



9. Extreme events and critical human water needs



Part 9.

Extreme events and critical human water needs

9.1 Basin Plan requirements

Part 13 of the Basin Plan seeks to ensure that water resource plans allow for a range of extreme events. Section 10.51 requires water resource plans to describe how the water resources of the water resource plan area will be managed during the following types of events:

- a. an extreme dry period – a drought that is outside the range of experience contained in the 114-year historical climate baseline
- b. a water quality event that results in water being acutely toxic or unable to be used for its established values and uses (for example, a blackwater event or blue-green algal bloom)
- c. any type of event that has resulted in the suspension of a statutory regional water plan in the past 50 years (including a transitional water resource plan or interim water resource plan).

It also requires the water resource plan to set out measures to meet critical human water needs during the above events.

The event identified at (c) above is not relevant to Victoria because our water management framework does not include statutory regional water plans and there has been no event that has caused the suspension of the transitional water resource plan. This type of event will not be addressed in the Wimmera-Mallee Water Resource Plan.

The Commonwealth Water Act (section 86A(2)) defines critical human water needs as the needs for a minimum volume of water, that can only reasonably be provided from Basin water resources, required to meet:

- a. core human consumption requirements in urban and rural areas
- b. those non-human consumption requirements that a failure to meet would cause prohibitively high social, economic or national security costs.

Under this definition, water used for irrigation is not considered to be a critical human water need, but water for livestock generally is.

Critical human needs

In Victoria, critical human needs is defined as the volume of water required to supply Stage 4 restricted demand in urban areas, supply domestic and stock needs and operate the distribution system to deliver that water.

9.2 Extreme events in the risk assessment

Extreme events were assessed in the risk assessment based on specific scenarios (see Risk Assessment in [Appendix B](#)). Extreme events considered in the risk assessment were extreme drought, major asset failure, bushfire, point source discharge, flooding and overbank inundation. These events were considered in terms of their impact on the ability to meet consumptive (including critical human water needs), environmental (including priority environmental assets), recreational/social and Aboriginal uses.

The risks identified for the Wimmera-Mallee (surface water) water resource plan area and the Wimmera-Mallee (groundwater) water resource plan area are outlined in the Risk Assessment in [Appendix B](#). A summary of these medium and higher-level risks is presented below in [Table 20](#) for the Wimmera-Mallee (surface water) water resource plan area and [Table 21](#) for the Wimmera-Mallee Water (groundwater) water resource plan area.

Table 20: Summary of risks from extreme events in the Wimmera-Mallee (surface water) water resource plan area

Cause	Availability				Priority environmental assets (structural form)		Condition			
	Environment	Consumptive	Social	Aboriginal	Environment	Aboriginal	Environment	Consumptive	Social	Aboriginal
Bushfire	3	3	1	4	2	2	2	3	2	4
Extreme drought	4	4	4	4	4	4	4	4	3	4
Extreme wet period	2	2	1	3	3	3	3	4	2	4
Flooding and overbank inundation	0	0	0	0	3	3	1	2	1	3
Major asset failure	3	3	3	3	1	1	2	3	2	3
Point source discharges	0	0	0	0	0	0	1	2	2	3

Legend	5	4	3	2	1	0
		Very high risk	High risk	Medium risk	Low risk	Very low risk

Table 21: Summary of risks from extreme events in the Wimmera-Mallee (groundwater) water resource plan area

Cause	Availability				Priority environmental assets (structural form)		Condition	
	Environment	Consumptive	Social	Aboriginal	Environment	Aboriginal	Consumptive	Aboriginal
Bushfire	1	1	1	3	0	0	1	3
Extreme drought	1	1	1	3	0	0	1	3
Extreme wet period	0	0	0	0	0	0	1	3
Flooding and overbank inundation	0	0	0	0	0	0	1	3
Major asset failure	0	0	0	0	0	0	0	0
Point source discharges	0	0	0	0	0	0	2	3

Legend	5	4	3	2	1	0
	Very high risk	High risk	Medium risk	Low risk	Very low risk	Not plausible – no risk

In order to address the risks identified above, the Risk Assessment identifies a number of strategies (in accordance with Basin Plan Requirements) including:

- ensuring water corporations maintain an emergency water supply
- ensuring appropriate planning is in place to respond to extreme events
- leading climate change adaptation across Victoria’s water system
- being prepared to respond to and manage exceptional circumstances and the impact on availability and the condition (quality) of water.

There are a number more specific strategies identified in the Risk Assessment in [Table 78](#) of [Appendix B](#).

More specifically, risks to Aboriginal values and uses of water from extreme events were identified. These will be addressed through the Aboriginal Water Policy outlined in *Water for Victoria* and are discussed in more detail in [Part 11.4.2](#). The Aboriginal Water Policy seeks to provide a framework for water planners to better understand, recognise, incorporate and manage for Aboriginal values.

9.3 Extreme events impacting on critical human water needs

Managing water resources for all competing uses during times of extreme events is a complex interaction of:

- climatic conditions (that is, patterns and reliability of rainfall)
- physical water systems (supply infrastructure and natural waterways)
- water-sharing arrangements (secure entitlements and trade)
- water planning arrangements (preparedness in the short and long term)
- demand for water for different purposes (domestic use including gardens, industrial use, rural consumption including for irrigation, stock, environmental and recreational water).

Victoria's water sector planning framework is designed to enable critical human water needs to be met throughout climatic extremes. It does this by integrating long-term planning, short-term planning and contingency planning. These arrangements complement Victoria's water entitlement framework, which provides the legal basis for how water is shared.

In addition to the extreme events specified in the Basin Plan, Victoria has reviewed its strategies and measures in relation to other types of extreme events. These additional events are outlined in the Risk Assessment at [Table 47 of Appendix B](#) and were assessed as a combination of their impact on consumptive uses. The strategies identified in those tables are outlined in [Table 78 of the Risk Assessment \(Appendix B\)](#).

These are:

- major asset failure
- bushfire
- flooding
- point source discharge
- overbank inundation.

The tools used to manage extreme dry events and water quality events are also used to manage the above extreme events.

9.3.1 Managing a water shortage

The Victorian Water Act provides for a range of tools to manage access to water during times of water shortage. Water shortage may occur because of extreme drought or because insufficient water is available that is fit for purpose.

Individuals managing their own risks

Since the early 1990s, state and federal water management policy has emphasised the responsibility of individuals to manage their farming practices in response to climate variability, especially drought, by recognising that those individuals are best placed to make decisions that affect their livelihoods.

Regional sustainable water strategies guide management from a longer-term perspective, through the collaborative development of policies aimed at ensuring security and flexibility for stakeholders in the system.

This strategic planning focuses on ensuring stakeholders have tools available to make the most effective decisions about their water resources. Such tools include the opportunity to trade on temporary and permanent water markets, and the ability to carry over allocated water from one year to the next. Trade and carryover are water management options available to urban water corporations and environmental water managers in many large regulated supply systems across Victoria. Such options enable individuals to judge their own needs during the season, and act accordingly.

Individuals accessing water under private rights (domestic and stock) are responsible for their own water supply and are not subject to restrictions or bans. The risk of reduced water availability is borne by individuals. If aquifer levels drop and extraction is not possible or surface water becomes unavailable, individuals are responsible for carting water to their properties.

When water is limited for availability or quality-related reasons, affected users may sometimes need to cart water from distant sources to provide for basic needs and to water stock. Local government authorities and water corporations own and manage water supply points to provide water supplies for water carting during drought. GWMWater offers access to potable and non-potable water from standpipes connected to its urban and rural reticulation systems for water carting. Fees apply as per GWMWater's Schedule of Tariffs.

The conditions of the Millennium Drought required special measures, sometimes on an unprecedented scale, to ensure essential water needs were met. On regulated systems, significant lessons were learned about delivering water for entitlement holders who take water specifically for domestic and stock purposes and the environment under low water availability scenarios.

As domestic and stock supply is for essential needs (household use and stock watering), the consequences are critical when not enough water is available to run a system. Rural pipeline users are required to have three days' on-farm storage. In some cases, domestic and stock customers can manage their own supplies through trade. However, for some small domestic holdings, this may be an unrealistic expectation, given the small volume of entitlement.

In order to mitigate the risks of a water shortage, many domestic and stock customers not connected to the reticulated pipelines can store up to five months' supply on their properties (in dams or tanks), and have additional supply available through rainwater tanks or groundwater bores in areas where groundwater quality is suitable. However, in extended dry periods, the capacity of many users to augment their supply is limited.

Statutory powers

To support a more equitable distribution of scarce water resources, the Victorian Water Act provides the following powers:

- the Minister may declare a water shortage to temporarily qualify rights under section 33AAA
- a water authority may reduce or restrict water delivered to a serviced property under section 231
- a water authority may reduce or restrict water supplied to a serviced property under section 141 or
- water restrictions may be applied to water supplied to serviced properties in urban areas.

Temporary qualification of rights may occur where the Minister has declared a water shortage exists in an area or a system. The temporary qualification of rights will result in the reduction of the volume of water a person is authorised to take under their entitlement. This reduction will apply for the determined period of time. A qualification of rights must apply to all rights in the same proportion unless the Minister deems there are extreme circumstances that warrant differential qualifications.



The water corporation may also reduce, restrict or discontinue the volume of water that is delivered or supplied to a serviced property in a range of circumstances. Section 231 of the Victorian Water Act sets out the circumstances in which the water corporation may reduce or restrict the delivery of water. Similarly, section 141 of the Act sets out the circumstances for reducing, restricting or discontinuing the supply of water. Water delivery typically refers to irrigation water or water delivered to an entitlement holder under a bulk entitlement. Water supply refers typically to urban water supply.

The circumstances in which the delivery or supply of water may be reduced or restricted include:

- insufficient capacity to deliver or supply the water (section 231(1)(a) and section 141(1)(a))
- necessity to avoid future water shortages (section 141(1)(b)(i))
- the quality of water available for supply does not meet the standards for its intended authorised use (section 141(1)(c)).

The ability to reduce, restrict or discontinue water supply in urban areas is further supplemented by permanent water saving rules and staged water restrictions. These measures, which were part of the response to the Millennium Drought, work to reduce the use of drinking water supplies to critical human needs in times of low water availability.

Victoria's permanent water saving (or use) rules are a set of common sense rules to reduce demand and ensure we use water efficiently. These rules are in place at all times. Whenever water restrictions are also in place, the more severe rule or restriction applies. There are penalties for not following the rules.

The permanent water saving rules are uniform across Victoria and form part of each water corporation's permanent water saving plan.

The rules do not prevent the need for water restrictions during major droughts but help ensure water is used more efficiently and encourage all Victorians to value this precious resource for the long term. These rules took effect from November 2011.

As water becomes incrementally less available, staged water restrictions may be imposed. Four stages are currently prescribed under water corporation by-laws. These staged restrictions progressively restrict more and more uses of water. For example, the ability to water a garden is limited progressively from odd or even days and at specific times to the use of watering cans rather than a hose. Stage 4 restrictions represent Victoria's position on what constitutes critical human water needs and operate to ensure urban water supplies are used only for those purposes in times of severe shortage.

These measures are designed to ensure the limited volume of drinking water available is secured for critical human needs for a longer period of time.

Planning

The Minister and water corporations undertake a range of long-term, short-term and contingency planning to manage the impacts of extreme events.

Long-term planning uses a 50-year outlook and a range of climate change and population growth scenarios.

Short-term planning uses a one to five-year outlook, depending on the physical characteristics of the water supply systems, the volume of water in storage at the beginning of the period and a range of flow scenarios.

Drought preparedness plans set out the actions that need to be prepared for and actions in response to water shortages if they arise in the immediate to short term – for example, if inflows are worse than expected under the assumptions on which urban water strategies are based, or

in response to water quality issues. Drought preparedness plans include drought response plans that need to be reviewed at least every five years.

Contingency plans are prepared to respond to extreme events that are outside the short-term planning assumptions. These are often reviewed after an extreme event in order to build learnings back into short-term planning assumptions where relevant.

Existing response measures to meet critical human water needs in the Wimmera-Mallee water resource plan area during an extreme event include:

- utilising existing cross-connection of reticulated supply networks, and/or additional cross-connections where necessary
- connecting to alternate supply sources where feasible (both surface and groundwater)
- implementing water restrictions (urban)
- purchasing bulk water allocations from other users where opportunities exist
- utilising existing groundwater licences and infrastructure to supplement surface water supplies (Horsham, eastern Grampians towns)
- carting water to supplement supplies for small towns reliant on harvesting from unregulated streams
- implementing various measures to increase operational efficiency (reduce water losses).

In addition to the above, where a water supply protection area has been declared in accordance with Part 3 of the Victorian Water Act, a consultative committee must prepare a statutory management plan in accordance with any guidelines issued by the Minister. These may be prepared for surface water or groundwater. These plans describe the resource, management objectives and specific rules for measures such as restrictions during water shortages, trade and carryover (where applicable).

The plans aim to ensure that surface water and groundwater resources are managed equitably and sustainably in declared water supply protection areas. There are currently no statutory management plans prepared for surface water or groundwater in the Wimmera-Mallee water resource plan area.



Case study: Emergency supply to Wimmera-Mallee domestic and stock customers

Domestic and stock supply for customers connected to the Wimmera-Mallee supply system is delivered in accordance with the bulk entitlement held by GWMWater. Before the Wimmera-Mallee Pipeline was built, water was delivered to town and domestic and stock customers' dams through a 20,000 km network of open, earth channels dating to the 1800s. The channel system was extremely inefficient, with losses of up to 85 per cent through seepage and evaporation.

The supply to domestic and stock customers' on-farm dams was not metered. In a water shortage, GWMWater could restrict customers to filling one dam per specified area (for example, one dam per 250 hectares), depending on the severity of the shortage. GWMWater could reduce losses further by running only the more efficient channels.

Between 1997 and 2009, record low inflows were recorded in the Wimmera-Mallee supply system, with storage levels so low that not enough water was available to undertake all the normal channel runs. By January 2007, storages finished the month at 4.6 per cent of capacity. A winter channel run had been made to fill town storages only, including towns that normally received water from a summer channel run. There was not enough water to provide a summer channel run for domestic and stock supply to farms.

Most domestic and stock customers were not supplied with water from the channels. However, enough water was supplied to the town storages to provide emergency supplies for some 2,300 properties for basic domestic purposes. GWMWater carted 28,000 litres for domestic use every second month from the town storages to each rural customer not supplied by a channel, or where water in their dam had become unusable.

Customers could access additional water from urban storages for stock watering or crop spraying, provided they arranged for carting and covered the costs. Water could also be accessed by people who were not GWMWater customers (for domestic use only) under a permit system for carting.

The Wimmera-Mallee Pipeline

The Wimmera-Mallee Pipeline Project, which commenced in late 2006, proved more critical for securing water for urban and domestic and stock supplies than initially anticipated. Construction of the pipeline was completed five years ahead of schedule in 2010, due in part to the dry weather enabling construction to continue all year-round. As construction of sections of the pipeline were completed, towns and domestic and stock customers were able to receive emergency supplies via the pipeline rather than carting. The pipeline construction schedule was designed to reduce losses by minimising the number of channels run.

9.3.2 Management of water resources during extreme dry periods

Surface water

In addition to the above general powers to address water shortages in extreme dry periods, water corporations have specific requirements. Under the Statement of Obligations issued by the Minister to water corporations, GWMWater is required to prepare a strategy for managing water security to provide water services in the towns and cities in its district now and into the future.

The Urban and Rural Water Supply Strategy has a long-term outlook of 50 years and is based on the latest scientific research on future water availability scenarios. As GWMWater has urban and rural responsibilities, the strategy considers urban and rural pipeline supplied customers in its five water supply systems – Murray, Goulburn, Grampians, Pyrenees and eastern Grampians and groundwater towns.

In addition to the long-term outlook, GWMWater is also required to prepare the following short-term planning strategies:

- Emergency Management Plans which provide guidance in response to sudden and severe water shortages due to emergencies such as bushfire, water quality events or terrorism.
- Drought Preparedness Plans document the contingency measures the water corporation will implement to secure urban supply during times of water scarcity. This may include the implementation of water restrictions, including a decision-making framework for how and when restrictions are to be applied. As well as demand reduction measures (restrictions), drought preparedness plans may outline contingency measures to further reduce demand or augment supplies. Before the unprecedented dry period between 2006 and 2009, many drought preparedness plans treated drought as relatively short term, often based on experience of historic events, such as 1967–68. All water corporations updated their drought preparedness plans in 2011–12 to incorporate the learnings of the Millennium Drought and again in 2017–18 as part of their five-yearly review.
- water corporations should engage with councils and other public open space managers to identify and assess which important liveability assets would be impacted under restrictions and the extent to which they should be exempted or covered under a water conservation plan.
- Annual Water Outlook (AWO), which is required to be published online and submitted to the Department of Environment, Land, Water and Planning by 1 December each year. The objective of AWOs is to provide stakeholders and the community with an annual snapshot of the current total system storage levels, recent trends in water use and an outlook of storage positions under a range of streamflow scenarios for each water supply system. AWOs also identify demand management measures (e.g. water restrictions, water efficiency programs, community awareness measures) to maintain security of water supply and ensure critical human water needs can be met in the 12-month period from 1 December each year.

Based on the streamflow scenarios, water corporations are required to identify a range of short and medium-term water supply measures such as:

- using pre-existing drought reserves or alternative water sources (e.g. groundwater entitlements/ allocations)
- purchasing water allocations on the water market
- bringing forward augmentations previously identified.

All urban water corporations engage in extensive consultation in undertaking drought preparedness planning. In particular, in setting agreed levels of service with their customers, taking into account customers' ability and preparedness to pay for a greater level of water security.

Groundwater

Groundwater towns throughout GWMWater's area have reliable access to water under their entitlements by virtue of the sheer volume of groundwater reserves in these areas. As a result, groundwater allocations are largely independent of short-term climatic conditions. Regional groundwater resources remain secure, with regular water level monitoring conducted across the groundwater resource areas.



GWMWater supplies 10 towns from the Murray Group Limestone Aquifer in the west of the region. Irrigation and domestic and stock are the major groundwater users. The urban demand for groundwater is currently:

- West Wimmera – baseline water demand for urban use over the past five years (2012-2016) is approximately 912 ML. Urban use in the West Wimmera and Murrayville areas make up less than two per cent of the total permissible annual volume that can be extracted from this resource.
- Nhill – urban groundwater demand has decreased significantly as the town has been connected to the Wimmera- Mallee Pipeline since 2012–13.
- Willaura system – baseline annual use for the eastern Grampians is 89 ML per year.
- Horsham – supplements town supply during surface water shortage. The supply source has not been used to supplement Horsham in the past five years. The average demand over the past five years is 18 ML per year, which has been used for testing of bore operation and water quality.

10.51(1)(a)

Water corporations may reduce or restrict the delivery of water to rural customers where there is insufficient capacity in the system (water shortage). Water corporations may reduce, restrict or discontinue the supply of water to urban towns where there is insufficient capacity for authorised use.

Permanent water saving rules have been in place since the Millennium Drought. These provide permanent restrictions on the use of drinking water outside the home. Water corporations may also apply staged water restrictions to further restrict the use of drinking water in order to protect the availability of water for critical human need in the long term.

The Minister requires water corporations, under a Statement of Obligations, to undertake short term and long-term planning of future water needs to ensure available water is managed in order to meet critical human needs within those events that can be predicted. This planning includes a drought response plan for rural water, drought preparedness plans for urban supply, and emergency management plans.

The Minister also causes a water security outlook to be published to inform the management of water resources under a range of water availability conditions.

Where the measures employed by water corporations is not sufficient to address the impacts of an extreme dry period, the Minister may declare a water shortage in an area or for a resource and temporarily qualify rights to temporarily change the water sharing arrangements in a system by reducing the water available to holders of a water access right in the area or resource.

9.3.3 Management of water resources during a water quality event

During an extreme water quality event, the water resource may not be fit-for-purpose use due to issues such as blue-green algae, a blackwater event, ash and sedimentation following a bushfire or the release of other pollutants.

The Risk Assessment found that bushfires, extreme drought, an extreme wet period, flooding and overbank inundation, major asset failure and point source discharges generated medium-or high-level risks to the condition of the water resource across some uses in the surface water area.

In the water resource plan area (groundwater), bushfires, extreme drought, extreme wet period, flooding and overbank inundation, major asset failure and point source discharges were found

to have medium-or higher-level risks to Aboriginal uses due to a lack of understanding of what these values are.

In addition to managing the impacts of water quality events on rural customers, water corporations are also required to comply with the standards in the *Safe Drinking Water Act 2003* for urban town supply.

Under the *Emergency Management Act 1986*, GMMWater is regional coordinator for major blue-green algae outbreaks in waterways within the GMMWater boundary. GMMWater coordinates the management of major outbreaks across these areas, while local water managers monitor and manage local blooms under their own emergency plans.

This approach is outlined in the Blue-Green Algae Regional Coordination Plan, which is based on the Victorian Emergency Management Manual. GMMWater is required to facilitate regional coordination planning and arrangements for monitoring and managing blue-green algal outbreaks.

Strong overarching statewide emergency management framework

- Emergency Management Manual Victoria contains policy and planning documents for emergency management in Victoria, and provides details about the roles organisations play in emergency management.
- Victoria has a statewide coordination plan for water quality incidents. This plan details prevention, response and recovery and typically classified as a Class 2 emergency
- Specific arrangements for blue-green algae management are outlined in the Algal Bloom Response Plan and the Blue-green Algae Circular, which is coordinated by DELWP, including:
 - roles and responsibilities of state and local government agencies, water managers and catchment management authorities in regard to blue-green algal blooms such as the Department of Health and Human Services advising about the potential health effects of algal blooms and administering the Victorian *Safe Drinking Water Act 2003*
 - during a substantial regional blue-green algal bloom, regional emergency arrangements are implemented.

In order to protect security of urban town supplies, the powers relating to restricting, reducing and discontinuing water supply can also be used in response to a water quality event. Modifying supply allows water corporations to support longer-term availability of urban town supplies to meet critical human needs.

The Basin Plan requires that the Wimmera-Mallee Water Resource Plan describe how water is managed during a water quality event that prevents the water being used for established purposes.

10.51(1)(b) Where water is no longer fit for purpose due to a water quality event, water corporations may reduce, restrict or discontinue the supply of water to urban towns where the quality of the water available does not meet the standards for authorised use, and in order to protect the availability of water for critical human needs.

Blue-green algae (BGA) is the predominant water quality event that can occur in Victoria. Responses to blue-green algae events relate to recreational use and public health and safety. Emergency response procedures are set out in the Blue-Green Algae Regional Coordination Plan and relate to protecting drinking supply and protecting the public from contact but do not aim to mitigate impacts of water taken from the system. Water corporations coordinate the management of major outbreaks while local water managers monitor and manage local blooms under their own emergency plans.



There is insufficient data on the impacts BGA has on domestic and stock use and irrigation and therefore there are no strategies to manage these impacts.

In addition, the Environment Protection Authority Victoria has powers to issue remedial notices, pollution abatement notices, clean-up notices and directions for pollution-related events.

As identified in the Risk Assessment, there is insufficient information regarding Aboriginal values and uses of water in order to have an adequate strategy for managing the impacts of water quality events in this context. As information about the impacts on these values improves, management strategies to respond to water quality events will be developed.

Water corporations develop management plans to manage risks to water resources. Where risks to the water quality are identified the public is immediately notified of the risks and restrictions on access may occur to prevent harm to individuals as a result of contact with contaminated water.

Table 22 of the Wimmera-Mallee Comprehensive Report details specific storage and asset actions during an extreme water quality event.

GWMWater does, however, manage a number of reservoirs which offer access for recreational use and undertake monthly sampling for algal analysis over the summer period when these lakes are in high use. Where risks to the water quality are identified the public is immediately notified of the risks and restrictions on access to the reservoirs may occur to prevent harm to individuals as a result of contact with the contaminated water.

Part 13 of this water resource plan outlines the recreational water values in the Wimmera-Mallee water resource plan area and identifies how water is made available for recreational uses.

Improving understanding of Aboriginal values and uses of water will enable increased capacity to plan and manage the impacts of extreme events on those values and uses. How this will be undertaken is outlined in more detail in **Part 11**.

Table 22 provides asset-specific information of actions that would be undertaken during a water quality event and addresses the requirements of section 10.51(1)(b) of the Basin Plan.

Table 22: Storage and asset-specific actions during an extreme water quality event

Asset	Action during extreme water quality event
Wimmera-Mallee Pipeline	<p>The Wimmera-Mallee Pipeline water is supplied from Lake Bellfield, and provides drinking water for many towns. In the case that Lake Bellfield develops blue-green algae, the drinking water guidelines apply. In the case of the Lake Bellfield supply being shut down customers supplied from the trunk main may need to have water carted to them.</p> <p>In the event that both storages have an algae bloom, the storage may be dosed with a coagulant such as FL4440 (PolyDADMAC) or an algicide. Note that large volumes may be required for this and a full feasibility and risk assessment of this action and impact should be undertaken prior to initiation of any works.</p>
Lake Wartook	<p>Lake Wartook supplies Horsham, Natimuk, and surrounding areas with drinking water and rural supply. There are currently no options for alternative pumping from nearby headworks storages, though Horsham does have a supplementary borefield which could be called on in critical situation.</p> <p>A curtain screen was installed on the outlet of the storage in 2014 as a result of bushfires in the catchment. The impact of the curtain on water quality may screen out some blue-green algae in the event of a blue-green algal bloom.</p> <p>In the event of a blue-green algal bloom, there are options to isolate the storage and use an established borefield as an emergency water supply. Depending upon the requirement for environmental flows, blue-green algae affected water may need to be released from Lake Wartook.</p>
Moora Moora	<p>Water in Moora Moora Reservoir is used to support GWMWater’s Wimmera-Mallee Pipeline Supply System 6 (WM12P SS6) via the Brimpaen storages, but may also be used to support environmental demands from Distribution Heads should there be sufficient water to do so.</p> <p>If sufficient water, flows can be transferred from Moora Moora to the Distribution Heads and onto Taylors Lake. Water can also move from Moora Moora Reservoir to the Glenelg River, that forms part of the inflows to Rocklands Reservoir.</p> <p>In the event that Moora Moora has a blue-green algal bloom, water can be supplied from Lake Wartook to Brimpaen and on to Supply System 6. Rural stock and domestic customers are supplied water from this supply system. Any customers prior to the Brimpaen storages would have to receive water carting once blue-green algae triggers have been reached.</p>
Lake Bellfield	<p>In the event that Lake Bellfield experiences a blue-green algae outbreak, limited alternative supply options exist. No options are available to bypass the storage directly, and Halls Gap, Pomonal and rural customers will be required to cease water use at relevant triggers; however, options exist for Supply Systems 1, 2, 3 and 4 to use water from Taylors Lake if required.</p> <p>All the water treatment plants providing drinking water to towns must isolate their supply from Lake Bellfield and begin carting water if the toxic blue-green algae species limits are exceeded. An option is also to establish emergency powder activated carbon (PAC) dosing at water treatment plants.</p>

continued

Asset	Action during extreme water quality event
Lake Fyans	<p>Water for Lake Fyans is harvested from Fyans Creek and its tributaries downstream of Lake Bellfield. Water may also be transferred from Lake Bellfield to Lake Fyans if required. Water in Lake Fyans is primarily used to supply the towns of Stawell, Ararat, and Great Western, as well as the Landsborough Valley Pipeline.</p> <p>In the event of having a blue-green algae outbreak in Lake Fyans, water from Lake Bellfield can be on stand-by to transfer water to Lake Fyans to manage blue-green algae and moderate poor quality water entering Stawell, Ararat and Great Western.</p> <p>If Lake Fyans has blue-green algae in it, a curtain can be installed at the inlet to the pump to minimise intake of algae into the pipe network. A curtain is stored at the Stawell depot.</p> <p>Stock and domestic customers will need to be isolated from the system and water carting initiated to ensure ongoing supply. For Stawell drinking water customers, an option is to establish emergency PAC dosing.</p> <p>If known toxic blue-green algae species limits are exceeded Great Western and Stawell Water Treatment Plants (WTPs) must isolate their supply and begin carting water. Ararat has PAC dosing, and may continue providing treated drinking water; however, algal and toxin monitoring must be conducted to ensure that no toxins or blue-green algae are exiting the WTP.</p>
Rocklands Reservoir	<p>Water held in Rocklands Reservoir is used to supply Wannon Water towns, and to provide water for environmental flow demands on the Glenelg River system. Water from Rocklands can be transferred to Lake Toolondo and Taylors Lake if required.</p> <p>If known toxic blue-green algae species limits are exceeded for drinking water, GWMW will inform Wannon Water immediately, and keep Wannon Water notified of results as they come in.</p>
Taylors Lake: acting as a source water	<p>If Taylors Lake is acting as a source water for water supplied into Supply Systems 1, 2, 3 and 4, it can be fed with water from Rocklands or Lake Bellfield. If the Wimmera River has adequate flows, water can also be harvested into Taylors Lake.</p> <p>If known toxic blue-green algae species exceed specified levels then the WTP storages need to be isolated, regulated towns are isolated and rural customers are advised to turn off their water meter. GWMWater would cart water for domestic use.</p> <p>Water supplied for crop spraying can be supplied until a biovolume of 10 mm³/L for known toxic species and then farmers are advised to use an alternative source.</p>

continued

Asset	Action during extreme water quality event
William system	<p>The Willaura-Lake Bolac system supplies drinking water to Willaura, Lake Bolac, Glenthompson (Wannon Water), and non-drinking water to the regulated supplies of Moyston and Wickliffe.</p> <p>Water is supplied principally by bores in the summer, and a mixture of bores and surface water in cooler months. The water is pumped to a 2 ML storage in the headworks, and on to Moyston and rural customers, as well as the Mt Pleasant and Bald Hill storages.</p> <p>If known toxic blue-green algae species exceed specified levels then GMMW will isolate the drinking water supply at Willaura WTP and cart water. If no toxins are present, open storages may be dosed with coagulant to help remove blue-green algae cells prior to treatment. Treated water should be analysed to ensure that treated water does not contain blue-green algae above the specified trigger values. At specified levels rural supplies are also advised to turn off their water meter and supplement their supplies with water carting.</p> <p>Water supplied for crop spraying can be supplied until a biovolume of 10 mm³/L for known toxic species and then farmers are advised to seek an alternative supply.</p>
Mt Cole system	<p>Water is gravity fed from the Mt Cole Reservoir into the Copes Hill Reservoir for use at the Ararat WTP.</p> <p>The Ararat WTP has PAC dosing, and may continue to be supplied with blue-green algae affected water, provided daily sampling is conducted to ensure that no blue-green algae or toxins are present in the treated water above drinking water trigger points.</p>

9.3.4 The role of the Environment Protection Authority Victoria

While water corporations have responsibility for maintaining the quality of water in the system to ensure that it is fit for purpose, the role of the Environment Protection Authority Victoria (EPA) is to manage pollution-related water quality events. In particular, the EPA has powers to issue the following:

- remedial notices that require the recipient to undertake works or activities to remediate the pollution. For example, the direction may be to conduct a clean-up, stop works, install controls or change a process or activity
- pollution abatement notices which aim to prevent further occurrence of pollution or potential environmental risk through installation of risk controls and changes to onsite processes and practices
- clean-up notices which aim to prevent further contamination and impact through removal of waste, clean-up activities, ongoing management of pollution and altered handling, storage or location of industrial or prescribed industrial waste
- directions to immediately stop an activity, address an incident or undertake an activity to prevent imminent danger to life, limb or the environment. Directions can be verbal or written.



9.3.5 Measures to meet critical human needs

Section 10.51(2) of the Basin Plan requires the Wimmera-Mallee Water Resource Plan to set out measures to meet critical human water needs during the extreme events where such events would compromise Victoria's ability to meet critical human water needs.

Given the arrangements outlined above and the powers in place to manage the ongoing supply of drinking water to cities and towns, Victoria does not consider that an extreme dry period or a water quality event such as those outlined above would compromise Victoria's ability to meet critical human water needs.

10.51(2) Measures to meet critical human water needs during extreme dry periods (section 10.51(1)(a) of the Basin Plan) or water quality events (section 10.51(1)(b) of the Basin Plan) are not required as adequate arrangements are in place to ensure that critical human water needs are not compromised.

The situation described in paragraph (c) of section 10.51(1) of the Basin Plan is not relevant to the Wimmera-Mallee water resource plan area.

9.4 New scientific information

Section 10.51 (3) of the Basin Plan requires that the water resource plan must provide that, if new scientific information suggests a change in the likelihood of an event of a type listed in 10.51(1) occurring (for example, due to climate change), consideration must be given whether, as a result of this new information, the water resources should be managed differently.

10.51(3) If new scientific information suggests a change in the likelihood of an event of a type listed in section 10.51(1) of the Basin Plan occurring, consideration will be given as to whether, as a result of this new information, the water resources should be managed differently.

Water for Victoria is the Victorian Government's adaptation response to the impacts of climate change on water resources and on the availability of water in the future. Victoria's temperature has steadily increased since the 1970s and overall streamflows have decreased by around 50 per cent or more over the past 20 years.

The Millennium Drought brought with it a seasonal shift in rain towards less rainfall during the cooler months (April to October), when runoff is greatest and storages usually fill. Climate science predicts this is the new reality with more extreme events likely to happen too, such as floods, droughts and bushfires which affect water availability and condition.

In Australia, we accept that drought is part of life and many parts of Victoria have experienced drought conditions over the past decade. The Millennium Drought was a wake-up call for many Victorians about taking water for granted, the importance of water security and the need to build resilience to drought. The Millennium Drought's severity has been linked to human-induced climate change.

Water for Victoria recognises that government has a key role in applying research to water management policy, planning and practice. The Victorian Climate Initiative, in partnership with the Bureau of Meteorology and CSIRO, means that Victoria's understanding of climate change and its impacts on water resources has grown substantially in recent years.

Through *Water for Victoria*, the state has committed to build on this understanding by continuing to invest in research and working with partners including community groups, local government, Traditional Owners, research organisations and the water sector.

Improving Victoria's ability to apply this research to water management policy, planning and practice is also vital. Tools for modelling and scenario planning help inform decisions about options for action in a future with climate change and periods of reduced water availability. The Department of Environment, Land, Water and Planning will continue to assess and report on changes in water resources, including changes in rainfall, streamflow and groundwater to inform adaptation and evaluation of actions. This is reflected in the Risk Assessment, which ties to action 2.2 in *Water for Victoria*.

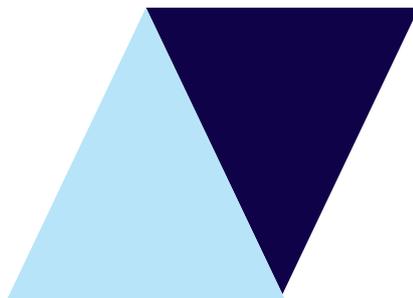
Practically, the Statement of Obligations issued to water authorities requires water authorities to comply with any guidelines forecasting the impact of climate change on water supplies issued by DELWP and utilise these guidelines in preparing their urban water strategies.

The GWMWater Urban and Rural Water Strategy will be reviewed and updated every five years to ensure that its actions remain appropriate to changing conditions (such as climate variability and customer awareness) and that it is based on the best available scientific information.

In terms of water quality response planning, the Regional Coordination Plan is reviewed annually to ensure:

- the plan reflects the current state of knowledge in relation to blue-green algae and water quality event management
- the plan is consistent with the latest DELWP Blue-Green Algae Circular
- GWMWater has up-to-date contact details for the various local water managers and other agencies.

Local water managers also annually review their risk management and incident response plans and provide a copy to the regional coordinator.



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