Annual report on drinking water quality in Victoria 2020–21

Proactively managing foreseeable risks to drinking water quality

VICTORIA State Government | Department of Health

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Acknowledgement of Aboriginal Victoria

The department proudly acknowledges Victoria's Aboriginal communities and their rich culture and pays respect to their Elders past and present.

We acknowledge Aboriginal people as Australia's first peoples and as the Traditional Owners and custodians of the land and water on which we rely.

We recognise and value the ongoing contribution of Aboriginal people and communities to Victorian life and how this enriches us.

We embrace the spirit of reconciliation, working towards the equality of outcomes and ensuring an equal voice.

Secretary's foreword

The department's vision is that Victorians are the healthiest people in the world and that Victoria is a place where future generations thrive. Ensuring safe drinking water, now and in the future, is integral to achieving that vision. To appreciate this, we only need consider the impact of waterborne disease where safe water and good sanitation has not been achieved.

We want prevention to come first; an ounce of prevention is worth a pound of cure. Drinking water quality management embodies that principle and continues to be a foundation for the prevention and control of waterborne disease around the world.

We also want to be always improving, challenging ourselves to learn and adapt based on the best-available data and evidence. That evidence, from around the world, tells us that waterborne outbreaks are often the result of inadequate treatment or treatment failure, complacency, and compromised source waters.

More frequent bushfires, floods, storms, power outages and algal blooms … and let's add our recent earthquakes for good measure … continue to challenge the quality and supply of our drinking water. Impacts include reduced capacity for raw water harvesting; challenges to safely treat the change in water quality; maintaining acceptable water quality within distribution systems; power failures disrupting critical treatment barriers; and damage to critical infrastructure.

Overall the 24 water agencies performed well against the drinking water quality standards in 2020–21, with 13 notifications of water that did not meet a drinking water quality standard under the Safe Drinking Water Regulations 2015 compared with 17 notifications made in 2019–20. All water sampling localities met the turbidity water quality standard for the fourth consecutive year.

This year a total of 63 reports of known or suspected contamination were made to the department compared with 51 reports in 2019–20. This report shares valuable lessons from 11 drinking water quality incidents this year, with nine resulting in drinking water advisories. These incidents were managed through the collective and collaborative efforts of water agencies and the department, fortunately avoiding adverse impacts to consumers.

Of the 17 water agencies that completed risk management plan audits in 2020–21, three water agencies did not comply with the obligations imposed by the Act. As expected, this year's audit process has also revealed opportunities for further improvement.

In particular we must maintain and enhance our multiple barrier approach to delivering safe drinking water to Victorians, at all points from water catchment to the tap. This requires improved assessment of water quality risks, maintaining water storage integrity, and gaining a better understanding of the systemic vulnerabilities in structures and processes. Protecting and restoring our water supply catchments is particularly important in the face of climate change, so that we and future generations can continue to access affordable and high-quality water.

We want to meet the needs of all Victorians. There are still communities in rural and regional areas, including schools and health settings, that do not have access to reticulated drinking water supplies, relying on private drinking water sources instead. We want to work in partnership with water agencies to look for opportunities to extend reticulated drinking water where this may be possible.

We also seek all opportunities to extend the provision of fluoridated water wherever possible to reduce preventable tooth decay. Coliban Water completed its Cohuna water fluoridation plant, providing 2,500 people with fluoridated drinking water for the first time. More than 96 per cent of Victorians, including 88 per cent of rural and regional Victorians, now have access to fluoridated water.

To achieve all of this, we remain committed to working together as one with the water industry, respecting each other's roles and expertise in the system, translating our enormous collective hindsight into effective foresight to get the best outcomes for Victorians. It is too easy to take for granted how convenient it is for most of us to turn on the tap and not worry about the safety of the water. But behind the scenes there are complex systems, sophisticated technologies and many, many hands. I would like to acknowledge the dedicated and tireless efforts of all those who work to bring safe, high-quality drinking water to our taps every day.

Working together to continuously improve the provision of safe drinking water, we can enhance the health and wellbeing of all Victorians.

Professor Euan M Wallace AM
Secretary
Department of Health

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Introduction

The *Safe Drinking Water Act 2003* (the Act) and Safe Drinking Water Regulations 2015 (the Regulations) provide Victorian water agencies and the Department of Health (the department) with a framework to ensure safe drinking water is supplied for the health and wellbeing of Victorian communities.

Section 32 of the Act requires that the Secretary of the department provides the Minister for Health with an annual report that details a statewide perspective of drinking water quality, along with details of the Secretary's activities under the Act, no later than 28 February each year.

Section 26 of the Act requires Victoria's 24 water agencies[1,2] to prepare and submit annual reports on issues relating to the quality of drinking water and regulated water to the Secretary no later than 31 October each year. Water agencies' annual reports assist in providing a statewide perspective of drinking water quality.

The Regulations and the department's *Guidance: Water quality annual report*[3] outline the information water agencies need to include in their annual reports. Where applicable, water agencies provide the following information in their respective annual reports:

- actions taken in respect of each emergency, incident or event that has affected water quality
- written undertakings that have been accepted by the Secretary
- the findings of the most recent risk management plan audit and any issues raised bythe approved auditor
- a summary of disinfection or treatment processes, including a list of all chemicals and other substances used to disinfect and treat the water
- information evidencing compliance or noncompliance with specific sections of the Regulations and actions taken
- analysis of water sample information, data and results
- a summary of variations in aesthetic standards and exemptions from a water quality standard
- a summary of complaints, responses and analysis
- details of any regulated water supplied.

1 There are 21 water suppliers and four water storage managers; one being both a water supplier and water storage manager.
2 As of 1 July 2021 there are 23 water agencies following the amalgamation of City West Water Corporation and Western Region Water Corporation to form the Greater Western Water Corporation.
3 *Guidance: Water quality annual report,* June 2017

In-depth information on the performance of each water agency is provided in their annual reports available on their respective websites (refer to Appendix 1 for water agency contact details).

This annual report summarises Victoria's drinking water quality performance and the department's activities during the 2020–21 reporting period. The report recognises the ongoing efforts made by water agencies in delivering high-quality drinking water to Victorians and the department's regulatory role in achieving this outcome, along with protecting public health.

In this reporting cycle, 17 of the 24 water agencies completed their risk management plan audits, and their audit outcomes are reported. The remaining seven water agencies audit outcomes were reported in the 2019–20 annual report, and progress with completing recommendations from the respective audits continue to be reported.

Proactively managing foreseeable risks to drinking water quality

Providing safe drinking water and sanitation is a cornerstone of public health; getting it wrong can lead to disease and sometimes death. In Victoria, drinking water contamination incidents have increased in frequency over the past three years, with 63 incidents in 2020–21 compared with 51 in 2019–20 and 37 in 2018–19.

Between December 2019 and June 2021, 17 drinking water advisories (boil water, do not drink water) were issued involving 12 water agencies, compared with an average of one advisory per year in previous years. The reasons for this significant change include increasing intensity and frequency of extreme weather events (for example, bushfires, storms, algal blooms), which will further increase the risk of future contamination events and subsequent health impacts on the community. Indirectly, these hazards have also made visible a number of treatment plant and process failures and human error that could have been prevented.

As a regulator, the department plays a key role in ensuring public trust and safety by operating with integrity, accountability and transparency. The department undertakes compliance and investigations with a critical lens to build lines of evidence to: support findings and decisions; prioritise and take action based on a risk-based approach; prevent recurrences through recommendations, actions and share learnings with water agencies; develop and issue guidance; and work collaboratively with stakeholders.

The safety, security and sustainability of drinking water requires a proactive risk management approach. Water agencies must constantly review and revise their risk management plans to incorporate potential hazards that arise from a changing landscape and new risks that may compromise drinking water quality and safety from catchment to tap. Other measures to address systemic issues include: scheduled and improved asset maintenance regimes such as: regular checks on asset conditions particularly after storm or fire events, water storage tank cleaning and asset upgrades; the review of treatment effectiveness; improvements to contingency plans and routinely testing and updating those plans; the development of emergency response plans and emergency preparedness systems; and competency and training of personnel. These measures can be critical in minimising, if not preventing, future drinking water contamination incidents.

Proactively managing foreseeable risks to drinking water quality will continue to maintain community confidence in the safety of Victoria's drinking water and contribute to the department's vision that Victorians are the healthiest people in the world.

Overview of performance and achievements in 2020–21

Ensuring compliance is integral to maintaining community confidence in drinking water supplies and protecting the public from hazards in water. Through administration of the Act and the Regulations, the department regulates the Victorian water agencies and assists them with their legislative and regulatory obligations.

In 2020–21 the department continued to work with water agencies to maintain and improve the quality of drinking water supplied to Victorian communities. The department also continued to implement its *Better regulatory practice framework,* which encompasses a risk-based approach, collaboration with stakeholders and water agencies, and providing consistent regulatory oversight.

Key performance outcomes and achievements relating to drinking water supplied in this reporting period are summarised below.

- As of 30 June 2021 there were 476 water sampling localities across the state, with an increase of two new water sampling localities compared with last year.
- The overall performance against the drinking water quality standards is as follows:
  - 467 localities, representing 98.1 per cent, continuously met all three Schedule 2 water quality standards (r. 12 (a)) in the Regulations compared with 98.5 per cent in the previous year.
    - 98.1 per cent of localities met the *Escherichia coli* (*E. coli*) standard compared with 99.4 per cent in 2019–20.
    - 99.8 per cent of localities met the total trihalomethane standard compared with 99.2 per cent in 2019–20.
    - 100 per cent of localities met the turbidity water quality standard for the fourth consecutive year.
  - 465 localities (97.7 per cent) continuously met all water quality standards in the Regulations compared with 459 localities (96.8 per cent) in the previous year.
  - 13 notifications from 10 water suppliers were made under s. 18 of the Act regarding water that did not meet a drinking water quality standard under r. 12 of the Regulations. This is a decrease from 17 notifications made by four water suppliers in 2019–20.

- A total of 63 reports of known or suspected contamination were made under s. 22 of the Act, compared with 51 reports in 2019–20.
  - Six 'boil water' advisories and three 'do not drink' water advisories were issued by seven water agencies due to the potential for contamination during maintenance activities, disinfection failures, process control issues, ingress of animals, *E. coli* detection and the impact of storms.
  - Of the section 22 reports of known or suspected contamination, there were 28 reports due to *E. coli* detections compared with 27 in 2019–20 and 17 in 2018–19. Following investigations by the water agencies, 20 of these reports did not result in a section 18 notification because the samples were not representative of the water in the relevant water sampling locality (false-positive samples).
- 17 of the 24 water agencies[4] completed their risk management plan audits in 2020–21. The audits' findings were that 11 water suppliers and all four water storage managers[5] complied with the obligations imposed by s. 7(1) and s. 8(1) of the Act respectively during the audit period. Three water suppliers (Barwon Water, East Gippsland Water and North East Water) did not comply with the obligations imposed by s. 7(1) of the Act during the audit period.
- Coliban Water completed its Cohuna water fluoridation plant, providing 2,500 people with fluoridated drinking water for the first time. More than 96 per cent of Victorians, including 88 per cent of rural and regional Victorians, now have access to fluoridated water.

4 Seven water agencies' risk management plan audit outcomes were reported in the 2019–20 annual report.
5 Grampians Wimmera Mallee Water operates both as a water supplier and a water storage manager.

Victoria's safe drinking water regulatory framework

Victoria's drinking water is managed under a comprehensive regulatory framework that began on 1 July 2004. This framework aims to ensure a consistent and reliable supply of safe, good-quality drinking water for Victorians. The framework consists of the:

- *Safe Drinking Water Act 2003*
- Safe Drinking Water Regulations 2015.

The safe drinking water legislation requires:

- a proactive catchment-to-tap risk management approach by water agencies
- that water agencies meet drinking water quality standards
- that water agencies disclose information to the department and the public.

The framework is consistent with the risk management approach in the *Australian drinking water guidelines 2011* (ADWG) and supports the *Health (Fluoridation) Act 1973*.

Minister for Health

The Safe Drinking Water Act provides several functions and powers to the Minister for Health:

- declaring any water that is not drinking water to be regulated water
- approving an application by a water supplier to vary a drinking water aesthetic standard
- approving an application from a water supplier for an exemption from a drinking water quality standard
- imposing conditions in relation to drinking water variations or exemptions
- fixing a period for which an administration levy is payable by water agencies, apportioning the amount between the water agencies and ensuring payment is made into the Consolidated Fund
- ensuring that an annual report on drinking water quality is provided to each House of the Parliament on or before the sixth sitting day of the House after the report has been received.

Department of Health

The Secretary of the department is the authority empowered to administer and enforce the Act. The functions of the Secretary under the Act include:

- protecting public health in relation to the supply of drinking water
- monitoring and enforcing compliance with the Act and the Regulations
- reporting on the performance of water agencies in relation to the requirements under the Act
- investigating and reporting on any aspect of drinking water quality in Victoria
- making recommendations to the Minister for Health on any matter relating to drinking water or regulated water
- promoting industry and public awareness and understanding of drinking water quality issues.

The Secretary also has the following specific authority under the Act:

- do all things necessary, including requiring a water agency to give specified information, to carry out the Secretary's functions under the Act
- accept an undertaking by a water agency relating to a contravention of the Act
- issue an enforcement notice to a water agency if it is contravening specific sections of the Act or is in breach of an undertaking
- establish and maintain a register of variations, exemptions and undertakings
- direct a water agency to give specified information and take specified corrective action if there is a risk to public health
- appoint a person to be an authorised officer and authorise them to assess and address immediate risks to public health relating to drinking water
- require water agencies to have their risk management plans audited and approve the auditor.

The Secretary must give the Minister for Health an annual report on drinking water quality no later than 28 February each year. This is that report.

Water Unit

The department's Water Unit administers Victoria's safe drinking water regulatory framework on behalf of the Secretary. The Water Unit has a regulatory role and activities include:

- reviewing and assessing the health significance of section 18 notifications and section 22 reports made by water agencies to the Secretary under the Act and ensuring that water agencies implement appropriate corrective actions and mitigation measures to minimise re-occurrences
- discussing current and future regulatory issues with water agencies and following up on compliance actions
- visiting and inspecting water treatment plants
- reviewing water agencies' drinking water quality annual reports
- reviewing and processing proposals by water agencies to vary water sampling localities and declarations concerning regulated water
- providing guidance and advice to water agencies on the safe drinking water regulatory framework and drinking water quality issues and working with them to achieve compliance with the Act and the Regulations
- providing input into national drinking water guidelines and policy development
- raising awareness across government, industry and the community on public health protection and health promotion issues related to drinking water
- reviewing technical appraisals and audit reports for water fluoridation schemes and overseeing the operational efficacy of fluoridation plants to ensure reliability in terms of safety and desired oral health benefits
- contributing to research about emerging drinking water quality issues
- leading the Victorian Government's emergency response during emergencies related to contaminated drinking water supplies.

Water agencies

The Act requires water agencies to provide safe, good-quality drinking water. In 2020–21 there were 24 water agencies[6] regulated by the department, with the Act distinguishing between two types of water agencies: water storage manager and water supplier. The Act applies to all water agencies involved with water storage, water treatment and distribution of drinking water and regulated water. Appendix 1 provides a list of water agencies.

Water agencies, depending on whether they are a water storage manager or a water supplier, have a range of obligations under the Act including:

- preparing, implementing, continuously reviewing and revising a plan to manage risks in relation to drinking water and having the risk management plan audited
- ensuring the drinking water they supply meets drinking water quality standards specified by the Regulations
- notifying the Secretary if drinking water it is supplying does not comply with a water quality standard
- reporting to the Secretary any known or suspected contamination of drinking water
- providing an annual report related to the quality of drinking water and regulated water to the Secretary no later than 31 October each year.

6 As of 1 July 2021 there are 23 water agencies following the amalgamation of City West Water Corporation and Western Region Water Corporation to form the Greater Western Water Corporation.

Water storage managers

Water storage managers store and supply water to water suppliers (Figure 1).

There are four water storage managers: Melbourne Water supplies untreated and treated drinking water to water suppliers, while Goulburn-Murray Water, Southern Rural Water and Grampians Wimmera Mallee Water supply untreated water to water suppliers.

Grampians Wimmera Mallee Water operates as both a water storage manager and a water supplier.

Figure 1: Water storage managers

- Water storage manager head office location

* Grampians Wimmera Mallee Water is both a water supplier and water storage manager

Water suppliers

Most Victorians receive reticulated drinking water supplied by a water supplier. Each water supplier covers a discrete geographic area where drinking water supply areas are defined as water sampling localities under the Regulations (Figure 2).

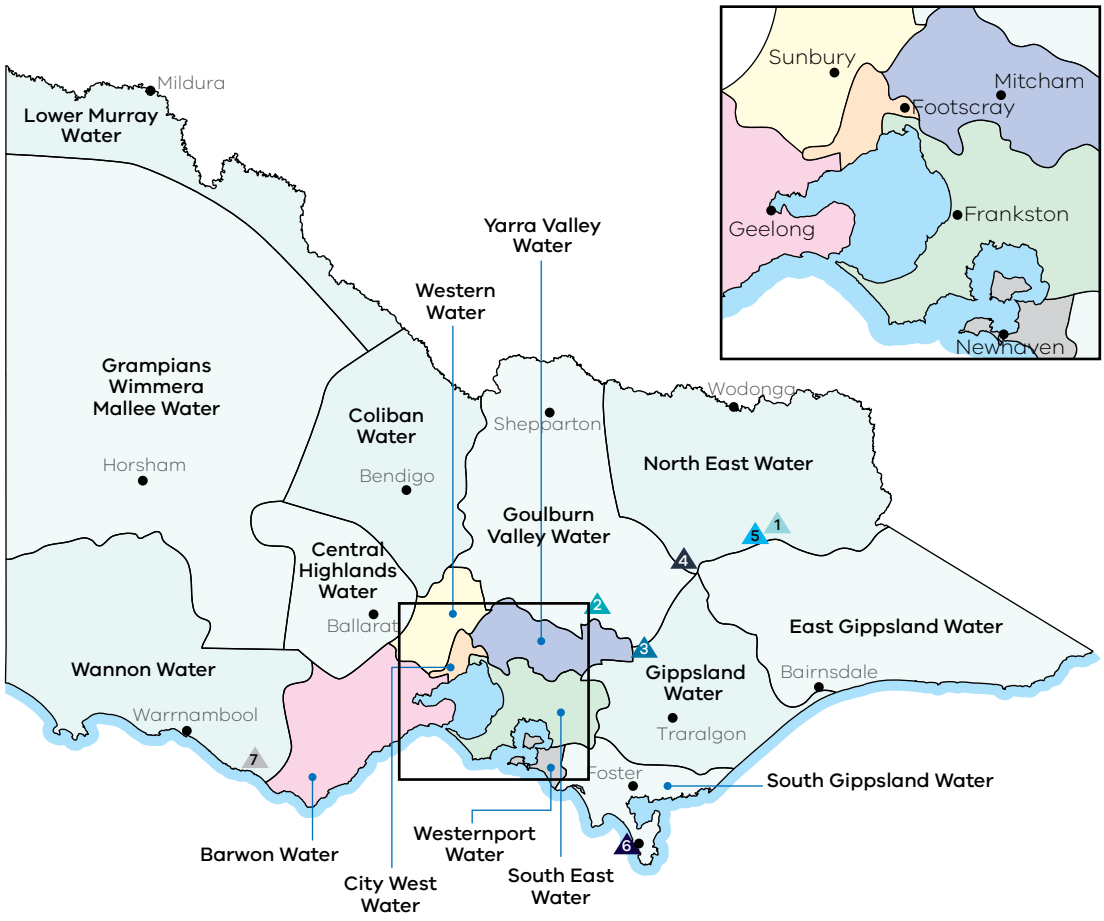
In this reporting period there are 21 water suppliers in Victoria, all responsible for ensuring water meets drinking water quality standards. The three metropolitan water suppliers receive treated drinking water from Melbourne Water (water storage manager) and apply additional treatment (secondary chlorination). Eighteen water suppliers apply primary and secondary treatment to untreated water to ensure all customers receive safe drinking water.

Seven water suppliers also manage regulated water supplies (water that could be mistaken for drinking water; for example, untreated reticulated water for irrigation, stock use or non-drinking domestic uses). Specific provisions for managing the risks associated with these water supplies are included in the Act and the Regulations.

During the reporting year, the process and administration to merge City West Water and Western Water to form Greater Western Water was completed.[7] The merger was to ensure that reliable, efficient and affordable water services could be maintained to meet the demands of the customers and the community in the rapidly growing outer west region of Melbourne.

7 Greater Western Water came into operation on 1 July 2021.

Figure 2: Water suppliers



- Water supplier head office location

1. Falls Creek Alpine Resort Management Board
2. Southern Alpine Resort Management Board (Lake Mountain)
3. Southern Alpine Resort Management Board (Mount Baw Baw)
4. Mount Buller and Mount Stirling Alpine Resort Management Board
5. Mount Hotham Alpine Resort Management Board
6. Parks Victoria (Tidal River)
7. Parks Victoria (Twelve Apostles)

Better regulation

The department is committed to modern regulatory practice and is actively involved in initiatives that aim to increase regulator efficiency and effectiveness, and to reduce the burden on regulated entities. These initiatives include participating in the Ministerial Statement of Expectations and the department's Better regulatory practice framework.

Ministerial Statement of Expectations

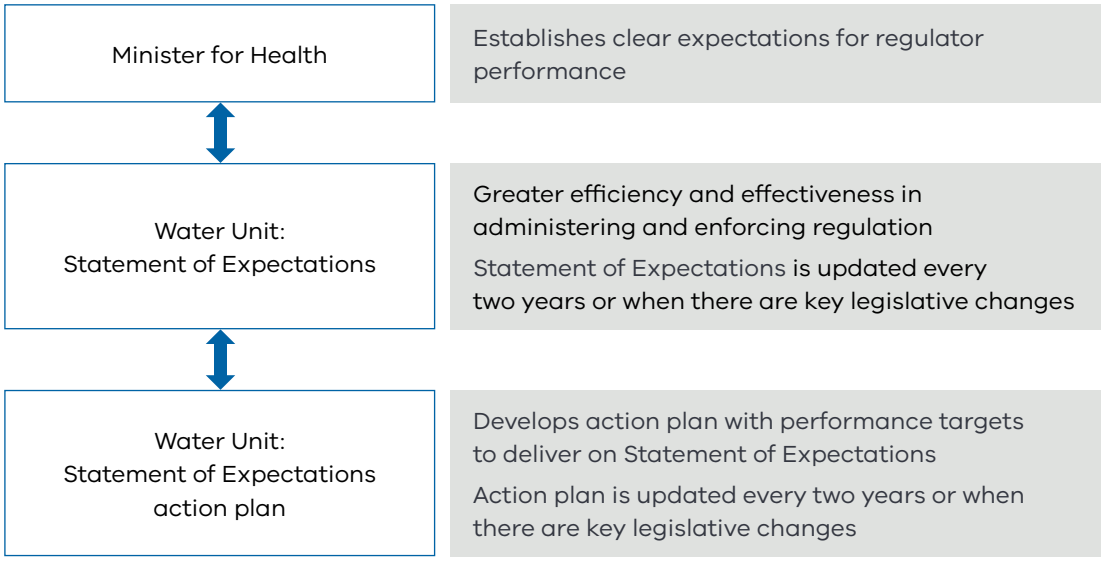
The Victorian Government developed the *Statement of Expectations Framework for Regulators* (Figure 3). This whole-of-government initiative requires each minister to establish clear expectations for regulator performance and improvement within their respective portfolios. It aims to promote greater efficiency and increase the effectiveness of administration and enforcement of regulation.

The Minister for Health issued the Water Unit with the *Statement of Expectations 2019–2021* that identified the following performance objectives and opportunities to drive continuous improvement in regulatory business processes and practices:

- compliance-related assistance and advice
- risk-based strategies
- stakeholder consultation and engagement
- timeliness
- transparency and accountability.

The Water Unit responded to the Minister's *Statement of Expectations 2019–21* by committing to a *Statement of Expectations action plan* that clearly outlines actions and performance targets. The *Statement of Expectations 2019–21* and the *Statement of Expectations action plan* can be viewed on the department's website <https://dhhs.vic.gov.au/ministerial-statements-expectations-regulators>.

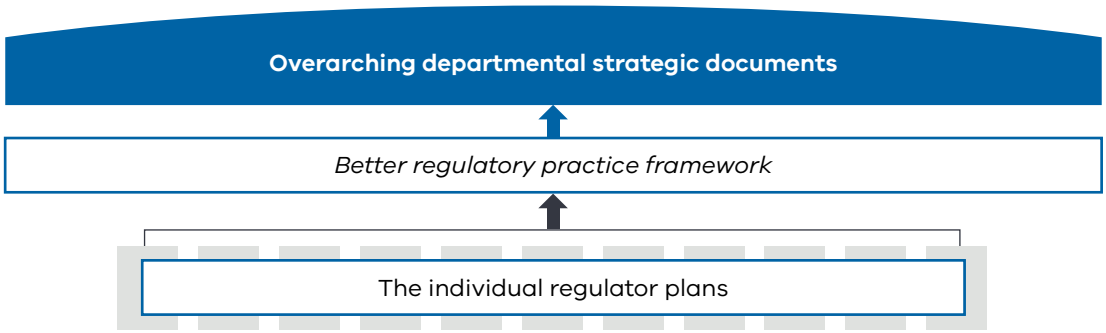
Figure 3: Statement of Expectations framework



Better regulatory practice framework

The department's *Better regulatory practice framework* provides clarity and consistency across the department's regulators (Figure 4). It provides a focus on regulatory outcomes, demonstrates a risk-based approach to regulation, and informs organisational improvements and stakeholder engagement activities.

Figure 4: Better regulatory practice framework



The *Better regulatory practice framework* ensures the Water Unit continuously improves its performance as a regulator. The framework has guided development of the *Water Unit regulator plan,* which outlines:

- the regulatory outcomes sought
- key regulatory risks to achieving the outcomes
- regulatory tools at the disposal of the Water Unit to influence compliance
- measurement of regulatory performance.

The Water Unit, in collaboration with water agencies, provides guidance and support to achieve legislative and regulatory outcomes to protect and improve the health of Victorian communities.

The *Better regulatory practice framework* <https://www.dhhs.vic.gov.au/better-regulatory-practice-framework> and the *Water Unit regulator plan* <https://www.dhhs.vic.gov.au/water-unit-regulator-plan-page> can be viewed on the department's website.

Continuous improvement

Safe Drinking Water Inter Agency Strategic Group

The department's vision is that Victorians are the healthiest people in the world. Consistent with this, ensuring safe drinking water is provided to the Victorian community should be a key objective and aspiration of each Victorian water agency. Each water agency has a critical role and responsibility for protecting, monitoring and continuously improving the supply of safe drinking water to their respective communities.

In February 2021 the department hosted a forum with water agencies to discuss the provision of safe drinking water, emerging trends in operational performance and the changing risk profile. Key focal areas identified at the forum included: risks and incident management; engagement across the sector; and regulatory practice and expectations.

An outcome from the forum was establishing the Safe Drinking Water Inter Agency Strategic Group (IASG), a high-level non-statutory interagency group that operates under the chair-ship of the Deputy Secretary of public health of the department with representation from water agencies and Department of Environment, Land, Water and Planning. The primary purpose of the IASG is to work collectively to improve the protection and management of drinking water quality in Victoria through continuous improvement practices in the face of a changing risk profile. The IASG also aspires to reduce the occurrence of water quality incidents across the water sector through proactive improvement.

Water agency representatives on the IASG from Barwon Water, Goulburn Murray Water, Goulburn Valley Water, Grampians Wimmera Mallee Water, Melbourne Water, Mt Buller & Mt Stirling Alpine Resort Management Board, North East Water and Yarra Valley Water commit to engaging with all Victorian water agencies to ensure their collective involvement in progressing strategic priorities and that they are informed of the work of the IASG.

Drinking water advisories and protocols: draft guidance for issuing and rescinding drinking water advisories

The compounding risks of climate change with more frequent bushfires, floods, power outages and algal blooms challenge the quality and supply of drinking water. These hazards have multiple impacts such as reduced capacity for raw water harvesting in catchments, challenges for water treatment plants to safely treat changes in water quality and maintaining acceptable water quality within distribution systems. This is reflected in the significant increase in the number of drinking water advisories issued by water agencies to affected customers; a total of 17 since December 2019 to 30 June 2021, which on average is one a month compared with an average of one a year before December 2019. Indirectly, these hazards have also identified treatment plant and processes failures that could have been prevented.

During the first half of 2020–21 the department completed development of the *Drinking water advisories and protocols: draft guidance for issuing and rescinding drinking water advisories*. The draft protocols were developed by industry experts Water Futures in consultation with the department, and apply the catchment-to-tap approach and align with the ADWG, a framework that all Victorian water agencies have adopted and accepted as best practice.

In December 2020 the department issued the draft protocols to the water agencies and relevant key stakeholders including regulators and health bodies in other jurisdictions for comment. Written submissions were received by the department. It is envisaged that the newly formed IASG will establish a working group that will consider the feedback to finalise the protocols.

The draft protocols were developed with the intent to:

- ensure water agencies adopt reasonably consistent and defensible approaches to issuing and rescinding drinking water advisories
- help the department and water agencies understand expectations for what may trigger advisories and the action, data/evidence and information required before rescinding them.

Since issuing the draft protocols, the department has used them to respond to and manage all drinking water contamination incidents including the nine drinking water advisories during 2020–21 (six 'boil water' advisories and three 'do not drink' advisories).

Performance reporting

An effective performance monitoring and reporting system is a key aspect of a well-governed water agency. Good governance requires that a water agency has a structured and regular system of performance monitoring and reporting that is appropriate for both internal and external reporting requirements such as the drinking water quality annual report. Furthermore, reporting on drinking water quality performance to regulators, governing boards and the community is an important part of a performance management framework for public sector accountability.

In 2020–21 the Water Unit proposed the development of performance-based outcomes and associated indicators to enable water agencies to demonstrate their commitment to continuous improvement. However, due to staffing constraints and increased demands in responding to drinking water quality incidents, this project could not be progressed as proposed. The intent is to progress the development of performance-based outcomes and associated indicators in 2021–22 through the IASG in consultation with the water agencies.

Collaboration with the Essential Services Commission

The department has strengthened its relationship with the Essential Services Commission (ESC), working together to ensure water agencies provide their essential services effectively and efficiently as they strive to achieve the best outcomes for Victorian communities while meeting their regulatory obligations.

The department has collaborated with the ESC on the following:

- review of water agencies' price submissions, particularly regarding water agencies meeting their regulatory obligations within the proposed revenue allowance
- drinking water contamination incidents and advisories including cause, preventive measures, customer impacts and regulatory obligations
- ESC water performance indicators for water agencies, which includes verifiable number of noncompliance events and the scope of customer impact.

Guidance for preparing drinking water quality annual reports

To better capture regulatory performance reporting by the water agencies, the department is updating the current *Guidance: Water quality annual report* (June 2017), which provides guidance to water agencies in meeting their annual reporting requirements under the Act and the Regulations. Following consultation with the water agencies, the guidance will be published in the *Government Gazette* under s. 26(3) of the Act, which will require water suppliers or water storage managers to include specified details in any report as required by this section.

Water sector liaison

The Water Unit, in collaboration with water agencies, provides guidance and support to achieve regulatory outcomes to protect and improve the health of Victorian communities. A key aspect to this is designated liaison officers assigned to each water agency.

The department continued to experience several challenges to business-as-usual. The arrangements enacted due to the COVID-19 pandemic continued this year, with the team working from home and engaging with water agencies and key stakeholders through virtual means.

Due to increased workload in responding to, and managing, the growing number of drinking water contamination incidents and resource constraints, the department was unable to hold a regulatory forum or publish any newsletters. However, communication with water agencies remained a priority and actively continued at all levels, as did regular liaison meetings between the department and water agencies to discuss regulatory compliance and to provide guidance and support. Water agencies were also encouraged to regularly contact the department via their liaison officers to allow open and transparent discussions, especially for clarity on any regulatory issues. This resulted in some positive change, with more proactive engagement from both parties as they collaborated in providing safe drinking water and the protection of public health.

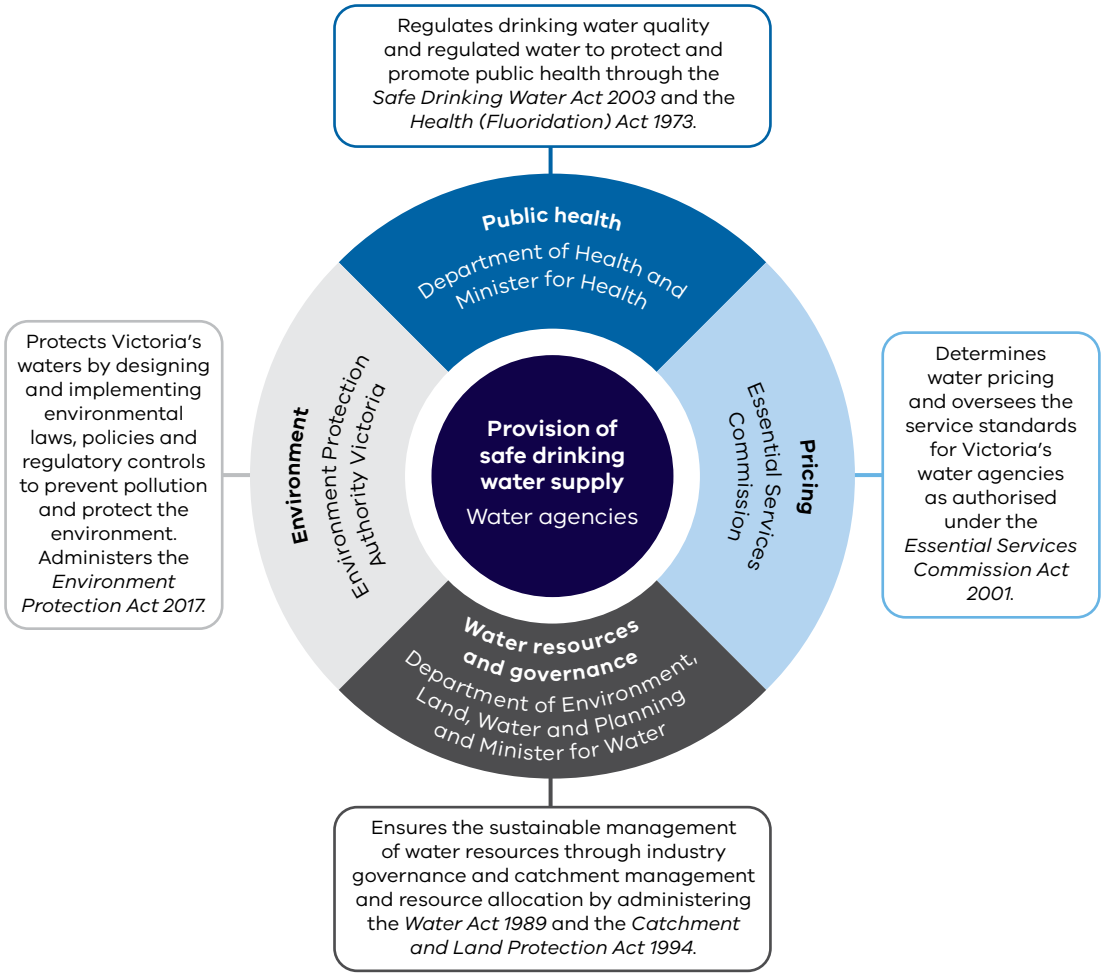
Water sector liaison is further enhanced through a whole-of-government approach including meetings with interdepartmental stakeholders and with other regulatory partners as referred to in Figure 5.

Whole-of-government approach to drinking water regulation

Four government agencies are involved in planning, managing and regulating Victoria's water agencies. While each agency has a clearly defined regulatory role, there is significant interagency collaboration, as shown in Figure 5.

The department encourages a whole-of-government approach to safeguarding drinking water quantity and quality, including through source water protection. The health of the natural environment is paramount for providing safe drinking water and can be achieved through better catchment management strategies and maintaining controls to reduce and prevent contamination. This interagency collaboration ensures an integrated and collaborative approach in delivering safe drinking water for the health, safety and prosperity of Victorian communities.

Figure 5: Victoria's drinking water regulatory system



Safe drinking water administration levy

In accordance with s. 51 of the Act, water agencies pay an administration levy to assist in defraying the costs of administering the Act. The meaning of costs of administering the Act is detailed in s. 52 of the Act. The proportion of levy that each water agency pays is based on a methodology that the Minister for Health considers fair and has been through consultation with stakeholders as required under s. 53(d) of the Act.

For 2020–21 there was no change to the levy methodology. Key steps in its calculation were:

1. The department estimates its annual cost of administering the Act.
2. The rural water storage managers, Parks Victoria and Alpine Resort Management Boards are levied a flat rate of 0.15 per cent of the department's annual cost estimate.
3. The balance of the department's annual cost estimate is apportioned to each of the state's water suppliers proportional to their number of customer connections previously approved by the minister.
4. The levy for the three metropolitan water suppliers is discounted by 25 per cent, and this proportion is allocated to Melbourne Water, which supplies their treated drinking water.

Department expenditure associated with administering the Act

The administration levy for the 2020–21 financial year remained at $1,310,817, the same amount as in 2019–20 because no indexation was applied by the government. Receipts totalling this amount were paid into the government's Consolidated Fund; equivalent funds were then appropriated to the department.

Table 1 shows the department's expenditure associated with administering the Act in this reporting period, along with a comparison with the previous two financial years.

Table 1: Department expenditure to administer the Safe Drinking Water Act, 2018–19 to 2020–21

Expenditure type	2018–19	2019–20	2020–21	Variance to prior year
Salaries, allowances and salary-related on-costs	$718,637	$902,729	$979,112	$76,383
Indirect costs	$62,020	$101,139	$99,478	–$1,661
Operating costs	$129,323	$110,397	$169,132	$58,735
Communication and education	$10,773	$2,482	$0	–$2,482
Research and development	$109,129	$43,000	$20,000	–$23,000
Information technology	$2,913	$4,005	$7,608	$3,603
Total expenditure	**$1,032,795**	**$1,163,752**	**$1,275,330**	**$111,578**

Salaries, allowances and salary-related on-costs and indirect costs

During the 2020–21 period, the department's salaries and related on-costs were more than the previous period due to the appointment of a fixed-term liaison officer. Indirect costs (office accommodation, depreciation and amortisation) were similar to the previous year.

Operating costs

Operating costs include attendances at conferences and accommodation, professional association memberships and the costs associated with engaging contractors for completing technical appraisals for fluoride plants and guidance material to assist water agencies. The department endeavours to maintain a strong knowledge base through its memberships with Water Research Australia (WaterRA), the Water Services Association of Australia (the peak body of the Australian water industry), the Australian Water Association and the Water Information Sharing and Analysis Centre. The operating costs were higher in this period due to engaging external experts to undertake the Silvan drinking water quality incident investigation and developing the *Drinking water advisories and protocols: draft guidance for issuing and rescinding drinking water advisories*.

Communication and education costs

Section 27(f) of the Act gives the Secretary the function of promoting industry and public awareness and understanding of drinking water quality issues. This includes informing the community and the water sector about drinking water and public health. In this reporting period there were no costs attributed to communication and education activities due to COVID-19 pandemic restrictions and resource demands focused on responding to drinking water quality incidents.

Research and development costs

The department is committed to improving the state of knowledge on managing risks to drinking water quality and ensuring evidence-based decision making to provide better outcomes for public health in Victoria.

WaterRA coordinates and manages a structured program of collaborative research in water to ensure the knowledge generated is transferred to industry. As an industry member, the department ensures public health priorities are considered in the development and delivery of its research agenda.

The department provides financial and in-kind support for research and development opportunities that will enhance available information, improve knowledge and understanding of various topical issues and guide and inform regulatory decisions.

The department, through WaterRA, supported the following projects during this reporting period.

Guide to sanitary surveys and operational monitoring in catchments (Project no: 1109)

The department contributed $15,000 to this project in 2016–17, which was completed in 2020–21.

A key part of assessing risks to source waters is to conduct what the water industry terms, a 'sanitary survey'. While there is much guidance available on how to conduct of a sanitary survey in a water supply source, this guide is specifically tailored to respond to the evidence published by WaterRA under Project 1036 'Treatment requirements for Australian source waters to meet health-based targets' and the anticipated introduction of microbial health-based targets in the ADWG. This guide will also assist water agencies in Victoria maintain the currency of their source water risk assessments underpinning the quantification of microbial hazards in source water as required under the Regulations.

WaterRA's 2020 publication *Good practice guide to sanitary surveys and operational monitoring to support the assessment and management of drinking water catchments* has drawn together and presented current best practice, noted recent innovations, highlighted current research and development activities and predicted future research priorities. The guide provides worked examples and recommendations of good practice source water sanitary survey methods that make appropriate use of modern technologies and that meet contemporary needs. This helps guide the water sector in its conduct of catchment assessments and observational monitoring under the ADWG and for establishing treatment requirements under health-based target approaches.

The guide provides valuable support for water utilities looking for consistency in the delivery of sanitary surveys as part of their source water assessments to support health-based targets and other risk assessment objectives. The guide has been developed based on extensive review of literature and practical case studies, sector-wide workshops and consultation processes, and major contributions from water utilities, catchment management authorities, health authorities, academics and technical consultants. As such it represents a community of practice consensus position from across the WaterRA membership.

Significance of the environment as a reservoir of antimicrobial resistance (Project no: 3040)

The department made a financial contribution of $10,000 when the project began in 2018–19, with no further contributions made in the current reporting period.

This project is a collaboration between water, environment, health and agriculture sectors that aims to investigate the diversity and abundance of pathogenic bacteria and antimicrobial resistance (AMR) genes in Victorian environments, with a focus on agricultural effluents and run-off inputs. This project aims to answer the following questions:

- Is the environment a significant reservoir for AMR?
- Do animal industries contribute significant antibiotic-resistant bacteria and genes loads to adjacent waterways?
- What monitoring and enforcement targets may be useful for monitoring and surveillance?

In 2020–21 the study collected data and baseline information about the microbial communities and types and amounts of AMR genes in Victorian environments present in manure, as well as water and sediment from several rivers and waterbodies. This surveillance data will help guide (i) future sampling campaigns, (ii) antibiotic-resistant bacteria and genes monitoring investments, and (iii) analytical approaches. It embodies the One Health approach to AMR mitigation and management called for by the World Health Organization and represents an important step towards fulfilling Australia's first *National antimicrobial resistance strategy* (2015–2019).

This study provides further indication that the environment, humans and animals are intrinsically linked and underpins the importance of the need for multi-sector AMR stewardship and surveillance. It highlights that actions in one sector/area can potentially have impacts on the others.

Despite delays due to the COVID-19 pandemic, this reporting period saw the completion of data collection assessing AMR genes in the environment. Project partners have been working closely to ensure results are adequately presented.

An abstract, titled *Environmental antimicrobial resistance in rural Victoria,* has been accepted to the 16th National Rural Health Conference in Perth (30 May to 1 June 2022) and will be presented by EPA Victoria.

In addition to the conference presentation, future work related to this project will include delivering a scientific journal paper and a short-form paper. The research will provide valuable information that will support the *Victorian antimicrobial resistance strategy* and provide a foundation for future research efforts proposed by The Cooperative Research Centre for Solving Antimicrobial Resistance for Agriculture, Food and the Environment. The research project is expected to be completed in the first quarter of 2022.

Understanding impacts of recreational access to drinking water catchments and storages in Australia (Project no: 1124)

The project began in 2018–19, with the department contributing $20,000 in that year and a further $18,000 in 2019–20.

Source water protection underpins the safety and affordability of drinking water supplies whereby prevention of contamination provides greater surety than removing contaminants. As part of the multiple barrier approach, the ADWG emphasises the protection of source waters to the maximum degree possible. Water agencies have been placed under increasing pressure to introduce or increase recreational access to drinking water catchments and water storages. There is also a lack of consensus around recreational access approaches across Australia.

In recent years there has been a considerable change both in the demand for recreational access in drinking water catchments and storages across Australia, and in our understanding of drinking water risks (and risks to recreators) within catchments that have recreational access.

This project seeks the best available scientific, economic and risk management knowledge to inform current and future decision-making processes to support communication with recreational bodies, state/territory governments, influencers, lobbyists, regulators and their drinking water customers. This includes:

- focusing on the current state of play of recreational access around Australia
- documenting case studies and evidence-based information on risks associated with recreational activities
- case studies on treatment efficacy
- cost-benefit impact analysis
- lessons to date.

A tiered communication package delivering key messages to the general public, policymakers and industry partners will also be developed.

This reporting period saw the completion of a cost-benefit review of recreation and source water protection in catchments. The cost-benefit review provides an industry-wide understanding of preventive risk management in drinking water supply systems. Future work will include developing a decision-making framework. The research project is expected to be completed in the first quarter of 2022.

Assessing the economic impact of harmful and nuisance algal blooms to the Australian water industry (Project no: 1125)

The project began in 2018–19, with the department contributing $10,000. No additional financial contributions were made in the current reporting period.

The prevalence and impact of harmful and nuisance algal blooms is a threat to the safety and security of drinking water supplies. In 2000 the Land and Water Resources Research and Development Corporation published a report, *Cost of algal blooms,* placing the cost to extractive users at approximately $95 million a year. In addition to standard escalation for inflation, this figure is likely to be significantly higher because the previous estimates did not account for increased frequency and intensity of algal blooms as a consequence of climate change.

The project outcomes include completing a comprehensive assessment of the economic impact of harmful and nuisance algal blooms including cyanobacteria to the water industry. This assessment will provide an improved understanding on the economic risk posed by harmful and nuisance algal blooms, which in turn will provide economic justification for adopting control and/or treatment strategies.

Milestones one and two, classifying financial models to investigate the cost of algal blooms, were delivered on time. To complete milestone three, a survey of algal-related issues and costs for Australian utilities, is required. A survey was conducted in this reporting period; however, it did not attract enough respondents. To attract additional participants, a new campaign will be organised in the first quarter of 2022.

Development of management system for emerging contaminants within the water industry (Project no: 1127)

The department contributed $5,000 to this project in 2019–20, which was completed in 2020–21.

Emerging contaminants affect the entire water industry, but each water agency is affected differently. The Australian water industry identified an opportunity to collaborate to improve understanding and management of the problem of unregulated contaminants. The aim of this project was to help the water industry better manage and understand contaminants of emerging concern (CEC) through:

- creating a CEC database
- developing a classification system based on source, treatment and effects to facilitate management of CEC by the water industry
- developing risk assessment approaches based on different classifications (source, treatment and effects) and integrating this functionality into the database as a prioritisation tool
- guidance on including CEC into current water quality risk management plans/ frameworks (for example, ADWG, *Australian guidelines for water recycling*).

The Emerging Chemicals Database for National Awareness (ECHIDNA) was developed to make CEC information and risk prioritisation available to water professionals and assist them with management and decision making for CEC in various water systems.

ECHIDNA is a web-accessible data repository with integrated CEC risk prioritisation framework. It helps identify potentially important CEC that may pose a risk to humans and the environment. The database and its ability to inform risk will continue to grow as new information is generated and incorporated, meaning its growth and ability to support water utilities, regulators, academics and consultants will evolve to reflect user engagement with the system.

ECHIDNA includes several unique features aimed at directly helping the water industry make evidence-based and informed decisions around the management of CEC including:

- classification and filtering functionalities to group CEC based on key properties and shortlist contaminants based on specific user needs
- an inbuilt risk prioritisation tool to identify high-risk contaminants and rank them based on the user-specified shortlist
- direct links to information on management options to address the risk of environmental and human health effects.

Understanding water quality risks under low and variable water level conditions (Project: 1133)

The project began in 2019–20, with the department contributing $20,000.

A continuing decline in rainfall and run-off in surface water catchments in many areas across Australia, including Victoria, has significant potential to impact on water quantity and quality. The impacts of declining reservoir levels are further compounded by factors such as increased water demands, intensification of recreation demands, and ensuring sufficient water levels to sustain ecosystem life supporting capacity in some cases.

Dams and reservoirs have long been recognised as critical storage barriers assisting to reducing water supply contamination hazards. These water supply assets also play a role in providing ecosystem services, which can effectively reduce levels of pathogens and other contaminants. The ecosystems services provided rely heavily on water levels. With water levels reducing, some of these services may be compromised.

Furthermore, there is potential for the water quality to be impacted by reduced and highly variable water levels. Reduced water quality can include increased algae blooms, elevated iron and manganese, and particulate (for example, inorganic sediment) and dissolved organic matter, including taste and odour-producing compounds. A change in water levels can also increase potential for short-circuiting of pathogens and other contaminants from inflows to dam and reservoir offtakes.

This reporting period saw the completion of a Bayesian network model of water quality impacts from low and variable reservoir levels. The model provides provide valuable knowledge to water agencies to better adapt and respond to a changing climate. Future work will include an expansion of data sources to make the model outputs more robust. The research project is expected to be completed in the first quarter of 2022.

Catchment health metrics (Project no: 1140)

The project began in 2020–21, with the department contributing $10,000 in the current reporting period.

There is a lack of consensus on catchment health metrics within the water industry. Such a metric would provide decision-makers and regulators with a common language and an objective understanding of what is required in order to maintain and improve the health of any given catchment and improve the efficacy of catchment management initiatives. There is a need to value catchments as a natural asset. Healthy catchments are essential to protecting our water sources, thereby increasing water security and a catchment's overall resilience. A healthy catchment contributes to a region's economic health, enhances environmental protection, and fosters thriving communities. A framework/tool is needed to quantify the benefits of investing in catchment management and thereby decreasing water treatment costs and improving water security.

This project aims to develop a catchment health metric tool that will provide catchment managers with the ability to have a live, continuous update of catchment health status – not every three years as is currently the case. It will provide an understanding of where the source water sits on the water safety continuum, and also provide the ability to undertake robust cost-benefit analysis and assess economic outcomes, measuring the cost-efficiencies of investment.

In addition to the tool, this project seeks to establish a common understanding and language for the analysis, review and acceptance of catchment management parameters, which would serve to increase acceptance of catchment management projects, increase efficiency of the investment process, allow for better benchmarking, and decrease cost to water utilities and other stakeholders.

This reporting period saw the completion of sponsorship and the hosting of an industry-wide workshop to develop the project needs. The research project is expected to release a request for proposals from expert academics in the first quarter of 2022.

Guidance for integration of gene testing in cyanobacterial management (Project no: 1141)

The project began in 2020–21, with the department contributing $10,000 in the current reporting period.

Cyanobacteria gene testing is used by some water utilities as a timely and efficient approach for cyanobacterial management. The gene testing is intended to determine the genetic potential of known toxin producers to produce toxins. However, the current guidelines only use speciation, counts and biovolume to determine the risk to consumers, recreational users and stock.

Some cyanobacteria species are well known for their potential to produce toxins. However, not all genotypes of known toxin-producing species produce toxins. Testing is available that detects and quantifies the presence of strains of cyanobacteria that have the potential to produce toxins. If these strains are present, then additional sampling and testing can be undertaken to confirm the presence of toxins in the water and appropriate management actions taken.

This project aims to develop guidelines (and a methodology) for including toxin gene testing in cyanobacteria management. This testing could improve the management of cyanobacteria blooms in water supplies by reducing the toxin risk and provide more accurate information of the toxin risks associated with cyanobacteria blooms.

In this reporting period, detailed project plans and a budget were prepared by the research team. These were shared with all project partners with a request for comment. Following incorporation of feedback, the research contract will be signed. Research is expected to begin by February 2022.

Information technology costs

In this reporting period the information technology costs were higher than the previous period.

Drinking water quality performance and regulatory requirements in 2020–21

Water sampling localities

Water suppliers are required to collect samples of drinking water from water sampling localities that have been specified under r. 6 of the Regulations. A water sampling locality is a discrete geographical area where water samples collected are representative of the drinking water that is supplied to that area.

All locations supplied with drinking water must be within a water sampling locality boundary. This allows water suppliers to determine any issues with drinking water sources, treatment processes or distribution, and to identify customers receiving drinking water in the water sampling locality.

Water sampling locality proposals are required to be submitted by water suppliers to the Secretary to specify new drinking water distribution systems, including when regulated water supplies are to be upgraded to drinking water supplies. Proposals by water suppliers to vary and/or revoke existing water sampling localities may be required due to redefining of boundaries, merging or dividing current water sampling localities, or changes to supply arrangements.

The revocations and specifications of Yarra Valley Water's water sampling localities that were gazetted in 2019–20 took effect on 1 July 2020.

With the merger of City West Water and Western Water to form Greater Western Water coming into effect on 1 July 2021, the department completed a review and gazettal in 2020–21 of a proposal to vary Greater Western Water's[8] water sampling localities by incorporating Western Water's 19 water sampling localities into City West Water trading as Greater Western Water.

As of 30 June 2021 there were 476 water sampling localities across the state, with a net increase of two new water sampling localities compared with last year.

Details of changes to water sampling localities in the 2020–21 period are provided in Tables 2 and 3.

8 The gazette notice No. S 360 was published on Thursday 1 July 2021 and coincides to when the section 88 determination under the *Water Act 1989* to abolish Western Water took effect.

Table 2: Water sampling locality gazettal in 2019–20, effective 1 July 2020

Water agency	Water sampling localities affected by notice	Reason for Government Gazette notice	Government Gazette number	Date notice takes effect
Yarra Valley Water	Mernda/Hurstbridge (revoked) Craigieburn, Kangaroo Ground and Yarrambat (new) Brahams Road, Bundoora, Croydon, Doncaster, Eltham, Emerald, Epping, Glen Waverley, Glenroy, Healesville, Ivanhoe, Kew, Lilydale, Lower Plenty, Lyrebird Avenue, Malvern, Mitcham, Montrose, Northcote, Plenty, Preston, Ridge/Monbulk, Seville, Somerton, Wallan, Warburton, Warranwood, Whittlesea, Woori Yallock, Yarra Glen and Yarra Junction (varied)	Water sampling locality changes were required to reflect changes to water supply sources, system hydraulics and updates to coordinate references. Mernda/Hurstbridge water sampling locality was removed and divided into three new water sampling localities at Craigieburn, Kangaroo Ground and Yarrambat.	S 304, Friday 26 June 2020	1 July 2020

Table 3: Water sampling locality gazettal in 2020–21, effective 1 July 2021

Water agency	Water sampling localities affected by notice	Reason for Government Gazette notice	Government Gazette number	Date notice takes effect
Western Water	Bulla, Darley, Diggers Rest, Eynesbury, Gisborne, Lancefield, Lerderderg, Macedon, Maddingley, Melton South, Merrimu, Mount Macedon, Myrniong, Riddells Creek, Rockbank, Romsey, Sunbury, Toolern Vale and Woodend	Substitution of the water supplier in Government Gazettes S 14 on 25 January 2007 and S 251 on 17 July 2009 from Western Water to City West Water (trading as Greater Western Water) was required for Western Water's 19 water sampling localities due to the merger of City West Water and Western Water to form Greater Western Water effective on 1 July 2021.	S 360, Thursday, 1 July 2021	1 July 2021

Drinking water quality standards

Section 17 of the Act requires that a water supplier must ensure all drinking water supplied complies with quality standards. The drinking water quality standards are specified under r. 12 of the Regulations, which states that drinking water supplied within a water sampling locality must not:

- exceed the standard set out in Schedule 2 of the Regulations (r. 12(a))
- contain any algal toxin, pathogen, substance or chemical, whether alone or in combination with another toxin, pathogen, substance or chemical, in such amounts that may pose a risk to human health (r. 12(b)).

Schedule 2 of the Regulations prescribes three parameters for which drinking water samples must be analysed, along with the required frequency of analysis and meet the respective water quality standard (Table 4).

Table 4: Safe Drinking Water Regulations Schedule 2 drinking water quality standards

Parameter	Sampling frequency	Quality standard
E. coli	Weekly	No *E. coli* per 100 mL, with the exception of any false-positive sample
Total trihalomethane	Monthly	≤ 0.25 mg/L
Turbidity	Weekly	The 95th percentile of results for samples in any 12-month period must be ≤ 5.0 Nephelometric Turbidity Units

For parameters not specified in Schedule 2 of the Regulations, the ADWG is the authoritative reference for health-based guideline values and is used to determine compliance with r. 12 (b) of the Regulations.

Section 18 notifications

In the Act, s. 18 refers to a notification required if noncomplying water is supplied. Section 18 of the Act states 'A water supplier must notify the Secretary in writing if 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 and must do so within 10 days after it becomes aware of that fact'. Notification under s. 18 ensures the department is aware of noncompliant drinking water and that the respective water agency implements corrective measures to mitigate any potential public health impacts and undertakes actions to prevent future recurrence.

In this reporting period, drinking water samples were collected from 476 water sampling localities around Victoria and tested for water quality parameters to determine compliance with water quality standards.

In 2020–21, 10 water suppliers notified the department of a total of 13 notifications about water that did not meet a standard under either r. 12(a) (compliance with Schedule 2 drinking water quality standards) or r. 12(b) (compliance with any other drinking water quality standards). This is a decrease compared with 2019–20 when 17 notifications were made to the department by four water suppliers.

Of the 13 notifications in 2020–21, 10 were about noncompliance under r. 12(a) and three related to noncompliance with any other drinking water quality standards under r. 12(b) as outlined in the sections below.

Goulburn Valley Water made three notifications, while Mt Buller and Mt Stirling Alpine Resort Management Board made two notifications.

Appendix 2 lists all section 18 notifications for the year.

Regulation 12(a): Compliance with Schedule 2 drinking water quality standards

To demonstrate compliance with r. 12(a), drinking water samples must be analysed for the parameters required under the Schedule 2 water quality standards of the Regulations as shown in Table 4 above.

Table 5 and Figure 6 are interlinked and refer to compliance with Schedule 2 drinking water quality standards. Table 5 represents the actual number of **water samples** that did not meet r. 12(a) drinking water quality standards, and Figure 6 illustrates the percentage of **water sampling localities** that complied with r. 12(a) drinking water quality standards.

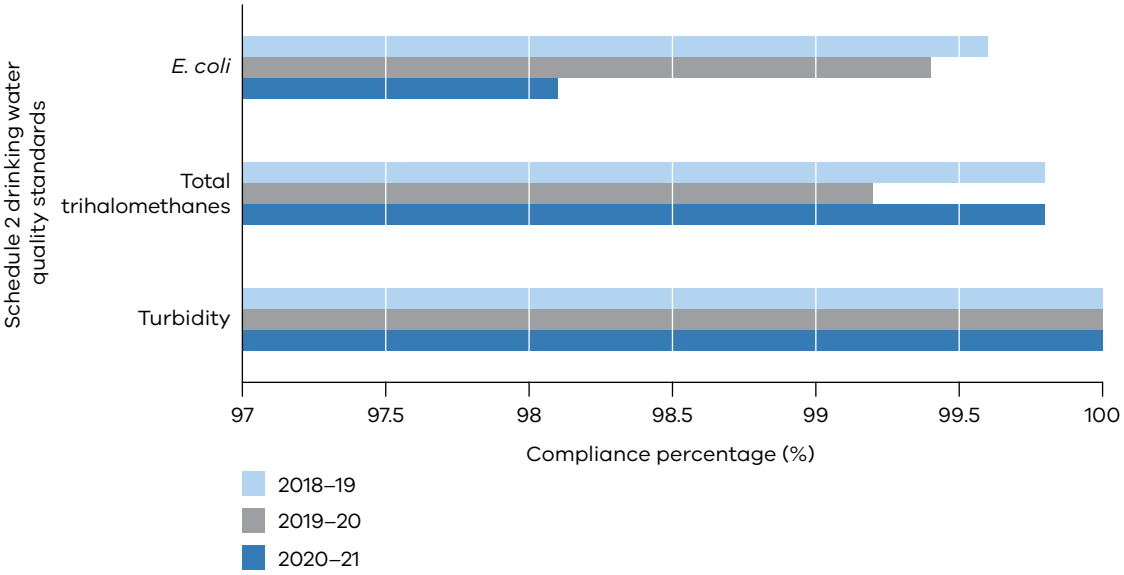
In this reporting period, there were 10 notifications by nine water suppliers representing nine water sampling localities that did not meet two of the Schedule 2 drinking water quality standards, one more notification than in 2019–20. In the 2020–21 reporting period the number of total notifications were distributed across a greater number of water agencies. There was a three-fold increase in the number of *E. coli* samples not meeting the drinking water quality standard, while a significant (five-fold) reduction was observed in the total trihalomethane standard not being met.

For the fourth consecutive reporting period, water suppliers were fully compliant with the water quality standard for turbidity.

Table 5: Water samples not meeting Schedule 2 drinking water quality standards, 2018–19 to 2020–21

Parameter	Water samples not meeting the quality standard		
	2018–19	2019–20	2020–21
E. coli	2	3	9
Total trihalomethane	2	6	1
Turbidity	0	0	0
Total	**4**	**9**	**10**

Figure 6: Percentage of water sampling localities compliant with Schedule 2 drinking water quality standards, 2018–19 to 2020–21



Escherichia coli

E. coli is a microbial indicator of drinking water quality. Schedule 2 of the Regulations require that all drinking water samples collected are found to contain no *E. coli* per 100 mL of drinking water, with the exception of any false-positive samples. The detection of *E. coli* can signal microbial contamination and therefore any detection is immediately reported to the department under s. 22 of the Act.

When *E. coli* is detected in drinking water, an investigation is undertaken by the water agency in accordance with the department's *Appendix 1: Guidelines for the investigation and reporting of E. coli detections* to determine the cause, undertake corrective actions and implement procedures to prevent the issue from recurring. If the investigation concluded that the sample taken was representative of the drinking water supplied in the relevant water sampling locality, a notification is made to the department under s. 18 of the Act.

E. coli notifications under s. 18 of the Act were made by eight water agencies with Goulburn Valley Water submitting two notifications for the Upper Delatite water sampling locality.

The majority of the noncompliances related to clear water storage tank integrity issues with the potential for ingress of contaminants and, in one case, the use of raw water for air scouring the reticulation system. The significant increase in the occurrence of *E. coli* detections may indicate asset maintenance programs and their implementation requires improvement.

E. coli detections also led to 'boil water' advisories for three agencies: Goulburn Valley Water, South East Water and Southern Alpine Resort Management Board. Further details on the potential causes of contamination and the advisories have been included under the 'Emergency preparedness and incident management' section of this report.

Water agencies have been encouraged to establish strategies to ensure chlorine residual levels are kept at target operating ranges, and to sample from more than one sample point within the same locality every week to maintain confidence in the drinking water quality across the network, including in the extremities of the system. The department also emphasised the importance of following the Secretary's guidance for investigating and reporting on *E. coli* detections.

With the increase in *E. coli* detections, there was a reduction in the number of water sampling localities complying with the *E. coli* drinking water quality standard; 98.1 per cent in 2020–21 compared with 99.4 per cent in the previous year (Figure 6).

Total trihalomethanes

Total trihalomethanes are by-products of disinfection, formed when chlorine comes into contact with organic matter in water. Schedule 2 of the Regulations require drinking water to be tested for total trihalomethanes to ensure the result complies with the standard of less than or equal to 0.25 mg/L.

Wannon Water made one notification for the exceedance of total trihalomethanes at the Cavendish water sampling locality in 2020–21, while it made two notifications each in 2019–20 and 2018–19 for the same water sampling locality. Historically, the Cavendish water supply has had high levels of organics, and Wannon Water has implemented measures to reduce the concentration of total trihalomethanes including increased flushing of the supply system, installation of an inlet spray bar and splashboard in the clear ware storage tank to volatise total trihalomethanes and a planned upgrade to the Cavendish disinfection plant to rectify the issue. On this occasion, elevated total trihalomethanes were caused by increased chlorine residuals to meet the desired contact time in temporary tanks that were set up when the clear water storage was taken offline during maintenance to replace the liner.

All water agencies in Victoria are monitoring for total trihalomethanes as required by the Regulations, including those that only use ultraviolet disinfection for primary treatment.

The percentage of water sampling localities that complied with the total trihalomethanes standard in 2020–21 was 99.8 per cent, an increase from 99.2 per cent compliance in 2019–20 (Figure 6).

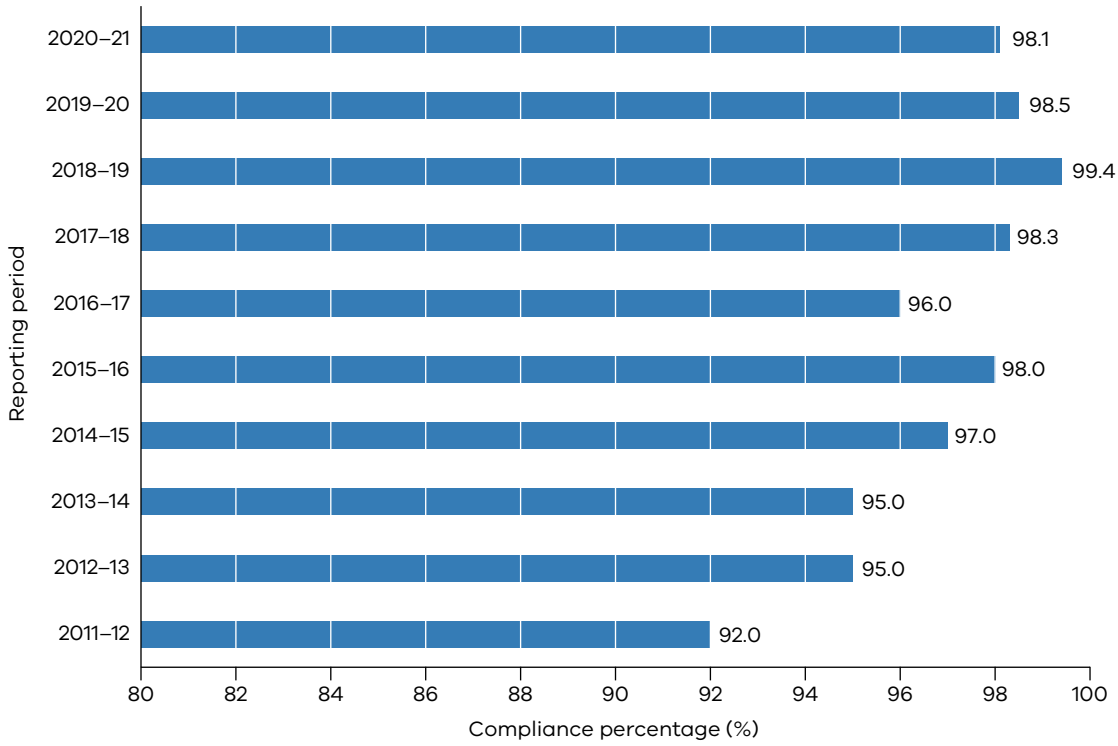
Turbidity

Turbidity is the cloudiness of water caused by the presence of fine, suspended matter in drinking water. Schedule 2 of the Regulations require the 95th percentile of results for samples in any 12-month period to be less than or equal to 5.0 Nephelometric Turbidity Units. In the 2020–21 reporting period, all water agencies were 100 per cent compliant with the turbidity water quality standard, a result that has been consistently achieved since 2017–18.

Performance summary of Schedule 2 parameters

Figure 7 presents the past 10 years of performance of water sampling localities continuously compliant with Schedule 2 parameters. During the reporting year, of the 476 sampling localities, 467 continuously met Schedule 2 drinking water quality standards, achieving an overall compliance of 98.1 per cent. This represents a slight decrease from the 98.5 per cent of compliant localities in the 2019–20 reporting period.

Figure 7: Percentage of water sampling localities continuously compliant with Schedule 2 drinking water quality standards, 2011–12 to 2020–21



Regulation 12(b): Compliance with other drinking water quality standards

To demonstrate compliance with r. 12(b), and as part of their water sampling program, water suppliers use a risk-based approach to determine the water quality parameters, water sampling locations and frequency of testing in their risk management plans. Water suppliers and each water supply system face different risks, depending on factors such as the condition of the water supply catchment, treatment applied and supply system arrangements. Water suppliers' water sampling programs are commensurate with this risk and tailored to each water sampling locality and supply system.

Three water agencies notified the department of a total of three parameters that did not meet a water quality standard under r. 12(b) (compliance with any other drinking water quality standards).

As Table 6 demonstrates, there was a significant reduction (70 per cent) in water agencies water samples not meeting other drinking water quality standards in 2020–21 compared with the two previous reporting periods.

Table 6: Water samples not meeting other drinking water quality standards, 2018–19 to 2020–21

	Water samples not meeting the quality standards		
Parameter	**2018–19**	**2019–20**	**2020–21**
Chlorine	1	2	0
Bromate*	0	0	0
Chloral hydrate*	0	3	0
Dichloroacetic acid*	0	0	0
N-Nitrosodimethylamine*	0	3	1
Trichloroacetic acid*	1	0	1
Aluminium**	1	2	0
Lead	5	0	0
Manganese	0	0	1
Nickel	1	0	0
Total	**9**	**10**	**3**

* Disinfection by-products

** Under the ADWG, no health-based guideline is set for aluminium at this time, but this issue will be kept under review.
However, in 2019–20, one water agency submitted two section 18 notifications to the department.

Disinfection by-products

Production of safe drinking water and maintaining safety throughout the supply and reticulation system typically requires the addition of a disinfectant. Reactions of chlorine disinfectants with natural organic compounds in source waters can produce disinfection by-products. While long-term, high concentrations of disinfection by-products may increase risks to human health, short-term, low-level exceedances of the health guideline values do not present a risk to health. The ADWG states that:

> *Although the microbial quality of drinking water is of primary importance and must never be compromised, chlorine levels and the formation of chlorination by-products should be controlled to prevent any adverse health effects that may eventually be found to be attributable to disinfection by-products.*

While total trihalomethanes are addressed in the Schedule 2 standards, water agencies also sample for other disinfection by-products where relevant. In 2020–21 Coliban Water made one notification for one locality that did not meet the standard for N-Nitrosodimethylamine. Mt Buller and Mt Stirling Alpine Resort Management Board reported not meeting the standard for trichloroacetic acid for the Mt Stirling locality.

Metals

Metals may be present in drinking water due to several reasons including:

- those naturally present in source waters and insufficient removal via treatment
- leaching from metal pipework and fittings
- their use in treatment processes (such as alum coagulant).

Goulburn Valley Water made one notification in which the Broadford water sampling locality did not meet the standard for manganese.

Variations of aesthetic standards

Section 19 of the Act allows the Minister for Health to vary aesthetic standards on application by a water supplier as it applies to drinking water supplied by the water supplier. During the year there were no applications by water suppliers to vary aesthetic standards.

Exemption from water quality standards

Section 20 of the Act allows the Minister for Health to exempt a water supplier from the obligation to comply with a drinking water quality standard for a specified period, provided that adequate measures are proposed to eliminate or minimise any risks to public health.

During the year there were no applications from water suppliers to be exempted from meeting a drinking water quality standard under the Regulations. There are no existing exemptions from meeting a water quality standard.

Section 22 reports of known or suspected contamination

Under s. 22 of the Act, an officer of a water supplier, water storage manager or council is required to immediately report to the Secretary if they believe, or suspect on reasonable grounds, that water supplied, or to be supplied, for drinking purposes either:

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

The requirement to report immediately to the department enables:

- rapid assessment of risk to determine if there may be or is a threat to public health
- timely response measures to prevent harm including issuing of a drinking water advisory to affected customers by the relevant water agency where necessary
- assurance to the department that the incident is being managed to protect public health
- water agencies to seek guidance from the department in managing incidents
- the department to identify trends or emerging issues that may not be adequately addressed in a water agency's risk management plan.

In the absence of immediate reporting to the department, there is a risk that the incident may lead to harms that could have been avoided or minimised. As such, there are penalties associated with a water agency not meeting the requirement of s. 22 of the Act to immediately report any known or suspected contamination to the department.

The department works with water agencies to ensure all relevant corrective actions are taken to reduce risks to acceptable levels and that preventive actions are implemented to minimise recurrence of the issue.

Understanding trends in section 22 reports helps identify potential systemic issues or emerging threats to the supply of drinking water, enabling a strategic response.

Section 22 reports have been increasing over the past three years. In 2020–21 there were 63 reports made under s. 22 of the Act by 18 water agencies compared with 51 reports the previous year (Table 7), an increase of 23.5 per cent, and 37 in the 2018–19 reporting period.

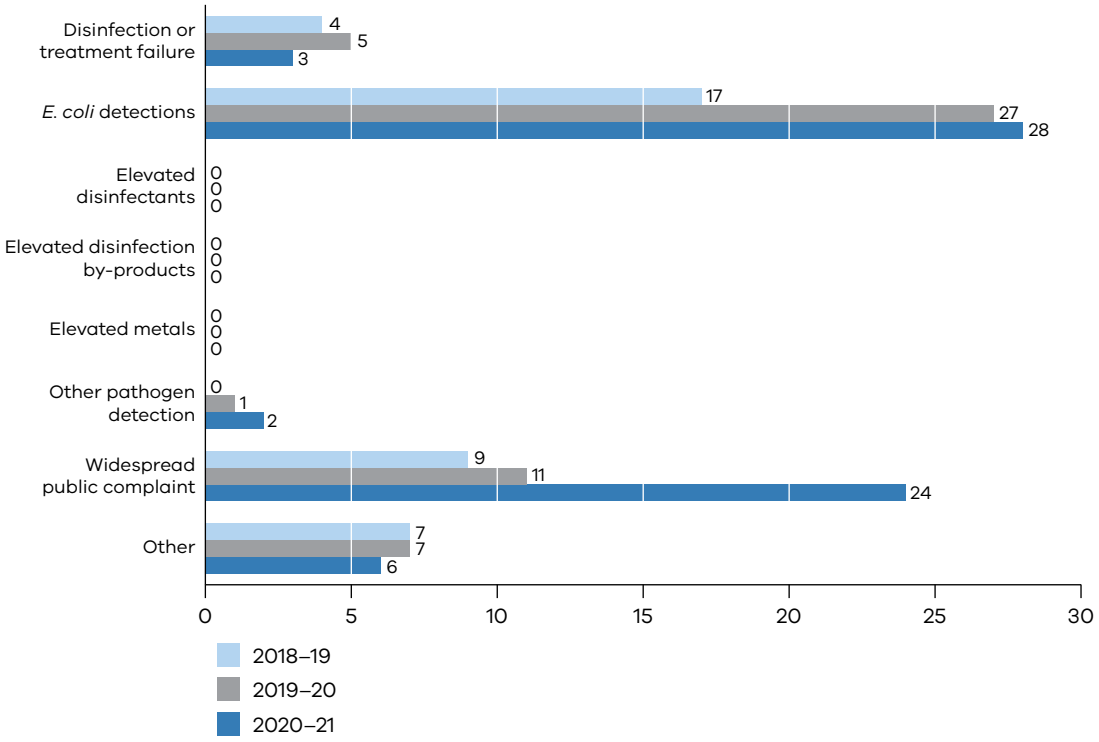
While some of the circumstances underpinning these events were due to extreme climatic conditions, many were preventable, indicating that water agencies need to improve their proactive management of foreseeable risks to their drinking water quality, rather than reacting when an incident occurs.

These reported issues are broadly grouped into various categories in Figure 8. *E. coli* detections continue to be the primary cause for section 22 reports followed by widespread public complaints. These reports are discussed in detail below and some are further discussed in the 'Emergency preparedness and incident management' section of this report.

Table 7: Number of reports made under section 22 of the Act, 2018–19 to 2020–21

Reporting period	Number of section 22 reports
2020–21	63
2019–20	51
2018–19	37

Figure 8: Categories of reports made under section 22 of the Act, 2018–19 to 2020–21



Escherichia coli detections

During this reporting period there were 28 reports of *E. coli* detections compared with 27 in the previous year, an increase of four per cent. Following investigations by the water agencies, 20 of these reports did not result in a section 18 notification because the samples were not representative of the water in the relevant water sampling locality (false-positive samples). A false-positive sample is where the *E. coli* detection is found not to represent the drinking water being supplied, and therefore the water sampling locality met the drinking water quality standard.[9] The significant increase (65 per cent) in total number of *E. coli* detection reports since 2018–19 is of concern to the department and this has been raised with the respective water agencies to identify gaps in their systems to implement measures to rectify the number of false-positive sample results following investigations.

Investigations into these detections attribute many to: sampler error or issues with sampling procedures or analysis; poor configuration of sampling taps and compromised integrity either due to asset condition or surrounding location potentially exposing them to contamination; damage to infrastructure such as storage reservoirs; and climatic events (storms, floods, bushfires).

Fourteen water agencies reported *E. coli* detections, with South East Water reporting detections on five occasions and Barwon Water reporting detections on four occasions.

Widespread public complaints

Regulation 16(j) requires water suppliers to provide in their annual reports a summary of complaints received by the water supplier relating to the quality of drinking water supplied, and a summary of the responses and analysis of the issues arising from the complaints. Where water supplied, or to be supplied, may cause widespread public complaints, the water agency must inform the department in accordance with s. 22 of the Act.

There were 24 reports of widespread public complaints in this reporting period, an increase of 13 (118 per cent) compared with the previous year. Coliban Water reported eight instances and Yarra Valley Water reported seven instances of widespread complaints with the quality of drinking water.

Widespread public complaints in the 2020–21 reporting period were due to planned and unplanned maintenance works, treatment issues affecting aesthetics, presence of algae producing taste and odour compounds (2-Methylisoborneol and geosmin), burst mains and the presence of natural organic compounds.

9 For a detailed description of a **false-positive sample**, refer to Schedule 2 of the Safe Drinking Water Regulations 2015 <https://www.legislation.vic.gov.au/in-force/statutory-rules/safe-drinking-water-regulations-2015>.

Disinfection or treatment failure

Silvan Water Treatment Plant: Melbourne Water, Yarra Valley Water and South East Water

There were three reports to the department related to disinfection/treatment failure during the 2020–21 reporting period. All three reports related to the outage of the primary chlorine disinfection process at Melbourne Water's Silvan Water Treatment Plant and the subsequent downstream effects that impacted two water suppliers: Yarra Valley Water and South East Water.

A significant storm event caused a loss of both overhead and underground mains power to the Silvan Water Treatment Plant. The subsequent failure of the backup generator meant primary chlorine disinfection was lost, resulting in undisinfected drinking water entering parts of the Melbourne's water supply system. Melbourne Water reported this incident as the water storage manager responsible for the loss in treatment, while Yarra Valley Water and South East Water both reported the outage as affected water suppliers. The incident resulted in two precautionary 'boil water' advisories being issued, one each from Yarra Valley Water and South East Water for their respective affected suburbs. Further discussion on this incident is provided under the 'Emergency preparedness and incident management' section of this report.

Other reports

There were six 'Other' category of reports that resulted in one 'boil water' advisory and three 'do not drink' advisories being issued by respective water agencies. The types of incidents included major burst water mains increasing the potential for ingress, raw water drawn into a treated water tank, using raw water to air scour the reticulation system, a tear in the floating cover of a clear water storage due to storms, and depressurisation of the distribution system caused by damage to a tank float arm. There were two further incidents categorised under 'Other pathogen detection', with one leading to a boil water advisory. In the second incident, the affected tank was immediately isolated and taken off supply, preventing the need for an advisory. Some of these reports are described in more detail in the 'Emergency preparedness and incident management' section of this report (see Appendix 3 for all section 22 reports received by the department).

Drinking water quality complaints

In 2020–21 there were 7,913 drinking water quality complaints received by 16 water suppliers, a six per cent increase on the previous year. Overall, nine water suppliers reported an increase in drinking water quality complaints in 2020–21, and seven reported a decrease in complaints. Appendix 4 presents details of each water supplier's drinking water quality complaints.

A drinking water quality complaint may be due to undesirable aesthetic water quality issues that do not necessarily represent a direct human health risk. Taste and odour issues may, however, result in the consumption of alternative, less healthy drinks, such as sugar-sweetened beverages or more costly bottled water.

The most common drinking water quality complaint was for discoloured/dirty water reported by 13 water suppliers, followed by taste and odour. A range of factors can result in drinking water tasting, smelling and appearing unpleasant.

Overall, nine water suppliers reported an increase in drinking water quality complaints, which is the same number as the previous year, with City West Water, South East Water, Barwon Water and Western Water reporting consecutive increases. Westernport Water reported a significant increase in drinking water quality complaints compared with the previous year. This is primarily due to dirty water complaints over a period of six weeks (November to December 2020) from sediment stirred up by high flows within the network, and taste and odour from geosmin caused by blue-green algae in the raw water source. Factors contributing to this significant increase include lower water demands during April to October 2020 due to COVID-19 restrictions affecting a transient tourist/holiday population, reduced system maintenance and a sudden sharp increase in flows arising from the lifting of COVID-19 restrictions that enabled tourist visits (highest November water consumption on record). Westernport Water undertook targeted flushing, inspections, cleaning and additional sampling to resolve the issue, as well as contacting each individual who submitted a complaint. Wannon Water had a 50 per cent increase in drinking water complaints followed by City West Water with a 43 per cent increase in complaints compared with the previous year.

Seven water agencies reported a decrease in drinking water quality complaints, which is the same number as last year, with Central Highlands Water and Lower Murray Water reporting consecutive decreases. North East Water had a 31 per cent reduction in drinking water quality complaints followed by Lower Murray Water and East Gippsland Water with a 20 per cent decrease in complaints compared with the previous year.

All water suppliers are implementing appropriate actions to minimise the number of drinking water quality complaints.

Lower Murray Water's Mildura drinking water was awarded the IXOM's Best Tasting Tap Water in Victoria in 2020.

Risk management plan audits

Sections 7 and 8 of the Act require water suppliers and water storage managers respectively to prepare, implement, continuously review and revise risk management plans. Section 10 of the Act requires risk management plans to be audited by an approved auditor to determine whether a water supplier or a water storage manager has complied with the obligations imposed by ss. 7(1) or 8(1) respectively, during the audit period. Section 11 of the Act empowers the Secretary of the department to require the water supplier or water storage manager to have its risk management plan audited by a specified date. The audits are carried out approximately every two years, a timeframe that allows water agencies to drive continuous improvement and best practices, reinforcing and promoting the risk management principles of Victoria's water industry.

In October 2019, under s. 11 of the Act, the Secretary by delegation and written notice required water suppliers and water storage managers to have their risk management plans audited between 1 November 2019 and 31 May 2020. However, due to the COVID-19 pandemic, and its impact on water agencies' normal business activities and operational challenges, the specified date to conduct the audit was extended from 31 May 2020 to 28 August 2020.

Of the 17 water agencies that completed their risk management plan audits in 2020–21, the audits found that 11 water suppliers and all four water storage managers (one being both a water supplier and water storage manager) complied with the obligations imposed by s. 7(1) and s. 8(1) of the Act respectively during the audit period. Three water suppliers, Barwon Water, East Gippsland Water and North East Water, did not comply with the obligations imposed by s. 7(1) during the audit period.

Of the seven water agencies[10] that completed their risk management plan audits in 2019–20, the audits found that six water suppliers complied with the obligations imposed by s. 7(1) of the Act during the audit period. One water supplier, Wannon Water, did not comply with the obligations imposed by s. 7(1) during the audit period for the second consecutive audit.

The audit outcomes of the 24 water agencies risk management plan audits, undertaken by approved auditors, are presented in Table 8.

10 These seven water agencies risk management plan audit outcomes were reported in the 2019–20 annual report.

Table 8: Water agencies risk management plans audit outcomes

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2019–20					
Central Highlands Water	9 April 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	1	Alignment of process flow diagram with actual system configuration.	OFI completed in 2019–20 reporting period.
Falls Creek Alpine Resort Management Board	17 April 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	8	The high-priority OFIs focused on improvements to SCADA systems for water supply assets, improved alarms and review of protocols and training needs. Other OFIs were identified with the supply system performance and resilience, with improvements to hypochlorite dosing alarms, procedures for flushing pipework and installation of an emergency standby generator for water pumps.	Four OFI actions were completed during 2020–21: • a backup generator was installed and commissioned in May 2021 • the SCADA software system was updated in January 2021 • a hypochlorite dosing system was commissioned in December 2020 • one OFI with no action (positively acknowledging an update to procedures for flushing pipework and maintenance of scouring system) was noted. Additionally, further work was undertaken on a new bore, with the bore drill completed, and commissioning and connection planned for summer 2021–22. Falls Creek did not consider additional security cameras to be necessary because an internal review of the current camera network and infrastructure did not highlight any areas that would benefit from more cameras. Two actions (on Rocky Valley Dam and leak detection technology) will be completed in 2021–22.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2019–20					
Lower Murray Water	29 May 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	19	The audit identified OFIs across different water supply assets. The main OFIs of note relate to water storage asset integrity, including asset condition and vermin proofing.	LMW has completed 17 OFI actions. Two OFIs are ongoing/in progress: • LMW has established communication protocols with GMW, Mallee CMA and the EPA to ensure timely notification of black water events and emergency situations that may adversely impact on the raw water quality. • Development of a monthly report on the status of all instrumentation calibration is in progress.
Mt Buller and Mt Stirling Alpine Resort Management Board	25 June 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	7	The OFIs identified potential improvements to training of operations staff, enhancing SCADA systems, developing alarms, aligning UV intensity against water turbidity, review and upgrades to chlorine dosing, upgrades to water storage reservoirs and upgrades to security measures.	Four OFIs have been implemented. OFIs still pending include: • UV systems overhaul (including aligning UV intensity against turbidity and alarming it to SCADA systems) • the review of security cameras and signage.
Parks Victoria	21 April 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	1	Develop a schedule for scenario testing of incident and emergency management procedures.	Completed a schedule, with scenario testing planned for times of usual patronage. A schedule for annual incident and emergency procedures is planned to be incorporated into the next Tidal River risk management plan updated by 31 March 2022.
Southern Alpine Resort Management Board	27 June 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	2	One OFI was to improve the SCADA system. The other OFI relates to upgrading the Lake Mountain Supply (currently regulated water) to potable water supply standard.	A SCADA system has been implemented at Mt Baw Baw. At Lake Mountain, the implementation of a SCADA system and the upgrade to a potable water supply standard is planned to be completed by December 2022.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2019–20					
Wannon Water*	15 April 2020	**Did not comply** with the obligations imposed by s. 7(1) of the Act during the audit period, with three minor noncompliances relating to establishment of preventative measures, establishment and implementation of critical control points, and the quantification of microbial risk. Audit recommendations focused on the review of microbial risk assessments and risks associated with waste return to the head of the treatment plant and the need for aligning treatment critical control points and critical control limits with the microbial risk profile.	2	In addition to the noncompliant finding, the OFIs relate to improvements to establishing the regular review of all risks identified in the risk assessment, which includes the analysis of available water quality data. Also identified was establishing a process in the risk assessment methodology for assessing residual risk.	All audit recommendations and OFIs have been completed.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
Barwon Water	18 August 2020	**Did not comply** with the obligations imposed by s. 7(1) of the Act during the audit period with one minor noncompliance for three separate isolated issues in relation to implementation and compliance with the requirements of the risk management plan.	12	In addition to the noncompliant finding, the OFIs were identified for a range of risk management processes and asset inspection improvements. Particular focus was needed on addressing potentially systemic issues that could lead to future noncompliance.	The causes of the three issues related to noncompliance were completed, and 10 of the 12 OFIs were implemented during the 2020–21 reporting period.
City West Water	4 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	2	The OFIs include to consider the reintroduction of water quality awareness training for staff and to monitor and develop a plan to minimise the high number of dirty water complaints from customers.	Water quality awareness training has also been scheduled for re-initiation for relevant staff in 2021–22. A program of work has been developed to address the increasing volumes of water quality complaints. This program includes consideration of long-term initiatives such as implementing a system-wide cleaning program following the mains flushing trial. Work to address this OFI will continue to progress in 2021–22.
Coliban Water	19 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	13	The OFIs spanned risk management plan auditable elements such as identification and management of risks to water supply and development and implementation of preventive strategies (including appropriate control and monitoring measures).	Six of the 13 OFIs have been implemented. The remaining seven OFIs are scheduled for completion by 20 June 2022.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
East Gippsland Water	26 August 2020	**Did not comply** with the obligations imposed by s. 7(1) of the Act. One minor noncompliance with 3 recommendations relating to reviewing the microbial risk assessment and the critical limits. and 3 opportunities for improvement were identified.	3	The three OFIs relate to updating the emergency contact list; implementing a process for progressing preventive and reactive maintenance and keeping records of maintenance work completed; and assessments for catchments that may have microbial indicator concentrations.	East Gippsland Water is responding to the recommendations to review: • the methodology to assess catchment categories, and to verify the nominated methodology has been consistently and transparently applied • the health-based target assessments and catchment categories for the catchments identified as areas of concern • the drinking water sampling program. The OFI relating to updating the emergency contact list has been completed. The OFI to develop a formal process for progressing preventative and reactive maintenance and keeping records of maintenance work completed has begun and will be rolled out across the business over the next three years. The OFI to consider undertaking Tier 2 assessments for catchments that may have anomalous microbial indicator concentration is being considered if the health-based target assessment review recommends it.
Gippsland Water	26 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	1	Consider raising work orders for reactive mains flushing in response to network monitoring results.	This OFI is partially completed, with the full resolution expected in early 2022.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
Goulburn-Murray Water	20 August 2020	Complied with the obligations imposed by s. 8(1) of the Act during the audit period.	3	The audit OFIs relate to incident criticality assessments to ensure appropriate management of incidents; documenting a process to assess risk management plan adequacy after incidents; and contractor inductions to lease holders operating on Goulburn-Murray Water land.	Two OFIs are scheduled for completion by December 2021 and one by July 2022.
Goulburn Valley Water	28 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	3	The audit OFIs relate to review options for roofing the clarifiers and filters at the Shepparton Water Treatment Plant; means to better house outdoor instruments; and means to further protect treated water storages from vegetation build-up on roofs and in gutters including a review of inspection frequencies for sites vulnerable to such build-up.	The two OFIs relating to the roofing of the clarifiers and filters at the Shepparton Water Treatment Plant and improving housing and ventilation of online instruments have been completed. A working group for reviewing means to further protect treated water storages has been formed.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
Grampians Wimmera Mallee Water	26 August 2020	Complied with the obligations imposed by ss. 7(1) and 8(1) of the Act during the audit period.	10	The OFIs cover a number of auditable elements and include opportunities to simplify drinking water management systems; improve identification of risks and tracking of risk reduction measures; continue to develop and implement the Draft Drinking Water Mains and Service Repairs and Installations Work Instruction; develop a stakeholder management plan; review the risk management plan and update content such as schematics; update the water sampling program; and quantify microbial hazards.	Nine of the 10 OFIs have been implemented. A stakeholder management plan will be completed by December 2021.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
Melbourne Water	28 August 2020	Complied with the obligations imposed by s. 8(1) of the Act during the audit period.	10	The OFIs cover several auditable elements including source water protection, water treatment plants, treated water storage reservoirs, documentation and verification monitoring. Two OFIs relating to treated water storage reservoirs are repeat findings from the 2017–18 risk management plan audit. It was noted that four of the 10 OFIs identified by the auditor could progress to noncompliances if not adequately addressed.	OFIs relating to source water protection: • Assessed the condition of priority catch drains to protect aqueduct water quality and undertaken remedial works with completion of some works due in December 2021. • Enhanced security patrols, inspections and CCTV to systematically and credibly monitor the extent of activity in protected catchments and improve proactive, preventive measures to limit activity. Further improvements will be implemented during 2021–22 and 2022–23 including fencing upgrades and increased monitoring and detection. OFIs relating to treatment: • Ensured standards and reagents are within date. • Commenced a new launder cleaning program for clarifiers at the Winneke Treatment Plant, with cleaning completion of all clarifiers in 2023–24. • Reviewed and updated HACCP set points and targets at all water treatment plants to standardise the controls and verify risk management plan documentation is accurate; due for completion in December 2021.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
Melbourne Water *(continued)*					In response to the OFI relating to the Winneke treated water storage and protection against ingress, Melbourne Water's condition assessment program specifies inspection timeframes. A review of the *Strategic asset management plan* is also underway, targeting completion in December 2021. Two OFIs related to reservoir and aqueduct inspections to protect against ingress and improve vegetation and debris management. Enhancements have been made to standard operating procedures, inspection blitz conducted and the preventative maintenance program under review. To improve logbook clarity, a planned transition to digital forms is underway targeting completion in 2022–23. A project to review dataset on chlorates and organic disinfection by-products and benchmark it against both Australian and international guidelines has been initiated, targeting completion in 2021–22.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
Mt Hotham Alpine Resort Management Board	18 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	6	The high-priority OFIs relate to upgrading the old storage tanks, the inclusion of additional sampling points and integration of the OHS system into the *Drinking water management plan*. The remaining three OFIs relate to record keeping and training.	Three of the six OFIs relating to record keeping and training have been completed. Two OFIs relating to additional sampling points and integration of the OHS system into the *Drinking water management plan* are expected to be completed by December 2022. One OFI relating to the upgrade of the clear water storage tank is ongoing as funding is required.
North East Water	30 October 2020	**Did not comply** with the obligations imposed by s. 7(1) of the Act during the audit period. The minor noncompliance was 'failure to implement a practice contained within the risk management plan', as the treated water storage tank at the Yarrawonga Water Treatment Plant site had inadequate protection against ingress from run-off via an unsealed ground level entry point on the roof.	4	Three OFIs relate to water treatment plants and one relates to network management.	Noncompliance issues have been rectified. The following OFIs have been completed: • condition assessment of the railings at the water treatment plants • ensuring standards and reagents are within date • reviewing the processes, systems and resourcing for new water mains and subdivisions. The OFI relating to the roofing of clarifiers and filters was completed with a risk assessment that deemed the risk was acceptable and a lower priority. Therefore, no projects were initiated; however, this is flagged within the water treatment plant upgrade requirements specification.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
South East Water	18 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	7	The OFIs include clearing vegetation around fences to reduce fire risk; improvements to databases to enable tracking of monitoring program samples; enhancing functionality and reliability of backflow information; increasing field audits to monitor correct sample handling processes due to an increase in *E. coli* false positives; staff training; formalising documentation to capture improvement actions from debriefs and audits; and updating the risk management plan framework.	Six of the seven OFIs have been completed, noting that some actions such as sample tap maintenance and entering audit items/ debrief action items into the audit tracking system remain ongoing. The update of the backflow database to a newer system is pending.
South Gippsland Water	28 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	7	The OFIs relate to improvements in water treatment and quality, clearer signage, resilience planning and the roofing of the Leongatha Water Treatment Plant.	Two OFIs relating to water treatment and quality have been completed. Four OFIs relating to clearer signage, labelling of sampling points, storage of parts and fittings, and resilience planning are in progress, with various expected completion dates of December 2021, July 2022 and 2023. The OFI relating to the roofing of the Leongatha Water Treatment Plant will be considered in South Gippsland Water's 2023 pricing submission to the ESC in 2022.
Southern Rural Water	21 July 2020	Complied with the obligations imposed by s. 8(1) of the Act during the audit period.	1	The OFI relates to the ability to clearly interpret Southern Rural Water's response to identified hazards within its risk management plan.	The overall readability of Southern Rural Water's risk management plan has been improved with the whole plan review expected to be completed by October 2021.

Water agency	Audit certificate date	Risk management plan audit outcome	No. of opportunities for improvement	Key opportunities for improvement (OFI)	Implementation status
Audits completed in 2020–21					
Western Water	28 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	3	The OFIs relate to tighter specifications to improve identification of dual reticulation parts and fittings; establishing a formal position on setting critical limits; and capturing batch and lot IDs for infrastructure.	A formal position on setting critical limits was established during the reporting period. Actions addressing the remaining two OFIs are ongoing.
Westernport Water	28 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	4	The OFIs relate to parts and fittings; the choice to use a floating cover for one tank; clearer labelling and commissioning processes.	Two OFIs are completed, with labelling to be completed by December 2021 and commissioning processes to be reviewed by May 2022.
Yarra Valley Water	19 August 2020	Complied with the obligations imposed by s. 7(1) of the Act during the audit period.	3	The OFIs relate to role-specific training enhancements for all staff; technology research and development; and standardised advice to plumbers on backflow prevention management.	Actions are progressing on all OFIs. A water quality awareness training module was developed and launched during the reporting period; further modules are planned over the next three years. Various networking and relationship-building activities to progress research and development have been undertaken. A standardised training program for plumbers and water business staff is being developed, with completion due in the 2021–22 reporting period.

* This is the second consecutive risk management audit that Wannon Water has been assessed to be noncompliant. Wannon Water has submitted a plan to address its risk management plan audit noncompliance issues.

Regulated water declarations

Some water agencies supply untreated water directly to communities through a piped distribution system. This water is not intended for human consumption; rather, it is used for purposes such as watering gardens, flushing toilets and other non-drinking domestic uses. If it is considered that this water could be mistaken for drinking water, the Minister for Health may, under s. 6 of the Act, declare the water to be regulated water.

Regulated water declarations are a mechanism for managing these non-drinking water supplies within the safe drinking water regulatory framework. A water agency supplying regulated water must have a risk management plan for that water supply. It must take all reasonable steps to ensure the community is made aware of the nature of the water, and it must provide information about the health risks associated with drinking the water.

The process for considering whether a particular supply is declared as regulated water involves consultation between the water supplier and the affected community.

Regulated water declarations can also be made if a water supply intended for drinking water deteriorates to the point where drinking water quality standards cannot be met. This has occurred in the past when extreme weather events significantly changed the characteristics of source water quality.

No variations were made to regulated water declarations during this reporting period. Appendix 5 lists regulated water supplies for this reporting period.

Undertakings

Under s. 30 of the Act, the Secretary may accept undertakings to address water quality issues and deliver permanent water quality improvements. A water agency may enter into an undertaking with the Secretary when the department or the water agency identifies a contravention under the safe drinking water regulatory framework. The undertaking describes what the water agency will do to resolve the issue and how any public health risks are managed while the agency resolves the contravention within a specified timeframe. During this reporting period, there were no undertakings in place.

Annual reports

Under s. 26 of the Act, all water agencies must provide an annual report on the quality of drinking water and regulated water for every financial year. Water agencies must give the report to the Secretary no later than 31 October of each year. Reports must be made available to the public on the respective water agency website by the next business day. Part 5 of the Regulations outlines the details to be included in the annual reports, and the department's *Guidance: Water quality annual report* assists water agencies in meeting the annual report requirements under the Act and Regulations.

As part of the *Better regulatory practice framework,* the department has enhanced its internal review process of water agencies' annual reports to ensure a consistent approach while ensuring water agencies have met the requirements of the Act, the Regulations and the guidance note.

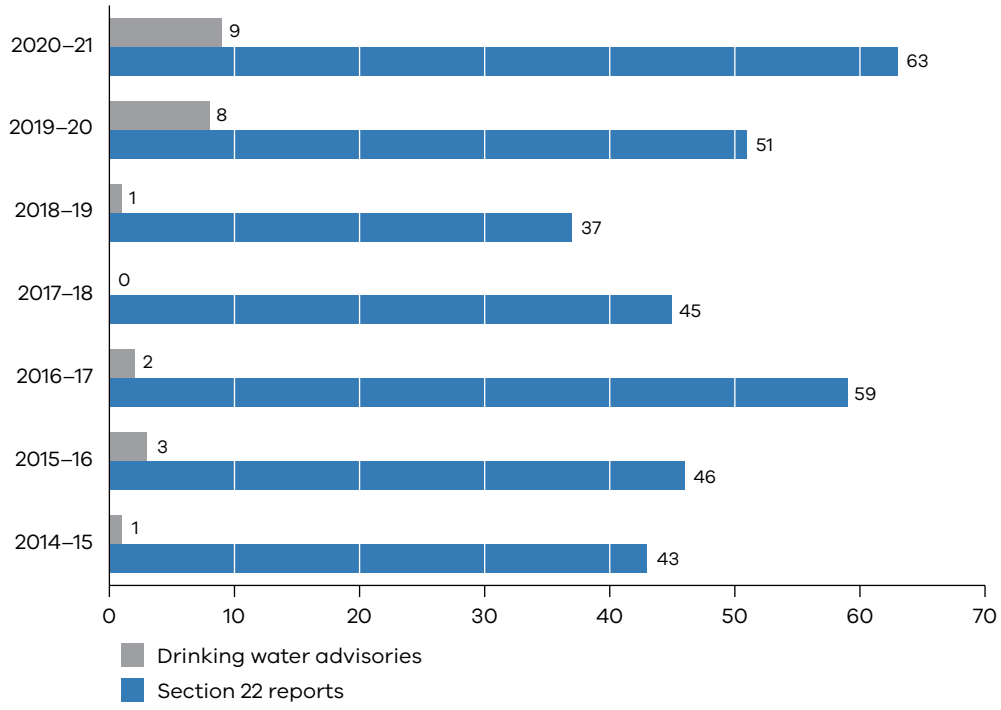
All water agencies submitted their annual reports to the department within the required timeframe for this reporting period. Individual water agency's drinking water quality annual reports can be viewed on their websites. Appendix 1 lists the contact details for each water agency.

Emergency preparedness and incident management

There were several drinking water quality incidents requiring significant involvement by the department including six 'boil water' and three 'do not drink' advisories issued by seven water suppliers between 1 July 2020 and 30 June 2021. Most incidents and resulting advisories were due to the use of raw water for air scouring the reticulation system, disinfection failure, clear water storage tank integrity issues, raw water entering the clear water storage, not following appropriate procedures and the detection of *E. coli* due to impaired asset integrity. Many of these incidents were preventable. Others causes were due to adverse weather events and power failure highlighting the need for water agencies to be better prepared for such extreme events and have measures in place to prevent incidents and reoccurrences. The advisories issued and the event(s) that triggered these advisories are discussed below.

Figure 9 demonstrates that since 2018–19 there has been a significant increase in advisories, with a total of 17 advisories over the last two reporting periods.

Figure 9: Trend of section 22 reports and drinking water advisories, 2014–15 to 2020–21



As outlined under the section title 'Continuous improvement', the IASG aspires to reduce the occurrence of water quality incidents across the water sector through proactive improvement. This requires a mindset that focuses on forecasting risk, avoiding or reducing precursors and an ongoing commitment to quality assurance and continuous improvement to do as much as is practicable to reduce risk.

Boil water advisories due to primary chlorine disinfection failure at Silvan Water Treatment Plant – Melbourne Water, South East Water and Yarra Valley Water

Causal factors that led to the incident

During a severe storm event in August 2020, both primary mains power (overhead and underground powerlines) and emergency backup power (via a diesel generator) were lost to Melbourne Water's Silvan Water Treatment Plant. This resulted in the loss of chlorine disinfection in which approximately 100 ML of undisinfected drinking water was delivered via the Silvan-Waverley, Silvan-Preston and Silvan-Olinda mains to around 270,000 customer properties in around 100 suburbs in the eastern and northern parts of metropolitan Melbourne serviced by South East Water and Yarra Valley Water.

The disinfection outage occurred for approximately seven hours, beginning late in the evening of 27 August 2020 to the morning of 28 August 2020.

Actions undertaken

Melbourne Water and Yarra Valley Water reported the incident to the department in the early morning of 28 August 2020 after all power was lost and undisinfected drinking water had entered the drinking water supply system for almost three hours. The incident was not immediately reported to the department under s. 22 of the Act by either water agency because their assessment was that there was no public health risk in supplying undisinfected water for three hours based on Melbourne Water's 2007 microbial risk assessment for the Silvan Reservoir.

On 28 August 2020, Yarra Valley Water, in consultation with Melbourne Water and the Department of Health, issued a precautionary boil water advisory. Yarra Valley Water took a conservative approach to the number of suburbs included in the advisory due to limited data on water movement and limited time to undertake detailed hydraulic analysis or large-scale network reconfigurations.

South East Water reported the incident to the department mid-morning on 28 August 2020 when Melbourne Water discovered that the Montrose Reservoir/Tank was not isolated as previously advised and therefore had also received undisinfected water. South East Water subsequently issued a precautionary boil water advisory to affected suburbs.

City West Water was advised by Melbourne Water of the incident, but its drinking water supply system was assessed to not have been affected by the incident.

Due to the large number of suburbs and customers affected, a multi-agency incident management response was established involving Melbourne Water, Yarra Valley Water, South East Water, the department and the Department of Environment, Land, Water and Planning. The Department of Health coordinated the overall drinking water contamination incident response.

Extensive communication of the boil water advisories by the two water suppliers occurred via their respective websites, social media, SMS, television, radio interviews and the VicEmergency app. Critical customers were also identified, contacted and provided with alternative drinking water supplies. Melbourne Water also supported the communication of the advisories on its website because both South East Water's and Yarra Valley Water's websites experienced outages due to the unprecedented volume of traffic on the sites.

In reinstating the affected drinking water supplies, Melbourne Water, South East Water and Yarra Valley Water's combined response actions were implemented in accordance with a joint reinstatement plan developed by the three water agencies and approved by the Department of Health. This involved restoring primary mains power back to the chlorine disinfection process at Silvan Water Treatment Plant, targeted chlorine dosing and demonstration of the removal of the undisinfected water from the affected drinking water supply systems. This was followed by water quality verification testing including free chlorine residual and *E. coli* to confirm undisinfected water was no longer in the drinking water supply system.

Key challenges for the water agencies in implementing the reinstatement plan included real-time information on the movement of undisinfected water in the distribution network and the inherent nature of parts of the distribution network that typically operate with very low chlorine residual.

To minimise customer impacts, the precautionary boil water advisory was lifted in stages after demonstration that the water was safe to drink. In consultation with the department, the first stage of the lifting of the advisories occurred on the evening of 29 August 2020 when 26 suburbs that Yarra Valley Water issued an advisory to were confirmed to not have received undisinfected water. The second stage occurred at noon on 30 August 2020 and involved lifting the South East Water advisory for 15 suburbs which had, or were likely to have, received undisinfected water supplied by South East Water. The final stage occurred in the late afternoon of 30 August 2020 and involved lifting the Yarra Valley Water advisory for the remaining suburbs that had, or were likely to have, received undisinfected water.

Preventive actions and lessons learned

The loss of disinfection at the Silvan Water Treatment Plant was a significant drinking water quality incident, with a large area of metropolitan Melbourne placed under precautionary boil water advisories to manage potential risk to public health. Improved reporting and communication procedures and improved hydraulic modelling of the distribution network could have minimised delays in issuing the advisories and assisted in timely identification of affected customers.

Since the incident, Melbourne Water, South East Water and Yarra Valley Water have undertaken investigations internally and jointly to establish the root cause for the incident, identify opportunities for improvement and undertake corrective actions. Some of these identified opportunities for improvement that have been implemented or in progress include:

- improved emergency power supply arrangements including asset upgrades and provision of immediate additional generator capacity at Silvan and installation of permanent, automatic emergency dosing units for each main supplied by Silvan
- review of risk assessments and contingency plans including review of triggers for escalation and criteria for issue of boil water advisory notices
- ongoing comprehensive review of disinfection control effectiveness to identify and correct any potential systemic issues
- approval of a new Mt Evelyn Water Treatment Plant – this new primary disinfection plant will be able to treat water supplied from Silvan Reservoir, downstream of the existing Silvan Water Treatment Plant to enable continuity of primary disinfection for water supplied from Silvan Reservoir during future planned and unplanned outages of the existing disinfection plant
- improvements to optimising chlorine residuals throughout the entire network, and increased continuous online water quality monitoring at storages
- improved hydraulic modelling within the distribution network
- improved joint emergency response plans and communication protocols (including the issuing and lifting of drinking water advisories) and readier access to VicEmergency SMS alerts.

Following the incident, the department issued a written notice under s. 29 of the Act to the three water agencies to obtain a greater understanding of the aspects of the water agencies' preparedness and response actions. The department subsequently wrote to the water agencies reinforcing its expectations that water agencies must immediately report drinking water quality incidents including when the required disinfection parameters are not met.

The department engaged independent experts to investigate the cause(s) of the Silvan drinking water quality incident and the collective preparedness and response to the incident. The investigation was to consider, report and make recommendations to improve the safety of drinking water in Victoria including changes to the Victorian legislative and regulatory framework and lessons to be learned from the incident to prevent future occurrences.

The investigation has provided a series of recommendations for the water agencies involved and the Department of Health. A joint action plan is under development to consider and respond to the recommendations, not already addressed by the water agencies.

Drinking water quality incident in Upper Beaconsfield – South East Water

Causal factors that led to the incident

Three ringtail possums were found in the McKenzie Road tank on 23 September 2020. South East Water reported the incident to the department on the morning of 24 September 2020.

The intrusion of possums occurred from the tank roof believed to be compromised following works undertaken by third-party contractors. During the investigation it was found that the tank cleaning was not undertaken at the scheduled frequency, and the monthly checks had not identified any tank integrity issues. Additional checks need to be built in to ensure effectiveness of infrastructure is maintained including bird proofing and roof deterioration.

Actions undertaken

On identification and removal of the dead possums, South East Water immediately isolated the McKenzie Road tank and sampled the water.

A boil water advisory was not issued due to the significant time that had lapsed when the incident was reported to the department in conjunction with the actions undertaken by South East Water when the possum intrusion was known. The tank was immediately removed from supply and then isolated for cleaning and repair, while the surrounding area was flushed to ensure no water from the tank remained in the system. The alternate supply from Hughendon Road tank, which had a secondary disinfection unit, was put into supply, with its chlorine set point raised to ensure a higher residual throughout the zone. Samples taken from the tank returned negative *E. coli* results. Approximately 900 residents supplied from the tank were sent a letter informing them of the issue and the actions taken by South East Water to rectify the issue.

In reinstating the affected drinking water supply, South East Water developed a reinstatement plan, which was approved by the department. This involved the Hughendon Road tank supplying the affected area and the chlorine set point on the outlet increased from 0.5 mg/L to 0.8 mg/L. All hydraulic zones downstream of the McKenzie Road tank were flushed including the extremities. Chlorine residuals taken at flushing points indicated free chlorine residuals of greater than 0.2 mg/L. The McKenzie Road tank was put back online after verification monitoring confirmed the safety of drinking water in consultation with the department.

Preventive actions and lessons

The incident prompted South East Water to identify a number of opportunities for improvements. These include:

- developing a chlorination strategy to address potential low chlorine residuals in the network
- reviewing third-party contractual onsite arrangements
- implementing a risk-based approach to tank cleaning frequency
- reviewing methods to address baffling or short-circuiting factors (characteristics that affect the mixing of water) within tanks
- incident escalation and alignment of incident-level classification and notification including timely reporting to the department under s. 22 of the Act.

Do not drink advisory for Manangatang – Grampians Wimmera Mallee Water

Causal factors that led to the incident

Raw water from an unprotected catchment was drawn from the Murray River into a clear water storage supplying the Manangatang township when a valve on the raw water intake pipe to the Manangatang Water Treatment Plant was inadvertently manually activated on 23 November 2020. This occurred while improvement works were being conducted to connect the inlet of the Manangatang plant to the raw water storage. Untreated water was supplied to the clear water storage tank and elevated tower for approximately 24 hours, and some of this water made its way to the township.

Actions undertaken

Following discussion with the Department of Health, Grampians Wimmera Mallee Water issued a 'do not drink' advisory on 24 November 2020 for the Manangatang township.

In reinstating the affected drinking water supply, Grampians Wimmera Mallee Water developed a reinstatement plan, which was approved by the department. The plan included cleaning the clear water storage and the elevated tank, flushing to achieve multiple turnovers of the water in the town reticulation system, and resampling for verification that the water was safe to drink. All water samples analysed resulted in no detection of microorganisms. In addition, there was no protozoan detected in the raw water. Metals were also analysed as a chemical indicator and all were found to be below recommended levels and within the ADWG. Furthermore, there were no recorded customer complaints or notifications of gastroenteritis symptoms received by Grampians Wimmera Mallee Water during the course of the incident.

Following the completion of corrective actions and verification monitoring to demonstrate that the water was safe to drink, Grampians Wimmera Mallee Water lifted the 'do not drink' advisory on 29 November 2020 after consultation with the department.

Preventive actions and lessons

Preventive actions identified included: removal of the raw water bypass that was incorrectly operated; increased water quality monitoring and control during the incident; and improvements to the process for managing minor capital works. Further investigations into the incident identified additional improvements, such as creating a detailed water quality incident management plan, setting authorisation procedures prior to action, clearer communication with the department, additional training for the incident management team, and increasing stock of sample bottles.

Boil water advisory for Mount Baw Baw Alpine Resort – Southern Alpine Resort Management Board[11]

Causal factors that led to the incident

During planned works the Mt Baw Baw Alpine Resort (the resort) used raw water for air scouring in the distribution system and due to the possible introduction of contaminants into the drinking water supply system, Southern Alpine Resort Management Board (SARMB) issued a 'boil water' advisory on 2 February 2021 without consulting the department. Regulatory monitoring post-air scouring works detected *E. coli* in samples taken on 3 February 2021 (1 MPN/100 mL) and 4 February 2021 (4 MPN/100 mL). The department was notified under s. 22 of the Act on the evening of 4 February 2021 via the out-of-hours emergency number.

Actions undertaken

The existing 'boil water' advisory issued by SARMB for air scouring remained in place. SARMB placed the boil water advisory inside every resort accommodation mailbox and informed external accommodation providers of the advisory via phone calls, while other stakeholders were informed via email.

In reinstating the affected drinking water supply, SARMB developed a reinstatement plan, which was approved by the department. This involved resampling the original sample point and undertaking a system flush with treated water. Following post-flushing on 5 February 2021, a number of samples were taken within the resort to verify the effectiveness of the corrective action.

The resort was unable to maintain a free chlorine residual in the distribution network due to the high organics content in the raw water and reticulation network despite undertaking remedial actions such as installing mesh filtration on the water pre-storage weir, flushing and turnover of the distribution system and maintaining continuous chlorine dosing to optimise chlorine residual.

11 SARMB submitted two section 22 reports; one for the 'boil water' advisory during air scouring and a second for the *E. coli* detections.

SARMB determined that it was difficult to maintain residual chlorine due the age of the reticulation network, which is known to have high levels of organic matter and the lack of media filtration to remove organic matter at the point of treatment. SARMB engaged a consultant to re-establish and maintain a safe drinking water supply with the provision of a short-term solution to assist with lifting the boil water advisory for the snow season and a long-term solution to improve drinking water quality and safety.

Short-term capital improvements included installing an automatic chlorine dioxide dosing system at the existing water treatment plant with contact tanks and network pumps. The aim of the chlorine dioxide was to reduce the organic content of the raw water feed and optimise the effectiveness of the existing hypochlorite dosing system. Chlorine dioxide treatment provided some improvement to the water quality and aesthetic properties. Following the installation of the chlorine dioxide dosing system, further flushing and verification monitoring of drinking water quality, SARMB assessed that the drinking water no longer posed a risk to public health and, following consultation with the department, lifted the boil water advisory on 28 June 2021. The department requested that SARMB provided weekly reports summarising the performance of the water supply system for at least four weeks, which included increased sampling and monitoring and to meet weekly.

SARMB committed to a long-term solution that includes installing a granular-activated carbon system with pre-coagulation and hypochlorite dosing and validating the existing UV treatment by December 2021.

Preventive actions and lessons

Key lessons include not using raw water to air scour the distribution system, having documented procedures for operations, training of drinking water quality staff and ensuring the risk management plan is fit for purpose and commensurate with drinking water quality risks. Capital improvements should be an ongoing feature to ensure continuous improvements in drinking water quality are attained. SARMB continues to actively monitor water quality and treatment performance on an ongoing basis.

Boil water advisory for Cudgewa – North East Water

Causal factors that led to the incident

On 25 February 2021 an operator found a dead rodent floating in the Cudgewa treated water basin as a result of integrity issues identified at the Cudgewa basin. A thorough inspection of the Cudgewa basin was completed by North East Water on 26 February 2021. Two 10 mm gaps/holes were found as possible vermin entry points, but the size was unlikely to have allowed the dead rat to enter. The opening and closing of the door during routine operation was considered as a possible vermin entry point. The vermin ingress was possible due to vulnerabilities in legacy basin infrastructure.

Actions undertaken

Due to the microbial hazard associated with animal carcasses, North East Water issued a 'boil water' advisory to Cudgewa customers on 25 February 2021 following consultation with the department. North East Water established an incident team to manage this issue.

In reinstating the affected drinking water supply, North East Water developed a reinstatement plan, which was approved by the department. This involved undertaking a thorough inspection of the Cudgewa basin on 26 February 2021. The basin was batch dosed with chlorine to increase the chlorine residual. Flushing was undertaken to achieve turnover of the basin and all potential vermin entry points were repaired. Once these measures had been completed and following sampling to verify the safety of drinking water, North East Water lifted the advisory on 4 March 2021 following consultation with the department.

Preventive actions and lessons

A similar event occurred in 2019–20 as a result of the Black Summer bushfires, when a dead animal was found in the basin resulting in a boil water advisory also issued for the Cudgewa water supply. Significant damage to the treated water basin including melting of pipes and flashing compromised the integrity of the basin and allowed access to vermin. North East Water has addressed the door operation including the addition of a spring mechanism to prevent the door from remaining open and lighting around the basin. Key lessons are the value of conducting detailed asset inspections following any event, especially bushfires, which can affect key water supply infrastructure, training for all treatment operators and undertaking exercise scenarios of vermin ingress in all of North East Water drinking water systems.

Boil water advisory for Upper Delatite – Goulburn Valley Water

Causal factors that led to the incident

Two routine drinking water samples taken from the Upper Delatite water sampling locality on 23 March 2021 contained *E. coli* at concentrations of 490 MPN/100 mL at the Sawmill Settlement Rosella Street clear water storage tank and 1 MPN/100 mL at a customer tap in the Sawmill Settlement and Merrijig reticulation system.

Following notification from a NATA-accredited laboratory on 24 March 2021 of *E. coli* detections, an internal visual inspection of the clear water storage tank by Goulburn Valley Water found light penetration in between the roof sheeting from a previous repair – the most likely ingress point for drinking water contamination.

Actions undertaken

Following consultation with the department, Goulburn Valley Water issued a 'boil water' advisory on 24 March 2021 to affected customers in the Upper Delatite water sampling locality via its website, SMS, social media, a media release, roadside billboard signs and town posters. Direct contact of vulnerable customers was also made, and they were provided with specific information.

Internally, Goulburn Valley Water declared the *E. coli* detections a level two incident and formed an incident management team. Alternative drinking water was provided to affected customers via bottled water and a water tanker located in town; a temporary water supply was also established for the local school and accommodation facilities.

In reinstating the affected drinking water supply, Goulburn Valley Water developed a reinstatement plan, which was approved by the department. This involved repairing the section of the clear water storage tank roof where ingress was suspected to have occurred and free chlorine residual within the clear water storage tank was increased to 1.5 mg/L. All water storages within the water sampling locality, including on site at the Upper Delatite Water Treatment Plant as well as within the reticulation system, were also inspected with no other ingress points, damage or issues found. Flushing was undertaken to turn over any remaining contaminated water in the supply system and the clear water storage tank. Two rounds of water quality verification samples were taken across the Upper Delatite water sampling locality to verify the safety of the drinking water after completing corrective actions. The boil water advisory was lifted on 27 March 2021.

Preventive actions and lessons

Goulburn Valley Water identified the need to ensure drinking water storages are inspected at the scheduled frequency to facilitate the timely assessment and identification of tank integrity issues. Since the incident, and as a result of the opportunity for improvement finding from the risk management plan audit, a clear water storage risk mitigation working group has been setup by Goulburn Valley Water with the aim of developing an improved, fit-for-purpose water storage assessment program based on a review of current industry best practices, risk prioritisation and various inspection methods.

Boil water advisory for Koo Wee Rup – South East Water

Causal factors that led to the incident

Following an initial *E. coli* detection of 1 MPN/100 mL during routine sampling on 20 May 2021, South East Water undertook a number of resamples in the Koo Wee Rup distribution network on 21 May 2021. The original sample point returning another *E. coli* detection of 1 MPN/100 mL and one additional sample point also had an *E. coli* detection of 1 MPN/100 mL. Investigative actions led to the conclusion that the high-level tank was potentially contaminated and prompted South East Water to bring forward the high-level tank drainage and inspection. A hole in the tank roof was determined to be the cause of the ingress. This was evident from grass deposits and discovery of a dead bird found during the investigation.

Actions undertaken

As soon as the repeat *E. coli* positive sample results were known, South East Water immediately isolated the Koo Wee Rup high-level tank and supply continued from the Koo Wee Rup low-level tank.

South East Water issued a 'boil water' advisory for the Koo Wee Rup locality on 22 May 2021 following consultation with the department. Messaging and advice was provided to the community through ground presence, digital communications (website, SMS and email) and letter drops. Drinking water from water tankers was made available for those unable to boil water, while bottled water was provided to aged-care facilities and schools.

In reinstating the affected drinking water supply, South East Water developed a reinstatement plan, which was approved by the department. This included flushing, inspecting low- and high-level tanks and undertaking repairs to the high-level tank. This was followed by pre- and post-corrective samples within the reticulation. After completing all corrective actions and verification monitoring confirming the safety of drinking water, the Koo Wee Rup high-level tank was put back online and South East Water lifted the boil water advisory on 25 May 2021 following consultation with the department. Validation monitoring was also conducted in the reticulation network after reinstating the high-level tank.

With confirmation from resampling that the drinking water contained *E. coli* and investigations that confirmed the integrity of the tank had been compromised, South East Water provided a section 18 notification to the department because the drinking water it supplied did not comply with the drinking water quality standard for *E. coli*.

Preventive actions and lessons

Key lessons learned from this incident include undertaking thorough visual inspections of tanks and clear water storages because the drone inspection was found to be insufficient in identifying signs of contamination or tank integrity issues. Regular scheduled maintenance including checks on asset conditions and tank cleaning should be undertaken at frequencies identified in procedures and can be critical in preventing similar incidents.

Do not drink advisory for Trentham – Coliban Water

Causal factors that led to the incident

Due to a severe storm and an associated heavy rain event, the Trentham Water Treatment Plant lost power on the evening of 9 June 2021. Due to safety concerns and directions from emergency services agencies, Coliban Water was unable to access the treatment plant. Access was gained the following day, on 10 June 2021, and normal operations restored with the help of an onsite generator. Although the treatment plant was operating normally, demand was unusually high, impacting on the ability to fill the onsite treated water storage tank. The unusually high demand was suspected as being caused by a burst water main.

Actions undertaken

Following consultation with the department, Coliban Water issued a 'do not drink' advisory on the evening of 10 June 2021, as there was a risk of ingress and contamination via the potential burst water main adversely impacting the ability to maintain positive pressure in the network, combined with the risks posed by the low level of water in the treated water storage tank.

Coliban Water issued communications to affected customers in Trentham and arranged for bottled water. Key messages were posted on Coliban Water's website on 10 June 2021, at around 7.00 pm, advising customers not to drink the water. These key messages and bottled water were also hand-delivered to customers and handed out at the Town Relief Centre on 11 June 2021. The notifications were also delivered via radio.

In the meantime, operational staff set about finding the burst water main. This was located and isolated on the afternoon of Saturday 12 June 2021. In reinstating the Trentham drinking water supply, Coliban Water developed a reinstatement plan, which was approved by the department. This included confirming the performance of the treatment plant using online data, confirmation that the burst water main had been isolated from the supply while it was being repaired, monitoring chlorine residuals in the distribution network to ensure sufficient disinfection was maintained, confirming the microbiological safety of the drinking water, providing online data on distribution network pressure to verify that positive pressure had always been maintained, and advising that flushing had been undertaken across the entire network.

Based on the information provided by Coliban Water, the department supported the lifting of the 'do not drink' advisory around 6.00 pm on 12 June 2021.

Preventive actions and lessons

Two trunk mains run from the Trentham Water Treatment Plant to Trentham distribution network. The burst was found on one of these trunk mains. Upon identifying the burst, the affected section of the main was isolated, with no customers taking water from the isolated section of main. The flow in the other trunk main was increased to ensure sufficient flows into town.

During the investigation of the burst main, it was identified that the water supply to some properties along Mulcahys Road, Trentham was restricted, due to low pressure. Subsequently, water service was restored to Mulcahys Road. As part of reinstatement activities, the area was investigated for leaks (one minor leak was found and repaired), and the area was flushed. Positive pressure was maintained in the distribution network throughout the investigation period. Additionally, good free chlorine residual (> 1 mg/L) was maintained.

Do not drink advisory for Sherbrooke Reservoir – Yarra Valley Water

Causal factors that led to the incident

Due to a severe weather event, John's Hill pump station was affected by a power outage. This required Yarra Valley Water to make operational changes to supply the Kallista (Ridge Road) high-level water supply zone from the Sherbrooke Reservoir supply zone within the Ridge/Monbulk water sampling locality. On reverting to normal operations, the Sherbrooke Reservoir was backfilled from Kallista (Ridge Road) zone. Unknowingly, due to ongoing power outage at Sherbrooke Reservoir, the reservoir was filled beyond its normal level and, consequently, the float arm was damaged.

Upon reseparating the two water distribution zones, the Sherbrooke Reservoir lost the function to automatically refill, causing depressurisation in elevated areas (greater than 400 m elevation) of the water supply zone for around 3.5 hours on 15 June 2021. Localised flooding and potential septic tank overflows within the catchment area meant there was potential for ingress at below ground hydrants and therefore potential contamination of the elevated section of the Sherbrooke Reservoir supply zone. Due to the power outage and backup batteries onsite having run flat, Yarra Valley Water was not initially aware of the damage to the float arm. The problem was discovered by field crew on inspection following reports of interrupted water supply from customers in the supply zone.

Actions undertaken

Yarra Valley Water issued a 'do not drink' advisory on 16 June 2021, following consultation with the department, to affected customers via its website, SMS, radio, social media channels, community hubs, phone calls to targeted customers and on the VicEmergency app.

In reinstating the affected drinking water supply, Yarra Valley Water developed a reinstatement plan, which was approved by the department. This included checking the integrity of the supply zone, and free chlorine residuals were measured across the supply zone to understand potential points of contamination. Sherbrooke Reservoir was refilled and dosed with free chlorine in excess of 1 mg/L and then placed back online, the supply zone was repressurised, and mains flushing was undertaken at hydrants across the affected supply zone to achieve full turnover of the system. The damaged float arm was repaired and telemetry communications were restored at Sherbrooke Reservoir.

Two rounds of verification samples were taken across the affected supply zone to verify the safety of the drinking water after completing corrective actions. The 'do not drink' advisory was lifted on 18 June 2021 by Yarra Valley Water following consultation with the department.

Preventive actions and lessons

Yarra Valley Water has identified the need to ensure batteries backing up the communications equipment are replaced before they run flat. For prolonged periods of power loss, backup generators should be deployed. In debriefing the incident with the department, Yarra Valley identified the need for improved system change management processes, with consideration of unintended consequences of any system changes.

Yarra Valley Water reached 98 per cent of its customers through the multiple channels used for customer notification of the advisory. Ten customers in the impacted area were not advised via SMS (the primary communication method of the advisory). During a review of the incident a minor change to the zone's boundaries was made to further improve accuracy.

Drinking water quality incident in San Remo – Westernport Water

Causal factors that led to the incident

The integrity of the San Remo Basin was compromised following severe storms. The closest weather station in Rhyll recorded high winds of 80 km/h on 9 and 10 June 2021. Given the basin's higher elevation relative to Rhyll, wind speeds are likely to have exceeded those recorded at Rhyll. Basin inspections on 11 June 2021 found an estimated three-metre triangular tear in the floating cover. The location of the tear was directly north of the inlet approximately 100 m away from the outlet. There was no evidence to suggest that debris physically penetrated the basin cover.

Actions undertaken

Westernport Water undertook a rapid risk assessment that concluded there was no immediate risk to public health from the supply of drinking water and that a 'boil water' advisory was not immediately required, although one was drafted should circumstances change and evidence demonstrate that the drinking water could be unsafe for consumption.

Westernport Water considered the potential for ingress of contamination via the tear in the floating cover to be low due to light rain, pumps to remove any water from the cover, the high winds would mobilise any matter from the cover, no vegetation around the basin or infrastructure to attract birds or points of shelter for vermin and the basin was double-fenced for security and public safety reasons, although winds caused minor damage to upper fence. In addition, disinfection efficacy was maintained for bacterial inactivation with water entering the basin maintaining a chlorine residual of 0.5 mg/L and residence time in the basin with mixing provided enough contact time further assisted by very low turbidity and steady pH.

While the department supported Westernport Water's rapid risk assessment, Westernport Water committed to undertake a number of measures to actively manage and monitor the provision of safe drinking water overnight. These included hourly inspections of the basin with trigger points for notification to the department being observation of fauna interacting with the basin and/or emergence of a tear near the outlet of the basin; inlet chlorine dosing increased to 3 mg/L monitoring free chlorine residual within the basin and at the outlet of the basin; inspecting the basin with specialist contractors, including divers early morning; and reporting overall assessment and findings, including estimated timeframe to repair cover and upper fence to the department to inform next steps and possible bypass of the basin. Daily microbiological testing was also undertaken across the entire distribution with an extra 10 samples taken each day in addition to the routine sampling program, this continued after the repair and scaled back to the normal program at a timeframe agree on by the department. No adverse results were received. Noting that any material changes that could compromise the safety of drinking water were to be immediately reported to the department.

Westernport Water discussed the possibility of bypassing the basin but faced challenges including fatigued crew. It was estimated to take up to six hours and the potential for an increase in pressure to cause pipes to burst, which was likely due to ageing infrastructure. The bypass system had not been tested for a number of years and was therefore not considered to be an appropriate contingency at the time.

Westernport Water's reinstatement plan, approved by the department, included accessing materials and repair to the basin cover (stitching and welding), with daily inspections for leaks or issues with repair; daily sampling at the basin and within the reticulation system; and installation of an online chlorine analyser at the basin's outlet to ensure timely chlorine readings, which enabled monitoring for possible ingress and contamination.

On 16 June the tear was repaired with a permanent fix, and a specialised dive team inspected for any signs of ingress or leaks. Following repairs and ongoing confirmation of the safety of drinking water from daily sample results, the sampling frequency at the basin and within the reticulation system reduced to thrice weekly for a period.

Following the completion of all actions in the reinstatement plan and verification monitoring demonstrating that the water was safe to drink, the incident was closed on 28 June 2021.

Preventive actions and lessons

The cover was fit for purpose; however, it was approaching the end of its useful life and due for renewal in 2021–22. Westernport Water aims to have the liner and cover at the site replaced by May 2022.

This incident highlights the importance of timely inspections following storm events and frequent testing of contingency plans to also ensure the functionality of any infrastructure integral to the plan to ensure its reliability when needed.

Water fluoridation for healthy teeth

Oral disease is one of the most prevalent diseases in our community. Although there have been significant improvements in oral health over the past 20–30 years, there is still evidence of poor oral health among many Victorians. The cost of treatment of oral disease is high, but it is preventable.

Water fluoridation significantly reduces tooth decay in people of all ages and reduces tooth decay rates by 26–44 per cent in children. Community water fluoridation is the most effective population-wide intervention to prevent tooth decay. Most Victorians living in metropolitan Melbourne have access to water fluoridation. However, there are still many Victorians living in rural and regional areas without access to this important public health initiative. Since 2013–14 six water fluoridation plants have been built, giving more than 78,500 people across 15 towns access to fluoridated drinking water.

Victorian action plan to prevent oral disease

The *Victorian action plan to prevent oral disease 2020–2030,* released in early 2020, sets out a vision to achieve good oral health for all Victorians by 2030 and to reduce the gap in oral health for people who are at higher risk of oral disease. The action plan focuses on opportunities for oral health promotion across the life course. Priority actions and key goals relevant to the water sector include:

- increasing the coverage of fluoridated drinking water and, by 2030, increasing the proportion of rural and regional Victorians accessing fluoridated drinking water to 95 per cent from a baseline of 87 per cent
- collaborating with water businesses to promote the benefits of drinking water, preferably fluoridated water.

Health (Fluoridation) Act

In Victoria, the *Health (Fluoridation) Act 1973* regulates the fluoridation of drinking water supplies. This Act is administered by the department.

Under the Health (Fluoridation) Act, the department oversees the ongoing compliance and performance of existing water fluoridation plants in Victoria and increasing access to water fluoridation in areas with non-fluoridated water supplies. Under this Act, the net capital costs and expenses for adding fluoride to a public water supply shall be paid by Parliament.

Before adding fluoride to any water supply, a water agency must submit plans and specifications to the department for consideration. The department conducts a technical appraisal of the fluoridation plant to assess the plans and specifications in accordance with Victoria's *Code of practice for fluoridation of drinking water supplies, Second edition,* to ensure the fluoridation plant can operate safely and reliably. When the technical appraisal is complete and following the water agency satisfactorily addressing any relevant issues, the department approves the plant's commencement. Fluoridation plant audits are arranged within 12 months of operation to verify the recommendations of the technical appraisal and any other requirements at the time the approval was provided.

Key achievements and activities

In 2020–21 the key achievements and activities included:

- February 2021: Wannon Water submitted a functional design report for a water fluoridation plant at the Terang Water Treatment Plant.
- April 2021: Coliban Water, which manages Cohuna's town water supply, started introducing fluoride to the town's water supply, providing 2,500 people in Cohuna with access to fluoridated water for the first time. This plant increases the percentage of rural and regional Victorians accessing fluoridated water to 88 per cent compared with 87 per cent at baseline. The *Case study: water fluoridation in Cohuna* is published on the Dental Health Services Victoria website.
- April 2021: The department commissioned a technical appraisal of Wannon Water's Camperdown Fluoridation Plant. It is anticipated that in early 2022 the plant will provide fluoridated drinking water to more than 5,000 residents of Camperdown, Lismore and Derrinallum, as well as customers connected to the Camperdown rural pipeline.
- May 2021: Western Water began the Merrimu Water Filtration Plant fluoride upgrade project, due to be completed in early 2022.
- June 2021: The department approved the construction of a water fluoridation plant at Wannon Water's Terang Water Treatment Plant. Upon completion, this plant will provide fluoridated drinking water to the communities of Terang, Mortlake, Glenormiston and Noorat – a combined population of around 4,000.
- Ongoing promotion of water consumption through the Smiles 4 Miles program and Community Health Centres, including a collaboration between Bellarine Community Health and Barwon Water on the Choose Water Every Day regional social marketingcampaign.

The department is committed to maintaining current, evidence-based information about water fluoridation. In April 2021 the department published an updated community information fact sheet, *Water fluoridation for healthy teeth*. The factsheet is available on the department's water fluoridation in Victoria website <https://www.health.vic.gov.au/water/water-fluoridation-in-victoria>.

The department, via its partnership with Dental Health Services Victoria, will continue to build on existing data on oral health profiles for local government. Local government area oral health profiles are available from the Dental Health Services Victoria website <https://www.dhsv.org.au/oral-health-programs/LGA-oral-health-profiles>.

88% of rural and regional residents have access to **fluoridated water**

Oral health profiles and action guides were updated and provided to all **79 Local Government Areas**

Coliban Water fluoridation plant at **Cohuna** commenced operations resulting in an **additional 2,500** people accessing fluoridated water

Water fluoridation plant performance

In the 2020–21 reporting period, Victoria had 49 water fluoridation plants operated by 14 water agencies and Aquasure (Victorian desalination plant operator).
The department's *Guidance: Water quality annual report* and *Code of practice for fluoridation of drinking water supplies, Second edition* require water agencies to report on water fluoridation plant performance including:

- the annual average, minimum and maximum fluoride concentrations at each water sampling locality, water supply and fluoridation plant
- a summary of incidents and emergencies reported during the year
- a summary of the fluoridation process and chemicals used at each fluoridation plant.

The *Code of practice for fluoridation of drinking water supplies, Second edition* also requires water agencies to notify the department of emergency and exceptional situations.

During the reporting period the department received 27 notifications from nine water agencies of fluoride concentrations of less than 0.6 mg/L for a continuous period of greater than 72 hours as a result of plant shutdowns due to dosing pump issues, faulty analysers, a blockage in the dosing line, a flowmeter replacement issue and the need to replace fittings on day tank pipework.

The department continues to engage with the water agencies to ensure all water fluoridation plants are performing at maximum efficiency 100 per cent of the time, delivering the optimal fluoride concentration to achieve a dental benefit.

On the horizon

Plumbing products

The department's *Annual report on drinking water quality in Victoria 2017–18* included a discussion on the presence of lead in some plumbing products and that ultimately reducing the lead content of plumbing products is the most effective means of reducing the risk of lead in drinking water.

The installation of plumbing fittings in Australia is overseen by state and territory plumbing regulatory agencies. The department committed to working with other government agencies, both at the state and national levels, to resolve this important public health issue.

In July 2021 the Australian Building Codes Board determined to reduce the lead content of plumbing products in contact with drinking water, providing industry with a three-year transition period from 1 September 2022. More information on the Australian Building Codes Board's decision can be found on its website <https://www.abcb.gov.au/resource/regulation-impact-statements/lead-plumbing-products-final-decision-ris>.

Australia's Environmental Health Standing Committee, of which the department is a member, has also since developed guidance for building and asset managers on managing the leaching of metals from plumbing systems. Refer to the new enHealth *Guidance on reducing exposure to metals in drinking water from plumbing products* <https://www1.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-publicat-environ.htm>, published in 2021

Adapting to climate change

Victoria's *Climate Change Act 2017* requires the preparation of adaptation action plans every five years for seven systems, namely health and human services, primary production, built environment, education and training, transport, natural environment and water cycle systems.

Throughout 2020–21 the department and the Department of Families, Fairness and Housing have been working together to develop the *Health and human services climate change adaptation action plan 2022–2026,* which will be published along with the other system-based plans in 2022. The plan builds on the *Pilot health and human services climate change adaptation action plan 2019–21* and will help ensure we are prepared to address the significant risks that climate change poses to health and wellbeing. The plan also recognises important interdependencies with other systems, including the water cycle system, and the collaborative approach we will collectively take to move towards a climate resilient Victoria.

The department is also investing in research to support better understanding and management of risks posed by climate change to Victoria's drinking water supplies. This includes supporting a collective research program managed by Water Research Australia focused on understanding drinking water quality risks under low and variable water levels. The outcomes of the research will guide future strategies for managing the water quality impacts of declining water levels in drinking water dams and reservoirs. The department has developed resources to provide advice for managing private drinking water supplies, including after fires and floods.

Victoria's antimicrobial resistance strategy

AMR refers to when microorganisms (bacteria, fungi, viruses and parasites) develop resistance to antimicrobial substances such as antibiotics. The emergence of AMR represents a real and growing threat in Victoria and across the world. It is relevant for the health of humans, animals and the environment. To manage the issue of AMR, a One Health cross-sector and transdisciplinary approach is being adopted, recognising the interconnection between people, animals, plants and their shared environment.

The Victorian Government is developing the first *Victorian antimicrobial resistance strategy 2022–2032*. A consultation process has been completed and will help inform the objectives and priority actions undertaken in the two five-year implementation plans covering 2022–2027 and 2028–2032.

Understanding the role of the water cycle in the emergence and amplification of AMR is an important area of research and surveillance that will be considered when developing the strategy.

ADWG: managing microbial quality of drinking water

In 2018 the National Health and Medical Research Council (NHMRC) consulted on the ADWG's revised Chapter 5 'Microbial quality of drinking water', incorporating a microbial health-based target.

The microbial health-based target approach is consistent with the World Health Organization's approach for defining the microbiological safety of drinking water. The proposed definition of microbial safety used in these guidelines for drinking water is a health outcome target of 1×10^{-6} disability-adjusted life years per person per year. The approach uses reference organisms that represent the major groups of pathogens (bacteria, viruses and protozoa) to provide a definition for a low level of acceptable risk and help inform water treatment requirements needed to reduce microbial risk to an acceptable level.

The NHMRC Water Quality Advisory Committee work plan includes finalising and publishing the revisions to Chapter 5 on the microbial quality of drinking water. The department, through its representation on Australia's Environmental Health Standing Committee, continues to work with the NHMRC to finalise the guidance. For more information refer to the NHMRC's website <https://www.nhmrc.gov.au/health-advice/water-quality-and-health/water-quality-advisory-committee-wqac>.

Victorian water agencies have already integrated microbial health-based targets into their risk management plans as a means of meeting their obligations under the Safe Drinking Water Regulations. The Regulations require water agencies to quantify microbial hazards including the extent to which pathogenic microorganisms are present in water that enters the drinking water treatment process, and the extent to which that drinking water treatment process removes or reduces pathogenic microorganisms in the water.

Appendices

Appendix 1: Water agency contact details

Water agency	Telephone	Website
Barwon Water	1300 656 007	www.barwonwater.vic.gov.au
Central Highlands Water	1800 061 514	www.chw.net.au
Coliban Water	1300 363 200	www.coliban.com.au
East Gippsland Water	1800 671 841	www.egwater.vic.gov.au
Falls Creek Alpine Resort Management Board	03 5758 1200	www.fallscreek.com.au
Gippsland Water	1800 050 500	www.gippswater.com.au
Goulburn-Murray Water	1800 013 357	www.g-mwater.com.au
Goulburn Valley Water	03 5832 4800	www.gvwater.vic.gov.au
Grampians Wimmera Mallee Water	1300 659 961	www.gwmwater.org.au
Greater Western Water (formerly City West Water and Western Water)	13 44 99	www.gww.com.au
Lower Murray Water	03 5051 3400	www.lmw.vic.gov.au
Melbourne Water	131 722	www.melbournewater.com.au
Mt Buller and Mt Stirling Alpine Resort Management Board	03 5777 6077	www.mtbuller.com.au
Mt Hotham Alpine Resort Management Board	03 5759 3550	www.mthotham.com.au
North East Water	1300 361 622	www.newater.com.au
Parks Victoria	131 963	www.parkweb.vic.gov.au
South East Water	131 694	www.southeastwater.com.au
South Gippsland Water	1300 851 636	www.sgwater.com.au
Southern Alpine Resort Management Board	03 5957 7222	www.southernalpine.vic.gov.au
Southern Rural Water	1300 139 510	www.srw.com.au
Wannon Water	1300 926 666	www.wannonwater.com.au
Westernport Water	1300 720 711	www.westernportwater.com.au
Yarra Valley Water	1300 853 811	www.yvw.com.au

Appendix 2: Section 18 notifications for drinking water quality standards, 2020–21

No.	Water agency	Water sampling locality	Water quality standard	Date
1	Barwon Water	Apollo Bay	*E. coli*	August 2020
2	Central Highlands Water	Enfield	*E. coli*	January 2021
3	Coliban Water	Bealiba	N-Nitrosodimethylamine	July 2020
4	Gippsland Water	Boisdale	*E. coli*	June 2021
5	Goulburn Valley Water	Broadford	Manganese	October 2020
6	Goulburn Valley Water	Upper Delatite	*E. coli*	March 2021
7	Goulburn Valley Water	Upper Delatite	*E. coli*	March 2021
8	Mt Buller and Mt Stirling ARMB	Mt Stirling	*E. coli*	January 2021
9	Mt Buller and Mt Stirling ARMB	Mt Stirling	Trichloroacetic acid	February 2021
10	Parks Victoria	Tidal River	*E. coli*	January 2021
11	South East Water	Koo Wee Rup	*E. coli*	May 2021
12	Southern ARMB	Mt Baw Baw	*E. coli*	February 2021
13	Wannon Water	Cavendish	Total trihalomethane	February 2021

ARMB = Alpine Resort Management Board

Appendix 3: Section 22 reports of known or suspected contamination, 2020-21

No.	Water agency	Water sampling locality	Reason	Date
1	Barwon Water	Apollo Bay	*E. coli* detection	August 2020
2	Barwon Water	Teesdale	*E. coli* detection	December 2020
3	Barwon Water	Bannockburn	*E. coli* detection	January 2021
4	Barwon Water	Moorabool	*E. coli* detection	March 2021
5	Barwon Water	Teesdale	Widespread public complaint	April 2021
6	Central Highlands Water	Enfield	*E. coli* detection	January 2021
7	City West Water	East Keilor	*E. coli* detection	January 2021
8	Coliban Water	Maiden-Gully Marong	Widespread public complaint	September 2020
9	Coliban Water	Cohuna	Other (burst water main)	October2020
10	Coliban Water	Cohuna	Widespread public complaint	December 2020
11	Coliban Water	Echuca	Widespread public complaint	December 2020
12	Coliban Water	Gunbower	Widespread public complaint	December 2020
13	Coliban Water	Leitchville	Widespread public complaint	December 2020
14	Coliban Water	Heathcote, Tooborac	Widespread public complaint	January 2021
15	Coliban Water	Harcourt	Widespread public complaint	February 2021
16	Coliban Water	Bendigo Raywood	Widespread public complaint	May 2021
17	Coliban Water	Trentham	Other (burst water main)**	June 2021
18	Gippsland Water	Boisdale	*E. coli* detection	June 2021
19	Goulburn Valley Water	Upper Delatite	*E. coli* detection*	March 2021

* 'Boil water' advisory issued

** 'Do not drink' water advisory issued

ARMB = Alpine Resort Management Board

No.	Water agency	Water sampling locality	Reason	Date
20	Grampians Wimmera Mallee Water	Manangatang	Other (untreated water drawn into clear water storage)**	November 2020
21	Grampians Wimmera Mallee Water	Minyip	*E. coli* detection	December 2020
22	Grampians Wimmera Mallee Water	Horsham, Natimuk	Widespread public complaint	January 2021
23	Grampians Wimmera Mallee Water	Donald	*E. coli* detection	May 2021
24	Melbourne Water	Silvan Main	Widespread public complaint	April 2021
25	Melbourne Water	Yarra Valley Water and South East Water metropolitan Melbourne WSLs	Disinfection or treatment failure	August 2020
26	Mt Buller and Mt Stirling ARMB	Mt Stirling	*E. coli* detection	January 2021
27	North East Water	Walwa	*E. coli* detection	October 2020
28	North East Water	Harrietville	*E. coli* detection	November 2020
29	North East Water	Cudgewa	Other pathogen detection*	February 2021
30	North East Water	Beechworth LL	*E. coli* detection	June 2021
31	Parks Victoria	Tidal River	*E. coli* detection	July 2020
32	Parks Victoria	Tidal River	*E. coli* detection	January 2021
33	South East Water	Dandenong	*E. coli* detection	July 2020
34	South East Water	Bayswater, Belgrave, Ferntree Gully	Disinfection or treatment failure*	August 2020
35	South East Water	Upper Beaconsfield	Other pathogen detection	September 2020
36	South East Water	Ferntree Gully	*E. coli* detection	February 2021
37	South East Water	Dandenong North	*E. coli* detection	May 2021
38	South East Water	Koo Wee Rup	*E. coli* detection*	May 2021
39	South East Water	South Melbourne	*E. coli* detection	June 2021

* 'Boil water' advisory issued

** 'Do not drink' water advisory issued

ARMB = Alpine Resort Management Board

No.	Water agency	Water sampling locality	Reason	Date
40	South East Water	Brighton-Heatherton, Mordialloc	Widespread public complaint	June 2021
41	South Gippsland Water	Inverloch	Widespread public complaint	October 2020
42	South Gippsland Water	Fish Creek	Widespread public complaint	December 2020
43	South Gippsland Water	Poowong, Nyora	*E. coli* detection	March 2021
44	Southern ARMB	Mt Baw Baw	Other (raw water used for air scouring)*	February 2021
45	Southern ARMB	Mt Baw Baw	*E. coli* detection*	February 2021
46	Wannon Water	Port Fairy	*E. coli* detection	November 2020
47	Wannon Water	Purnim	*E. coli* detection	February 2021
48	Wannon Water	Cobden	Widespread public complaint	January 2021
49	Wannon Water	Cobden	Widespread public complaint	June 2021
50	Western Water	Darley	*E. coli* detection	March 2021
51	Western Water	Darley, Lederderg, Maddingley, Merrimu	*E. coli* detection	May 2021
52	Western Water	Romsey	*E. coli* detection	June 2021
53	Westernport Water	Bass, Kilcunda, Waterline	Widespread public complaint	November 2020
54	Westernport Water	Bass, Cowes, Kilcunda, San Remo-Phillip Island, Waterline	Other (tear in clear water storage cover)	June 2021
55	Yarra Valley Water	Bundoora, Croydon, Doncaster, Eltham, Glen Waverley, Glenroy, Ivanhoe, Kew, Lilydale, Lower Plenty, Mitcham, Montrose, Northcote, Preston, Ridge/Monbulk, Seville, Warranwood	Disinfection or treatment failure*	August 2020

* 'Boil water' advisory issued

** 'Do not drink' water advisory issued

ARMB = Alpine Resort Management Board

No.	Water agency	Water sampling locality	Reason	Date
56	Yarra Valley Water	Mitcham	Widespread public complaint	September 2020
57	Yarra Valley Water	Craigieburn	Widespread public complaint	September 2020
58	Yarra Valley Water	Somerton	Widespread public complaint	October 2020
59	Yarra Valley Water	Bundoora	Widespread public complaint	December 2020
60	Yarra Valley Water	Croydon	Widespread public complaint	March 2021
61	Yarra Valley Water	Glen Waverley	Widespread public complaint	April 2021
62	Yarra Valley Water	Craigieburn	Widespread public complaint	April 2021
63	Yarra Valley Water	Ridge/Monbulk	Other (depressurisation of distribution system)**	June 2021

* 'Boil water' advisory issued

** 'Do not drink' water advisory issued

ARMB = Alpine Resort Management Board

Appendix 4: Drinking water quality complaints reported by water suppliers

		Number of complaints				Type of complaints		
		2020–21	2019–20	Variance to 2020–21[a]	2018–19	Discolour/ turbidity/ dirty water	Taste and odour	Other
Metropolitan water suppliers								
1	City West Water	1,062	745	▲ 43%	555	***	**	**
2	South East Water	968	849	▲ 14%	816	***	**	*
3	Yarra Valley Water	4,004	4,224	▼ 5%	4071	***	**	*
Regional water suppliers								
4	Barwon Water	242	197	▲ 23%	174	**	**	***
5	Central Highlands	70	83	▼ 16%	116	***	**	*
6	Coliban Water	232	218	▲ 6%	253	***	**	*
7	East Gippsland Water	51	64	▼ 20%	57	**	**	***
8	Gippsland Water	144	136	▲ 6%	191	***	**	*
9	Goulburn Valley Water	170	179	▼ 5%	173	***	**	*
10	Grampians Wimmera Mallee Water	88	89	▼ 1%	75	***	**	*
11	Lower Murray Water	28	35	▼ 20%	57	**	***	*
12	North East Water	169	246	▼ 31%	114	***	**	*
13	South Gippsland Water	81	70	▲ 16%	87	***	**	*
14	Wannon Water	203	135	▲ 50%	149	***	**	*
15	Western Water	234	214	▲ 9%	177	***	**	*
16	Westernport Water	167	14	▲ 1,093%	37	***	**	*
Other water suppliers[b]								
Total		**7,913**	**7,498**	▲ **6%**	**7,102**			

Notes:

a) Figures with a grey upwards arrow denote an increase in customer complaints to 2019–20. Figures with a blue downwards arrow denote a decrease in customer complaints to 2019–20.

b) Parks Victoria and the four Alpine Resort Management Boards did not have any water quality complaints during the reporting year.

*** most common

** second most common

Appendix 5: Regulated water supplies at 30 June 2021

Water agency	Water supply area
Central Highlands Water	Amphitheatre, Raglan, Redbank
Coliban Water	Borung, Dingee, Jarklin, Macorna, Mitiamo, Mysia, Wychitella
Goulburn Valley Water	Corop, Goulburn Weir, Kirwans Bridge, Molesworth, Strathbogie, Woods Point
Grampians Wimmera Mallee Water	Antwerp, Apsley, Berriwillock, Buangor, Chillingollah, Chinkapook, Cowangie, Culgoa, Dooen, Elmhurst, Glenorchy, Goroke, Harrow, Jung, Kaniva, Kiata, Lalbert, Lascelles, Lillimur, Marnoo, Miram, Moyston, Murrayville, Nandaly, Nullawil, Patchewollock, Pimpinio, Serviceton, Speed, Streatham, Tarranyurk, Tempy, Ultima, Waitchie, Walpeup, Watchem, Westmere, Wickliffe, Yaapeet Pipelines: Ararat-Lake Fyans pipeline, Mount Cole pipeline, Mount Zero pipeline, Moyston pipeline, Northern Mallee pipeline, St Arnaud pipeline, Stawell supply main, Wickliffe pipeline, Willaura pipeline, Willaura-Lake Bolac pipeline
Southern Alpine Resort Management Board	Lake Mountain Alpine Resort
Lower Murray Water	Millewa water supply system (Cullulleraine, Meringur, Werrimull), Mystic Park
Wannon Water	Darlington, North Otway pipeline

Glossary

Blue-green algae	Blue-green algae, or cyanobacteria, are a type of microscopic, algae-like bacteria that inhabit freshwater, coastal waters and marine waters. Blue-green algae in water bodies can potentially affect human health. Refer also to 'Harmful algal bloom'.
'Boil water' advisory	Advice issued by a water supplier that requires consumers to boil their drinking water supply before consumption (or for purposes connected to human consumption such as food preparation, tooth brushing or ice making) due to a deterioration in the quality of drinking water supplied to a level that has been assessed as posing an unacceptable risk to public health.
Catchment	An area of land that collects rainfall and contributes to surface water (streams, rivers, wetlands) or to groundwater.
Catchment-to-tap	A risk management approach based on the principle that multiple treatment barriers minimise or mitigate identified hazards in raw water and produce water that meets drinking water quality standards.
Chloral hydrate	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Corrective actions	Actions put in place following an incident or issue to alleviate immediate concerns.
Dichloroacetic acid	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Disinfectant	An oxidising agent (for example, chlorine, chlorine dioxide, chloramines or ozone) added to water in any part of the treatment process or distribution system to reduce microorganisms to acceptable levels.
Disinfection	The process designed to destroy or inactivate microorganisms in water, including essentially all pathogenic (disease-causing) bacteria. There are numerous disinfection processes including chlorination, chloramination, chlorine dioxide disinfection, ozonation and ultraviolet disinfection.
Disinfection by-products	Products formed from the reaction between disinfectants, particularly chlorine, and naturally occurring organic materials in water.
Distribution system	A network of pipes leading from a water treatment plant to customers' plumbing systems.

'Do not drink' advisory	Advice issued by a water supplier when water supply is suspected or is confirmed to have unacceptable levels of chemical contaminants present in the drinking water supply that can pose an unacceptable risk to public health if ingested. Consumers are usually advised to 'do not drink water or use affected water human consumption such as food preparation, tooth brushing or ice making'. In such cases boiling water will not make it safe for drinking and alternative drinking water source is required.
Drinking water	Water that is intended for human consumption or for purposes connected with human consumption, such as preparing food and making ice (excludes pre-packaged bottled water).
Drinking water quality standards	Drinking water quality standards specified in r. 12 of the Safe Drinking Water Regulations 2015 for the purposes of s. 17 of the *Safe Drinking Water Act 2003*.
Escherichia coli	*Escherichia coli* (also known as *E. coli*) is a type of faecal coliform bacteria. The presence of *E. coli* is an indicator of the presence of contamination from human or animal waste. Its presence most likely indicates a breach of a water quality treatment barrier or contamination during the distribution of the water. It is used an indicator for the presence of microbial pathogens.
False-positive sample	An investigation concluded that the detection of *E. coli* in a sample is not representative of the drinking water in the relevant water sampling locality. Refer to the meaning of 'false positive' in Schedule 2 of the Safe Drinking Water Regulations 2015.
Groundwater	Water contained in rocks or subsoil.
Harmful algal bloom	Naturally occurring algae that sometimes produce toxins that affect either aquatic life, such as fish, or human health. This includes blue-green algae and many other algae.
Hazard	A biological, chemical, physical or radiological agent that has the potential to cause harm. Physical and chemical hazards include heavy metals, trace organic compounds, total suspended solids and turbidity. Microbiological hazards include bacteria, viruses and protozoan parasites.
N-Nitrosodimethylamine	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Nephelometric turbidity units	A measure of clarity determined by a nephlometer that emits a light beam through water.
Notification	Verbal and written communication received by the department from water suppliers under s. 18 of the *Safe Drinking Water Act 2003* when drinking water supplied to the public does not (or is not likely to) comply with drinking water quality standards.

Parameters	Parameters for drinking water quality fall under four categories: physical, chemical, microbiological and radiological. Physical parameters include colour and turbidity. Chemical parameters include metals and organic compounds. Microbiological parameters include viruses, protozoa and bacteria. Radiological parameters include beta- and gamma-emitting radionuclides.
Pathogen	Disease-causing microorganisms including types of virus, protozoa and bacteria.
Preventive actions	Actions put in place following immediate corrective actions to minimise the risk of a recurrence of an incident or issue.
Raw water	Water found in the environment – such as rainwater, groundwater, reservoir water and river water – that has not been treated.
Regulated water	Water that is not intended for drinking but that could reasonably be mistaken for drinking water.
Report	Verbal and written communication received by the department from water suppliers, water storage managers or council officers under s. 22 of the *Safe Drinking Water Act 2003* about known or suspected contamination of water.
Reticulated drinking water supply	The piped drinking water network.
Risk	The likelihood and consequence of a hazard causing harm in exposed populations in a specified timeframe.
Risk management	The systematic evaluation of the water supply system, the identification of present and potential hazards and hazardous events, the assessment of risks and the development and implementation of preventive strategies to manage those risks.
Risk management plan	A plan prepared by water agencies under the *Safe Drinking Water Act 2003* that details how risk is managed in relation to the storage or supply of drinking water and regulated water to the public.
Safe drinking water regulatory framework	The legislation used to regulate the supply of Victoria's drinking water is referred to as the safe drinking water regulatory framework. The framework consists of the *Safe Drinking Water Act 2003* and the Safe Drinking Water Regulations 2015. The safe drinking water regulatory framework supports the *Health (Fluoridation) Act 1973* and is consistent with the risk management approach in the *Australian drinking water guidelines*.

Section 18	Refers to a notification required if noncomplying water is supplied. The Act states that 'a water supplier must notify the Secretary in writing if 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 and must do so within 10 days after it becomes aware of that fact'.
Section 22	Refers to an officer to report known or suspected contamination. The Act states that it 'applies if an officer of a water supplier, water storage manager or council believes, orsuspects, on reasonable grounds, that water supplied, or to be supplied, for drinking purposes: • may be the cause of an illness; or • may be the means by which an illness is being, has been or will be, transmitted; or • may contain any pathogen, substance, chemical or blue-green algae toxin, whether alone or in combination, at levels that may pose a risk to human health; or • may cause widespread public complaint'. A section 22 must be reported immediately to the Secretary.
Surface water	Water naturally open to the atmosphere such as that in rivers, streams, lakes and reservoirs.
The Act	*Safe Drinking Water Act 2003*
The Regulations	Safe Drinking Water Regulations 2015
Trichloroacetic acid	A by-product formed in drinking water via a reaction between chlorine and naturally occurring organic material.
Trihalomethanes	Organic compounds formed when chlorine reacts with naturally occurring organic matter in water supplies.
Turbidity	The cloudiness of water caused by the presence of fine, suspended matter.
Ultraviolet (UV) disinfection	A method of water disinfection in which light in the 100–400 nanometer wavelength range is applied to inactivate microbial pathogens.
Water agency	Water storage managers and water suppliers are referred to collectively as water agencies.
Water fluoridation	The adjustment of the level of fluoride in drinking water to around 1 mg/L (also known as 1 part per million), a level that helps to protect teeth against decay.

Water sampling locality	A geographic area defined by the following criteria: an area supplied with drinking water; a discrete area of similar water quality, inclusive of all customers supplied with drinking water of similar water quality; and able to be described by its boundaries. Water samples are required to be taken and analysed from water sampling localities.
Water storage manager	The Melbourne Water Corporation constituted under the *Water Act 1989* or a water corporation within the meaning of the Water Act (other than Melbourne Water Corporation constituted under the Water Act) that supplies water to a water supplier; or any other person or body declared by the Regulations to be a storage manager for the purposes of the *Safe Drinking Water Act 2003*.
Water supplier	A supplier of drinking water or regulated water to the public; the holder of a water licence issued in Part 2 Division 1 of the *Water Industry Act 1994;* an authority within the meaning of the *Water Act 1989;* Parks Victoria established under the *Parks Victoria Act 1998;* an alpine resort management board established under the *Alpine Resorts (Management) Act 1997;* or any other person or body declared by the Regulations to be a water supplier for the purposes of the *Safe Drinking Water Act 2003*.