentachlorphenol	1	One per system	8	≤0.01	<0.001	0
Picloram	1	One per system	8	≤0.3	<0.0001	0
Prometryn	1	One per system	8	b	<0.002	-
Simazine	1	One per system	8	≤0.02	<0.002	0
Tetrachloroethene	1	One per system	8	≤0.05	<0.001	0
Trichloroacetic acid	1	One per locality	19	≤0.1	0.044	0
Triclopyr	1	One per system	8	≤0.02	0.00003	0

Table notes:

a Insufficient data to set an ADWG guideline value based on health considerations

b No ADWG information available

* Monitoring is conducted at raw water inlets to WTPs or at clear water storage outlets to distribution systems

† Monitoring conducted at Devon North, Lance Creek and Leongatha water treatment plants only

Aesthetics

SGW strives to provide drinking water that is consistently clear and pleasant to drink for all customers. Actions taken to manage aesthetic characteristics include:

- Optimisation of treatment processes to minimise levels of iron, manganese, and organic compounds in supplied water
- pH adjustment of treated water
- Regular flushing and air-scouring to remove sediment accumulation in water mains
- Frequent sampling and analysis for aesthetic parameters
- Monitoring and management of cyanobacterial ('algal') blooms in raw water reservoirs
- Monitoring when required for compounds that may impart unpleasant tastes and odours to drinking water

Individual aesthetic characteristics are discussed below; analysis results are summarised in Tables 27 to 32.

Colour

Water may appear coloured due to the presence of natural organic substances including humic and fulvic acids, and dissolved inorganics, such as iron and manganese. Based on aesthetic considerations, the ADWG specifies that colour should not exceed 15 Hazen Units (HU). Water supplied by SGW complied with the guideline value for colour; refer to Table 27.

Iron

Iron is present in source waters due to dissolution of soil and rock. High iron concentrations in drinking water can occur through rusting of iron pipes and fittings. Based on aesthetic considerations, the ADWG specify that the concentration of iron should not exceed 0.3 mg/L. Water supplied by SGW complied with the guideline value for iron; refer to Table 28.

pH

The property of pH relates to the hydrogen ion concentration of water. pH is measured on a logarithmic scale from 0 to 14. A pH of 7 is neutral, a pH greater than 7 is alkaline, and a pH less than 7 is acidic.

To reduce corrosion and encrustation in pipes and fittings, the ADWG specifies that the pH of drinking water should be between 6.5 and 8.5. The ADWG also states that new concrete tanks and cement-mortar lined pipes can significantly increase pH and a value up to 9.2 may be tolerated, provided monitoring indicates no deterioration in microbiological quality.

The reference to microbiological quality is made in the ADWG because the disinfecting power of chlorine in chlorinated systems is greatest at lower pH and gradually declines as pH increases. Significant impairment of chlorine disinfection occurs above pH 8.0. The results for pH in chlorinated systems are provided in Table 29.

All but three chlorinated localities complied with the aesthetic guideline range of 6.5 to 8.5 One sample from Yarram, two samples from Alberton, and one from Port Franklin recorded pH values above this range but within the upper tolerance limit of 9.2 The increase in pH can be attributed to low water usage in the sample site locations and supply from cement-mortar lined mains. Mains flushing was carried out to remove aged water from the system in response to each separate incidence. There were no indicators of microbiological deterioration in relation to the elevated pH values.

The chemistry (and the effect of pH) for chloramination disinfection differs from that of chlorination. A higher pH is beneficial in a chloraminated system as it slows the natural decay of monochloramine and prevents the formation of dichloramine and trichloramine, which can cause unpleasant tastes and odours.

The pH results for chloraminated localities is provided in Table 30. All localities complied with the aesthetic guideline for pH.

Hardness

Hardness is a measure of the concentration of calcium and magnesium ions in water. To minimise undesirable build-up of scale in hot water systems, the ADWG specifies that total hardness of drinking water should not exceed 200 milligrams per litre of calcium carbonate*. Water supplied by SGW complied with the guideline value for hardness; refer to Table 31.

Alkalinity

Alkalinity is defined as the quantitative capacity of an aqueous solution to neutralise an acid. In simpler terms, it is a measure of how easily the pH of water can be changed. Alkalinity is mainly determined by the levels of carbonate, bicarbonate and hydroxyl anions (negatively-charged ions) present. The property of alkalinity has a strong influence on what is referred to as water stability, which is the tendency of water to be corrosive, stable, or scale-forming on contact with surfaces.

Water stability is complex and influenced by several factors, but in general soft water of low pH and low alkalinity will tend to corrode surfaces. Highly corrosive (aggressive) water is not desirable in that it can lead to the leaching of copper and other metals from pipes and plumbing fittings.

In contrast, hard water of high pH and high alkalinity will tend to deposit calcium carbonate (form scale) on pipes, plumbing fittings, and hot water systems. While encrustation of pipes and fittings is not desirable, a thin layer of calcium carbonate can be beneficial in that it provides protection against corrosion in conditions of changing water stability.

There are no specific standards for alkalinity in drinking water but as this property provides resistance against changes in pH that can lead to either corrosion or excessive encrustation, a reasonable level should be maintained in drinking water supplies. What is reasonable for a particular type of water will depend upon its other characteristics of pH and hardness, but a value in the range of 50 to 200 milligrams per litre of calcium carbonate *(refer to note below for definition of unit) is generally considered optimal. Results of alkalinity monitoring are provided in Table 32.

*** Explanatory note on units used to express both alkalinity and hardness properties**

The unit of concentration "calcium carbonate equivalent", expressed as "milligrams per litre of calcium carbonate" (or mg/L $CaCO_3$) is commonly used in water chemistry to describe aggregate properties, such as hardness and alkalinity. This is because these properties are caused by various dissolved minerals, primarily calcium and magnesium for hardness, and bicarbonate and carbonate for alkalinity. However, the minerals can exist in different forms and combinations, making it complex to measure and compare their concentrations directly.

To simplify this, calcium carbonate – which is a common compound that is easy to measure and understand – is used as a standard reference. Consequently, when a value is expressed as "mg/L $CaCO_3$", it denotes the extent of hardness or alkalinity in the water, assuming all the various minerals were in the form of calcium carbonate. This convention simplifies the understanding and comparison of water quality data.

Table 27: True colour results for 2023–24

Water treatment plant / system	Localities supplied	Minimum samples collected per quarter	Total number of samples collected in reporting period	Average result (HU)	Maximum result (HU)	Number of samples where guideline was not met
Devon North	**Alberton Yarram**	1	4	<2	<2	0
Dumbalk	**Dumbalk**	1	4	<2	<2	0
Fish Creek	**Fish Creek**	1	4	<2	4	0
Foster	**Foster**	1	4	<2	<2	0
Lance Creek	**Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi**	1	4	<3	4	0
Leongatha	**Leongatha Koonwarra**	1	4	<2	<2	0
Meeniyan	**Meeniyan**	1	4	<2	<2	0
Toora	**Port Franklin Port Welshpool Toora**	1	4	<2	<2	0

Table 28: Iron results for 2023–24

Water sampling locality	Frequency of sampling (samples per quarter)	Total number of samples	Minimum result (mg/L)	Maximum result (mg/L)	Number of samples where guideline was not met
Alberton	1	4	<0.01	0.02	0
Cape Paterson	1	4	<0.01	0.02	0
Dumbalk	1	4	0.02	0.06	0
Fish Creek	1	4	<0.01	0.01	0
Foster	1	4	<0.01	0.02	0
Inverloch	1	4	0.01	0.02	0
Koonwarra	1	4	0.01	0.02	0
Korumburra	1	4	<0.01	0.02	0
Lance Creek	1	4	0.01	0.03	0
Leongatha	1	4	<0.01	<0.01	0
Loch	1	4	0.01	0.02	0
Meeniyan	1	4	<0.01	0.02	0
Nyora	1	4	0.01	0.02	0
Poowong	1	4	0.01	0.03	0
Port Franklin	1	4	<0.01	<0.01	0
Port Welshpool	1	4	0.01	0.02	0
Toora	1	4	<0.01	0.01	0
Wonthaggi	1	4	<0.01	0.02	0
Yarram	1	4	<0.01	0.04	0

Table 29: pH results for chlorinated systems in 2023–24

Water sampling locality	Minimum frequency of sampling (samples per week)	Total number of samples	ADWG aesthetic guideline for pH*	Minimum result (pH)	Mean result (pH)	Maximum result (pH)	Number of samples not compliant with aesthetic guideline
Alberton	1	52	6.5 to 8.5	7.7	8.2	9.2	2
Dumbalk	1	52	6.5 to 8.5	7.8	8.0	8.2	0
Fish Creek	1	52	6.5 to 8.5	7.5	7.8	8.2	0
Foster	1	52	6.5 to 8.5	7.3	7.6	8.0	0
Koonwarra	1	52	6.5 to 8.5	7.5	7.8	8.1	0
Leongatha	2	104	6.5 to 8.5	7.2	7.5	7.9	0
Meeniyan	1	52	6.5 to 8.5	7.4	7.6	7.9	0
Port Franklin	1	52	6.5 to 8.5	7.6	8.0	8.7	1
Port Welshpool	1	52	6.5 to 8.5	7.3	7.6	7.9	0
Toora	1	52	6.5 to 8.5	7.3	7.5	7.8	0
Yarram	1	52	6.5 to 8.5	7.3	7.7	8.5	0

* The ADWG states that a pH value of up to 9.2 may tolerated where monitoring indicates there is no deterioration in microbiological quality; refer to text (page 43) for further information

Table 30: pH results for chloraminated localities in 2023–24

Water sampling locality	Minimum frequency of sampling (samples per week)	Total number of samples	ADWG aesthetic guideline for pH*	Minimum result (pH)	Mean result (pH)	Maximum result (pH)	Number of samples not compliant with aesthetic guideline
Cape Paterson	1	52	6.5 to 9.2	7.9	8.2	8.6	0
Inverloch	2	113	6.5 to 9.2	7.8	8.2	8.3	0
Korumburra	1	62	6.5 to 9.2	7.7	8.1	8.8	0
Lance Creek	1	52	6.5 to 9.2	7.7	8.1	8.3	0
Loch	1	63	6.5 to 9.2	7.8	8.2	8.5	0
Nyora	1	60	6.5 to 9.2	7.6	8.1	8.4	0
Poowong	1	52	6.5 to 9.2	7.5	8.1	8.5	0
Wonthaggi	2	104	6.5 to 9.2	7.5	8.2	8.6	0

* For chloraminated localities, SGW assesses pH performance using the ADWG upper tolerance limit of 9.2: refer to text (page 43) for further information

Table 31: Total hardness in calcium carbonate ($CaCO_3$) equivalents* 2023-24

Water treatment plant / system	Localities supplied	Sampling frequency (samples per quarter)	Total number of samples	Minimum result (mg/L as $CaCO_3$)*	Average result (mg/L as $CaCO_3$)*	Maximum result (mg/L as $CaCO_3$)*	Number of samples where guideline was not met
Devon North	**Alberton Yarram**	1	4	23	27	30	0
Dumbalk	**Dumbalk**	1	4	69	97	120	0
Fish Creek	**Fish Creek**	1	4	31	36	42	0
Foster	**Foster**	1	4	34	45	57	0
Lance Creek	**Cape Paterson Inverloch Korumburra Lance Creek Loch Nyora Poowong Wonthaggi**	1	4	32	56	72	0
Leongatha	**Leongatha Koonwarra**	1	4	48	56	60	0
Meeniyan	**Meeniyan**	1	4	67	88	110	0
Toora	**Port Franklin Port Welshpool Toora**	1	4	27	35	43	0

* refer to explanatory note on units in text

Table 32: Alkalinity results for 2023–24

Water treatment plant / system	Localities supplied	Minimum sampling frequency (samples per quarter)	Total number of samples	Minimum result (mg/L as $CaCO_3$)*	Average result (mg/L as $CaCO_3$)*	Maximum result (mg/L as $CaCO^3$)*
Devon North	**Alberton** **Yarram**	1	4	18	22	24
Dumbalk	**Dumbalk**	1	4	46	56	65
Fish Creek	**Fish Creek**	1	4	31	36	42
Foster	**Foster**	1	4	38	45	51
Lance Creek	**Cape Paterson** **Inverloch** **Korumburra** **Lance Creek** **Loch** **Nyora** **Poowong** **Wonthaggi**	1	4	25	53	73
Leongatha	**Leongatha** **Koonwarra**	1	4	36	40	44
Meeniyan	**Meeniyan**	1	4	45	52	60
Toora	**Port Franklin** **Port Welshpool** **Toora**	1	4	35	38	42

* refer to explanatory note on units in text

Comparison of results for other water quality parameters

A comparison of results for the 2023–24 reporting period and the previous two fiscal years for water quality parameters other than those listed in Schedule 2 of the Regulations is presented in Table 33. The comparison is based on percentage compliance with the guideline values of the *Australian Drinking Water Guidelines 2011*.

Table 33: Three-year comparison of percentage samples compliant with health-related ADWG guidelines

	Percentage of samples compliant with health-related guidelines from the *Australian Drinking Water Guidelines 2011*		
Water Quality Parameter	**2021–22**	**2022–23**	**2023–24**
Arsenic	100 %	100 %	100 %
Aluminium	100 %	100 %	100 %
Chlorine	100 %	100 %	100 %
Copper	100 %	100 %	100 %
Cyanogen chloride	100 %	100 %	100 %
Iron	100 %	100 %	100 %
Lead	100 %	100 %	100 %
Manganese	100 %	100 %	100 %
Nitrate	100 %	100 %	100 %
Nitrite	100 %	100 %	100 %
NDMA	100 %	100 %	100 %
Antimony	100 %	100 %	100 %
Barium	100 %	100 %	100 %
Beryllium	100 %	100 %	100 %
Boron	100 %	100 %	100 %
Cadmium	100 %	100 %	100 %
Chloroacetic acid	100 %	100 %	100 %
Chromium	100 %	100 %	100 %
Cyanide	100 %	100 %	100 %
Dichloroacetic acid	100 %	100 %	100 %
Mercury	100 %	100 %	100 %
Molybdenum	100 %	100 %	100 %
Nickel	100 %	100 %	100 %
Selenium	100 %	100 %	100 %
Silver	100 %	100 %	100 %
Sulphate	100 %	100 %	100 %
Trichloroacetic acid	100 %	100 %	100 %
Zinc	100 %	100 %	100 %
1,2-dichloroethane	100 %	100 %	100 %

Table 33: Three-year comparison of percentage samples compliant with health-related ADWG guidelines (continued)

Water Quality Parameter	Percentage of samples compliant with health-related guidelines from the *Australian Drinking Water Guidelines 2011*		
	2021–22	2022–23	2023–24
2,4,5-T	100 %	100 %	100 %
2,4,6-trichlorphenol	100 %	100 %	100 %
2,4-D	100 %	100 %	100 %
Atrazine	100 %	100 %	100 %
Benzene	100 %	100 %	100 %
Benzo(a)pyrene	100 %	100 %	100 %
Carbon tetrachloride	100 %	100 %	100 %
Clopyralid	100 %	100 %	100 %
Dicamba	100 %	100 %	100 %
Glyphosate	100 %	100 %	100 %
MCPA	100 %	100 %	100 %
Metsulfuron methyl	100 %	100 %	100 %
Pentachlorphenol	100 %	100 %	100 %
Picloram	100 %	100 %	100 %
Simazine	100 %	100 %	100 %
Tetrachloroethene	100 %	100 %	100 %
Triclopyr	100 %	100 %	100 %
Gross Alpha Activity*	Not monitored	100 %	Not monitored
Gross Beta Activity*	Not monitored	100 %	Not monitored

* Radionuclides are monitored every 5 years.

8 Complaints relating to water quality for 2023-24

Complaint overview

SGW records and attends to all complaints relating to drinking water quality to ensure the highest level of customer satisfaction. Table 34 displays the five complaint types and the number of complaints received for each type over the 2023–24 year. Determination of the number of complaints per 100 customers supplied is based on the number of complaints compared with the total number of connected properties.

Complaints are broken down into complaint type per locality and supply system in Table 35. A comparison of the number complaints with that of the previous three reporting periods is provided in Table 36.

Table 34: Number of customer complaints for 2023–24

Type of complaint	Number of complaints	Number of complaints per 100 customers (connected properties) supplied
Colour/sediment	56	0.25
Taste and/or odour	17	0.08
Air in water	3	0.01
Suspected illness & health concerns	3	0.01
Other	6	0.03
Total complaints	**85**	**0.38**

Table 35: Customer complaints per complaint type and locality for 2023–24

Water treatment plant / supply system	Water sampling locality	Complaint category					Total complaints per locality	Total complaints per supply system
		Colour / sediment	Taste / odour	Air in water	Health concerns	Other		
Devon North	**Alberton**	0	0	0	0	0	**0**	**3**
	Yarram	3	0	0	0	0	**3**	
Dumbalk	**Dumbalk**	0	1	0	0	0	**1**	**1**
Fish Creek	**Fish Creek**	0	0	0	0	0	**0**	**0**
Foster	**Foster**	0	1	0	0	1	**2**	**2**
Lance Creek (southern towns)	**Cape Paterson**	2	1	0	0	0	**3**	**18**
	Inverloch	1	2	0	0	0	**3**	
	Lance Creek	0	0	0	0	0	**0**	
	Wonthaggi	2	1	1	1	4	**9**	
Lance Creek (northern towns)	**Korumburra**	1	1	0	1	0	**3**	
	Loch	0	0	0	0	0	**0**	
	Nyora	0	0	0	0	0	**0**	
	Poowong	0	0	0	0	0	**0**	
Leongatha	**Koonwarra**	0	0	2	0	0	**2**	**46**
	Leongatha	35	7	0	1	1	**44**	
Meeniyan	**Meeniyan**	1	0	0	0	0	**1**	**1**
Toora	**Port Franklin**	2	1	0	0	0	**3**	**14**
	Port Welshpool	8	0	0	0	0	**8**	
	Toora	1	2	0	0	0	**3**	
Total complaints per category		**56**	**17**	**3**	**3**	**6**	**85**	**85**

Table 36: Complaints comparison of 2023–24 with the previous two reporting periods

Type of complaint	Number of complaints			Comparison with previous reporting periods	Comments
	2021–22	2022–23	2023–24		
Colour/ sediments	28	14	**56**	Moderately significant increase	Increase from 2022–23 may be attributed to water supply network disturbances following mains breaks. Interruption of network cleaning programs during the COVID-19 pandemic may also be exerting a long-term effect with respect to increased sediment accumulations within water supply systems.
Taste/odour	11	15	**17**	Slight increase	Sustained low level of complaints over the 3-year period from 2021–22 can be attributed to improved ability to mitigate the effects of algal blooms in Lance Creek Reservoir. This includes use of supplemental supply from Melbourne water grid, and improved treatment technologies. Slight increase for 2023–24 may be attributed to sediment distribution following mains breaks.
Air in water	3	6	**3**	No significant change	Sustained low level of complaints for air in water. Complaints received followed water mains break repair and planned works.
Health concerns	4	1	**3**	No significant change	Category includes reports of gastrointestinal illness as well as general queries re water quality and health concerns.
Other	5	3	**6**	No significant change	Complaints in this broad category may include issues with aquatic animal pets, and problems with internal household plumbing or appliances. While usually beyond the control and responsibility of SGW, the complaints are recorded and actioned as appropriate.
Total	51	39	**85**	Moderately significant increase	See above comments and "Management of complaints" discussion on following pages.

Management of complaints

Colour / sediment

Colour / sediment complaints relate to problems with the clarity of water. Tap water containing sediments or particles and is coloured yellow, brown or blackish hues may be reported as "dirty water" by the customer. The particles and colour are produced by manganese and other mineral oxides rather than what might commonly be referred to as "dirt" (i.e., soil, mud, sewerage), but the overall effect is one of water appearing dirty and unacceptable to the customer.

Complaints in this category also include reports of stained laundry items which may result from oxidation of minerals in contact with laundry detergents in a washing machine.

Colour / sediment complaints primarily result from:

- High manganese levels in source waters. The soil in the South Gippsland region is naturally high in manganese, and run-off into reservoirs and rivers is unavoidable. Not all manganese can be removed during the water treatment process so accumulation in the distribution system can occur.
- Accumulation of sediment within clear water storages and water mains over time.
- Unintended scouring of water mains following high flows or recharging of the system.

Corrective actions to address colour / sediment water include:

- Use of aeration and potassium permanganate dosing systems at water treatment plants to oxidise manganese and maximise physical removal through filtration.
- Cleaning of clear water storage tanks and basins.
- Implementation of scheduled air-scouring and flushing programs within all water sampling localities to remove manganese and other accumulated sediments.
- Additional flushing when required in response to individual complaints, and increased frequency of flushing regimes for problem areas.
- Provision of a commercial cleaning product which removes discolouration marks from laundry items in response to individual customer complaints.

There were 56 complaints received in relation to coloured water in the 2023–24 reporting period.

Increase from 2022–23 may be largely attributed to an increase in water supply network disturbances following mains breaks. Mains renewal programs have been adjusted in response to this, with replacement of old mains in Leongatha now prioritised and underway.

Interruption of network cleaning programs during the COVID-19 pandemic may also be exerting a long-term effect with respect to increased sediment accumulations. The air-scour cleaning program resumed in 2024, however, only one to two localities per year can be cleaned due to resource limitations.

Taste and odour

What is considered acceptable in terms of the flavour and smell of water has some level of individual subjectivity. Some customers, for example, may object to the taste and odour of chlorine, while others receiving water with the same chlorine concentration do not. A complaint may relate to a customer's acute sensitivity to chlorine taste and odour, or the perception that chlorine is something that is undesirable to drink.

While tastes and odours in drinking water do not generally denote that water is unsafe, SGW endeavours to minimise unpleasant flavours as much as possible. This is important not only for the customer's satisfaction and enjoyment but also so that they will choose supplied tap water over other potentially less-safe or healthful forms of hydration (e.g., from a poorly-managed tank water system, or from sugary soft drinks) or options having adverse environmental impacts (i.e., purchased bottled water).

Taste and odour complaints result primarily from:

- Cyanobacterial (blue-green algal) compounds in the water.
- Manganese and/or iron sediment in the water.
- Changes in pH, dissolved oxygen, and other factors in relation to ageing of water within a water main due to low flows.
- Chlorine in water.

Corrective actions to prevent or address taste and odour issues include:

- Routine monitoring of supplied water for taste and odour, manganese, iron, turbidity, pH and chlorine.
- Analysis for taste and odour related parameters (as above) when required in response to individual complaints.
- Use of powdered activated carbon (PAC) at treatment plants to remove algae-related and other taste and odour compounds from water.
- Use of aeration and potassium permanganate dosing systems at water treatment plants to oxidise manganese and maximise removal from source waters.
- Water main flushing and air-scouring programs.
- Use of supplementary supply where available (i.e., Melbourne water for Lance Creek system).

There were 17 complaints relating to taste and odour issues received from customers in the 2023–24 reporting period. The sustained low-level of taste and odour complaints in the past three years (refer to Table 36) can be largely attributed to the connection of the Lance Creek system to the Melbourne water supply grid in 2018. The ability to supply the system with 100 per cent Melbourne water has allowed the Lance Creek Reservoir to be taken completely offline when affected by cyanobacterial blooms. The capacity to blend Melbourne and Lance Creek waters has also enabled dilution of cyanobacterial taste and odour compounds in the reservoir to levels acceptable to customers.

Air in water

Air in water complaints are received following mains breaks, implementation of air-scour mains cleaning programs, or following other planned works on the water supply system. Air-related complaints are often reported as "white water" or "milky water". This is due to the effect of tiny air-bubbles on the appearance of the water.

Notifications delivered to customers in advance of planned works and air-scouring programs include advice to flush internal taps following scheduled conclusion of the works. This action normally resolves any potential "white water" issue. Where it cannot be resolved by the customer, mains flushing is carried out to remove air from the system.

There were three complaints involving air in water from SGW customers in the 2023–24 reporting period. These followed planned works involving valve operations and mains shutdowns.

Suspected illness and health concerns

Customers may make a complaint if they suspect supplied tap water is the cause of illness or other conditions, such as skin or eye irritation and problems with hair. Generally-speaking a customer will call to seek reassurance with regards to water quality rather than alleging that the water is the cause of their health problem.

Customers with health concerns are encouraged to consult a medical professional for diagnosis and treatment. Depending on the nature of the complaint, additional monitoring to verify quality of drinking water supplied to the customer's residence and through the domestic plumbing system may be carried out. Details of the complaint and results of both monitoring and diagnostic testing (if provided) are recorded via an Illness Complaint Record Form.

In the unlikely event supplied drinking water was found to be a cause of illness, the Department of Health would be immediately notified. Further actions, which might include issue of a boil water advisory, would be implemented as a matter of the highest priority.

There were three customer health concerns recorded for 2023–24. Investigation found no evidence of related water quality problems.

Other complaints

Other complaints relate to concerns that are generally beyond the control and responsibility of SGW. These may include problems with aquarium fish or garden plants, and issues with domestic plumbing or appliances, including at-home filtration devices.

In response to such complaints, results of monitoring programs that may be relevant are reviewed, and additional investigation and sampling is carried out where appropriate. Customers are informed of the likelihood of supplied water being the cause of the problem and given advice on where to seek additional assistance if required. There were six complaints in this category in the 2023–24 reporting period.

9 Findings of the most recent risk management plan audit

Audit overview

Under section 7 of the Act, a water supplier is required to prepare, implement, and review a risk management plan for the supply of drinking water to the public. The plan must be audited by an approved external auditor periodically as directed by the Department of Health.

An audit was not required to be conducted in the 2023–24 reporting period.

Progress summaries for actioning of opportunities for improvement identified in the 2023 and 2020 audits are provided as Appendix B and Appendix C, respectively.

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Regulated water

Regulation 16 of the Safe Drinking Water Regulations 2015 requires details of regulated water supplied be included in this annual report. Regulated water is defined as "water that is not intended for drinking but could reasonably be mistaken as drinking water". SGW did not supply any regulated water in the 2023–24 reporting period.

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Appendices

Appendix A: Drinking Water Quality Policy

Drinking Water Quality Policy

"Committed to high-quality drinking water"

South Gippsland Water is committed to providing safe, high-quality drinking water that consistently meets accepted standards, guidelines, regulatory requirements, and customer expectations. To achieve this, in partnerships with stakeholders and relevant agencies, the Corporation will:

- Manage water quality at all points along the delivery chain from source water to consumer;
- Use a risk-based approach to identify and manage potential threats to water quality;
- Continually assess the quality of drinking water through appropriate monitoring programs and effective reporting systems;
- Develop appropriate contingency planning and incident response capability;
- Integrate into our planning the needs and expectations of customers, stakeholders, regulators, and employees;
- Continually improve our management systems by assessing performance against industry best practice, corporate commitments, and stakeholder expectations;
- Participate in appropriate research and development activities to ensure continued understanding of drinking water quality issues and performance;
- Contribute to the debate on setting industry regulations and guidelines, and other standards relevant to public health and the water cycle.

The Corporation will implement and maintain a drinking water quality management system consistent with the NHMRC, *NRMMC Australian Drinking Water Guidelines** to effectively manage risks to drinking water quality.

All managers and employees involved in the supply of drinking water are responsible for understanding, implementing, maintaining, and continuously improving the drinking water quality management system.

This Drinking Water Quality Policy is proudly displayed at South Gippsland Water facilities and is communicated to all persons working for or on the Corporation's behalf during induction or contract proceedings. The Policy is available to the public upon request or via the South Gippsland Water website. Contact details are: –

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14–18 Pioneer Street
PO Box 102
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Robert Murphy
Managing Director

Date: 30 September 2024

* NHMRC, NRMMC (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy.* National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra

Appendix B: Progress summary for 2023 drinking water Risk Management Plan Audit

Item	Opportunity for improvement (OFI)	Target completion date	OFI status as of Sept 2024	Action progress as of Sept 2024	Comments
1.	Put in place measures to help prevent outdated hard copies of RMP documentation being present at WTPs, depots, and offices.	Dec 2023	Closed	Complete	Notifications of updated documents are to emphasise direction to discard outdated hardcopy versions. Regular internal auditing at water treatment plant laboratories, including checks of hardcopy documentation has been added to operator task lists in WIMS (Water Information Management System) and MS Teams Planner.
2.	Formalise how reagents that have gone past their minimum recommended shelf life can have their agreed expiry dates extended, or have the reagents repurposed for non-critical uses, or discarded.	Dec 2023	Closed	Complete	Reagents will no longer be ordered in bulk or large volumes. Regular internal auditing at water treatment plant laboratories, including checking of expiry dates has being added to operator task lists in WIMS (Water Information Management System) and MS Teams Planner
3.	Consider the value of introducing a carbon dosing system to permit powdered activated carbon dosing at the Devon North WTP.	Dec 2023 (consideration)	Closed	Complete	The feasibility and value with respect to infrequency of algal blooms at Devon North have been assessed. The Devon North supply has been deemed as less-requiring of a permanent carbon-dosing system than other water supply systems at this time. Infrequent blooms and related taste and odour issues will continue to be managed with the temporary carbon dosing system until such time as a permanent system is deemed appropriate and can be installed.
4.	Serious consideration should be given to full replacement of all basins relying on legacy floating cover arrangements with modern, conventional treated water storage tanks.	Sep 2023 (consideration)	Closed	Complete OFI to be given (long-term) future consideration	Following industry consultation and risk assessment, SGW has evaluated the costs and benefits of replacing floating cover basins with modern treated water tanks. While tanks would incur significant upfront costs—at least ten times more than refurbishing basin linings—SGW's experience shows they would still require similar inspection and maintenance. Additionally, tanks may be more vulnerable to climate change impacts, such as extreme weather and rising temperatures. SGW will continue managing risks related to floating covers, potentially increasing reliance on external contractors and more frequent water sampling to address climate-related concerns. Recent refurbishments of four basins were completed, with the fifth scheduled for 2024–25. SGW will monitor evolving industry practices and water quality over the next 15 to 25 years to inform future decisions regarding the auditor's recommendation.
5.	Check whether there are parts or fittings that do not bear the (W) watermark and if so to remove them from use for potable water works.	Sep 2023	Closed	Complete	Work Orders for Maintenance Team Leaders and Stores Officers to audit depot sites for non-watermarked items. All work orders complete.

Appendix C: Progress summary for 2020 drinking water Risk Management Plan Audit

Item	Opportunity for improvement (OFI)	Target completion date	OFI status as of September 2023	Action progress	Comments
1.	Consideration could be given to the possible value of roofing of the (Leongatha) WTP infrastructure to improve ease of maintenance and asset life and reduce slime formation.	Aug 2024 (consideration)	Closed	Complete	Installation of a roof over the clarifier at Leongatha Water Treatment Plant has been included on SGW's 15-year Capital Improvement plan for longer-term consideration (OFI-1)
2.	SGW could consider means to keep analytical instrumentation reagents and standards within their appropriate operating temperature range and seek to minimise variations in that temperature.	Not applicable	Closed	Complete No action required.	Brick analyser shed at Lance Creek WTP is already installed. OFI is based on a misunderstanding during the audit (likely due to social distancing and masking rules at the time). Operator was speaking of issues with operating temperatures previous to construction of shed.
3.	SGW may wish to keep track of emerging issues relating to microbial pathogens and disinfection by-products given its continuing use of floating covers rather than conventional tanks.	On-going	Closed	Complete	SGW will keep abreast of emerging issues via on-going review of relevant publications and attendance at seminars, etc. Monitoring of basins is already in place.
4.	SGW could more clearly label some of its sampling points to help reduce the risk of misunderstanding when samples are collected.	Dec 2022	Closed	Complete	An audit of existing signage was conducted. Metal signage tags have been installed where required. Sampling staff also undergo training and internal auditing to ensure competency. They are also provided with sampling site guidebooks, which are updated regularly.
5.	Where parts and fittings are being stored, SGW could consider providing sufficient space under cover to protect parts and fittings from potential UV degradation.	Aug 2024	Closed	Complete	All pipe lengths and fittings are now stored undercover in existing storage sheds at works depots, obviating requirement for additional storage to be constructed.
6.	SGW could consider adding some clear signage on the temporary potable water tanker	Dec 2021	Closed	Complete	Signage of all temporary water trailers complete
7.	SGW could consider some formal resilience planning to provide safe water for systems that do not have a backup water supply feed to protect the supply of safe water in the event of untreatable source water contamination or treatment system failure (e.g., Leongatha that is a large system with limited contingency).	April 2022	Closed	Complete	Resilience planning included in SGW's Urban Water Strategy (UWS). The UWS is a state-required 50-year strategy for water and waste-water services that recognizes the variables and future impacts of climate change and growth. The UWS process completed, and report produced April 2022, in alignment with DELWP/DEECA guidelines. Resilience assessments were undertaken for each system. Systems found to be either resilient or small enough for water to be supplied by tanker in an emergency. Contingency planning and work with respect to clear water storages and bypasses is on-going. Filter and clarifier upgrades for enhanced treatment are under consideration.

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Appendix D: Glossary of water treatment agents and processes

Aluminium chlorohydrate	Aluminium salt used as a coagulant in water treatment
Aluminium sulphate	Aluminium salt used as a coagulant in water treatment
Chloramine	A compound of chlorine and ammonia used for disinfection
Chlorine	An element used as a disinfectant in water treatment. May be applied in gaseous, elemental form, or via aqueous solution of sodium hypochlorite.
Coagulation	A chemical water treatment process that involves neutralisation of ionic charge on particles (impurities) in water. This destabilisation of charge allows for particles to come together (coagulate) rather than repel each other electrostatically. This leads to the formation of small fluffy, flake-like masses.
Dewatering of wastewater	Method of post water treatment water conservation. Removes excess water from sludge so it can be returned to a reservoir and reused.
Disinfection	Use of chemical, other agent (e.g. ultraviolet light) or process to kill or inactivate microorganisms which may be harmful to human health.
Dissolved air floatation (DAF) clarification	Water treatment process involving use of pressurised air for clarification. Microscopic air bubbles attach to floc and cause it to float and form a sludge layer. This allows for separation of impurities (as floc) from water.
Filtration	Final water treatment process prior to disinfection; clarified water passes through large filters where impurities are entrapped.
Flocculation	A physical water treatment process that causes flake-like particle aggregates (formed through coagulation processes) to come together into larger masses known as floc. Formation of floc allows for purification of water via sedimentation and filtration processes.
Fluoridation	Addition of fluoride to water for public dental health purposes.
Granular medium	Layers of sand, gravel and crushed anthracite that make up a water treatment plant filter.
Hydrochloric acid	An acid used to lower the pH of water which enables optimisation of coagulation processes
Manganese oxidation	Water treatment process important for minimising dirty/coloured water complaints. Oxidation of dissolved manganese in raw (source) water causes it to precipitate out of solution as a solid. This is in turn allows for the solid oxidised manganese particles to be removed via coagulation, flocculation and filtration processes.
Manganese sequestration	Process that may be used to mitigate post treatment manganese oxidation and resulting discolouration of water. Manganese that has not been removed in treatment may oxidise on contact with chlorine disinfectants or air. Sequestration (or chelation) causes manganese to form soluble complexes that do not cause discolouration of water.
pH correction (pre/post treatment)	Raw water pH can vary due to environmental factors. Pre pH correction is needed to optimise treatment processes. Post pH treatment may be required to ensure pH is suitable for disinfection, and for distribution to customers in terms of aesthetics and water stability.
Polyacrylamide	Chemical polymer which may be used to facilitate flocculation or dewatering processes. Acts by binding particles/floc together.
Potassium permanganate	Compound used to oxidise manganese
Powdered activated carbon (PAC)	Primarily used to adsorb taste and odour compounds produced by algae from raw water
Sedimentation clarification	A physical water treatment process using gravity to remove suspended solids from water
Sodium hydroxide	Base used to raise the pH of water and optimise coagulation pH levels.
Ultraviolet disinfection	Use of ultraviolet light to kill/inactivate water-borne microorganisms that may be harmful to human health.

Appendix E: Glossary of acronyms and terms used in report

ADWG	*Australian Drinking Water Guidelines 2011;* published by the National Health and Medical Research Council
CFU (or cfu)	Colony-forming unit. A quantifier used in microbiology. One visible microbial colony on a growing medium (agar plate or other) represents one microbial cell in the original sample. May be expressed as CFU per unit
CWS	Clear water storage: A tank or basin that contains and protects water that is safe to drink
Coliforms	A general term for certain types of rod-shaped bacteria that share identifying characteristics.
Cyanobacteria	Photosynthetic aquatic bacteria commonly referred to as 'blue-green algae' (though not actually algae).
DWMS	Drinking Water Management System
'the department'	Department of Health (State Government of Victoria)
E. coli	*Escherichia coli:* thermotolerant bacteria used as an indicator of faecal contamination
HACCP	Hazard Analysis and Critical Control Point
HBT	Health based targets: measurable health, water quality or performance objectives that are established based on a judgement of safety and on risk assessments of waterborne hazards
<	'Less than' (mathematical term)
>	'Greater than' (mathematical term)
≤	'Less than or equal to' (mathematical term)
L	Litre: a unit of volume equal to 1000 cubic centimetres
mg/L	Milligrams per litre: a unit of concentration (one milligram is equal to 0.001 grams)
ML	Megalitres: a unit of volume (one megalitre is equal to one million litres)
NATA	National Association of Testing Authorities
ng/L	Nanograms per Litre: a unit of concentration (one ng is equal to 0.000000001 grams)
NHMRC	National Health and Medical Research Council
OFI	Acronym for "opportunity for improvement" as noted in audit reports
Pathogen	Disease-causing microorganism (bacteria, viruses, protozoa or fungi)
PAC	Powdered activated carbon
PLC	Programmable logic controller: a digital computer used for automation of electromechanical processes
Potable water	Water that is safe to drink
PVC-EIA	Polyvinyl chloride – Ethylene interpolymer alloy: Geomembrane material for linings and coverings
Quarter	Time period referring to one quarter of a year, i.e. three months.
Raw water	Untreated source water (from a river, creek or reservoir). Non-potable (unsafe) water
RMP	Risk Management Plan
'the Act'	*Safe Drinking Water Act 2003*
'the Regulations'	Safe Drinking Water Regulations 2015
SGW	South Gippsland Water (South Gippsland Region Water Corporation, 'the Corporation')
Turbidity	A measure of the cloudiness of water due to suspended solids

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South Gippsland Water

START SAFE
WORK SAFE
HOME SAFE