Chapter 10. Extreme events and critical human water needs
10. Extreme events and critical human water needs

This Chapter outlines the measures in place to respond to extreme events and meet critical human needs during these kinds of events. These events require alterations to business as usual operations and require water agencies from across Basin States to coordinate their actions and work together. This Chapter meets requirement under Part 13 of Chapter 10 of the Basin Plan.

10.1 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 water resources will be managed and critical human water needs will be met during these kinds of events:

- an extreme dry period – a drought that is outside the range of experience contained in the 114-year historical climate baseline
- a water quality event that results in water being acutely toxic or unable to be used for its established values and uses, such as a blackwater event or blue-green algal bloom
- 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

The Commonwealth Water Act (section 86A (2)) defines critical human water needs as:

- the needs for a minimum amount 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.

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4. The event identified is not relevant to Victoria because our water management framework does not include statutory regional water plans and there are no powers to suspend a transitional or interim water resource plan. Therefore, this type of event will not be addressed in Victoria’s North and Murray Water Resource Plan.
In Victoria critical human water needs are defined as the amount of water:

- required to supply Stage 4 restricted demand in urban areas
- supply essential domestic and stock and emergency water supply points to meet water carting requirements for rural customers
- to operate the distribution system to deliver that water

The Victorian assessment of critical human water needs is in line with the definition in the Commonwealth Water Act. It meets core human consumption requirements of Stage 4 water restrictions, emergency water supply points and essential domestic and stock needs, and of providing the water required to deliver the water to meet the core human consumption requirements.

**Critical human water needs in Victoria**

- Stage 4 urban water restrictions limit almost all outside water use:
  - residential or commercial gardens and lawns cannot be watered at any time
  - public gardens, lawns and playing surfaces cannot be watered at any time
  - fountains or water features cannot be filled or topped up at any time
  - hard surfaces including driveways, paths, concrete, tiles, timber decking and other paved areas cannot be hosed down except where cleaning is required as a result of an accident, fire, health hazard, safety hazard or other emergency
  - a high-pressure cleaning unit can be used, or if such a unit is not available, a hose fitted with a trigger nozzle, or a bucket in the course of construction or renovation
  - residents can wash the windows, mirrors, lights, registration plates of cars, boats or other vehicles at home, and for spot removal of corrosive substances, or at a commercial car wash, using a bucket or watering can, and only where cleaning is required for health and safety reasons, safety hazard or other emergency
  - councils and schools cannot water sporting grounds and gardens at any time
  - a new or existing pool or spa of any capacity cannot be filled
  - new or existing pools or spas can only be topped up using a bucket or watering can
  - a mobile spa can only be filled or topped up in accordance with a water use plan
  - a water toy connected to a hose cannot be used at any time

- There are more than 300 emergency water supply points throughout Victoria that provide water carting for emergency stock and domestic purposes
- Essential domestic and stock needs include rural users who access domestic and stock water from pipelines
- Water to operate the distribution system to deliver water to towns that are too big to supply water by carting and to deliver to emergency water supply points and pipelines that supply rural domestic and stock customers
10.2 Extreme events in the risk assessment

Extreme events were assessed in the risk assessment based on specific scenarios. See Appendix B. Extreme events considered in the risk assessment were:

- bushfire
- extreme drought
- extreme wet period
- flooding and overbank inundation
- major asset failure
- point source discharge

These events were considered in terms of their impact on the ability to meet consumptive use, including critical human water needs, environmental use, including priority environmental assets and recreational/social and Aboriginal uses.

A summary of these medium and higher-level risks related to extreme events is presented in:

- Table 10-1 for the Victorian Murray water resource plan area
- Table 10-2 for the Northern Victoria water resource plan area
- Table 10-3 for the Goulburn-Murray water resource plan area
## Table 10-1: Summary of risks from extreme events in the Victorian Murray water resource plan area

<table>
<thead>
<tr>
<th>Cause</th>
<th>Availability</th>
<th>Priority environmental assets (structural form)</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Aboriginal Environment Consumptive Social Aboriginal</td>
</tr>
<tr>
<td>Bushfire</td>
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<td></td>
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<tr>
<td>Extreme drought</td>
<td></td>
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<td></td>
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<tr>
<td>Extreme wet period</td>
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<tr>
<td>Flooding and overbank inundation</td>
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<tr>
<td>Major asset failure</td>
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<td></td>
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<tr>
<td>Point source discharges</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

<table>
<thead>
<tr>
<th></th>
<th>Very high risk</th>
<th>High risk</th>
<th>Medium risk</th>
</tr>
</thead>
</table>
Table 10-2: Summary of risks from extreme events in the Northern Victoria water resource plan area

<table>
<thead>
<tr>
<th>Cause</th>
<th>Availability</th>
<th>Priority environmental assets (structural form)</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Aboriginal Environment Consumptive Social Aboriginal</td>
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<tr>
<td>Bushfire</td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Consumptive Social Aboriginal</td>
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<tr>
<td>Extreme drought</td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Consumptive Social Aboriginal</td>
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<tr>
<td>Extreme wet period</td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Consumptive Social Aboriginal</td>
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<tr>
<td>Flooding and overbank inundation</td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Consumptive Social Aboriginal</td>
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<tr>
<td>Major asset failure</td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Consumptive Social Aboriginal</td>
</tr>
<tr>
<td>Point source discharges</td>
<td></td>
<td>Environment Consumptive Social Aboriginal</td>
<td>Environment Consumptive Social Aboriginal</td>
</tr>
</tbody>
</table>

Legend:
- 5: Very high risk
- 4: High risk
- 3: Medium risk
Table 10-3: Summary of risks from extreme events in the Goulburn-Murray water resource plan area

<table>
<thead>
<tr>
<th>Cause</th>
<th>Availability</th>
<th>Priority environmental assets (structural form)</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Environment</td>
<td>Consumptive Social Aboriginal Environment Aboriginal Environment Consumptive Social Aboriginal</td>
<td></td>
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<tr>
<td>Bushfire</td>
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<tr>
<td>Extreme drought</td>
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<tr>
<td>Extreme wet period</td>
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<tr>
<td>Flooding and overbank inundation</td>
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<tr>
<td>Major asset failure</td>
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<tr>
<td>Point source discharges</td>
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</tr>
</tbody>
</table>

Legend

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high risk</td>
<td>High risk</td>
<td>Medium risk</td>
</tr>
</tbody>
</table>
The risk assessment identifies a number of strategies to address the risks identified above, (in accordance with Basin Plan Requirements). These range from strengthening planning arrangements to improve resilience to extreme events for all water users, providing improved information so individuals can manage their own risk better, and making sure arrangements are in place to respond to extreme events when they happen.

These strategies cover both water availability and water condition or quality. They are listed here with more information available in Appendix B (Table 4.2.1).

Actions in these strategies include:

- delivering long-term watering plans
- ensuring water corporations maintain emergency water supplies
- improving understanding of climate science and how it applies to water management
- improving public reporting on water availability and user-focused information and reporting
- improving rural water supply planning
- improving state-wide water resource planning and risk assessment
- investigating increased flexibility and choice for licence-holders
- maintaining compliance with the Safe Drinking Water Act 2003
- managing availability risks for recreational water users
- managing exceptional circumstances by improving emergency management capability
- managing groundwater related risks, including groundwater and surface water connectivity, through Victorian planning and implementation frameworks
- managing pollution related events, such as point-source discharge
- managing risks from earth resources development
- managing salinity, waterlogging and water quality including issues arising from an extreme wet period
- managing water quality events
- monitoring and reporting on the benefits of environmental watering
- planning for supply challenges by urban water corporations
- preparing for and responding to extreme events such as bushfire, failure to meet critical human water needs, blue-green algal blooms, flooding or major asset failure
- protecting waterways and their catchments by strengthening integrated catchment management across Victoria
- protecting water quality by implementing the State Environment Protection Policy
- providing long-term investment to improve waterway health
- recognising and managing for Aboriginal values
- providing water resource information that supports planning and decisions

More specifically, the identified risks to Aboriginal values and uses of water from extreme events will be addressed through the Aboriginal Water Policy outlined in Water for Victoria (DELWP, 2016) and discussed in more detail in Chapter 8 of this Comprehensive Report. In brief, the Aboriginal Water Policy aims to provide a framework for water planners to better understand, recognise, incorporate and manage for Aboriginal values and uses.
10.3 Extreme event management

- Water managers are responsible for communicating the risks associated with variable water availability.
- Inherent in Victoria’s entitlement regime is the notion that individual entitlement holders use tools like carryover and the water market to manage the risk of variable water availability.
- Even with the best possible planning there will still be unexpected conditions, so the Victorian Water Act provides the Minister and water corporations with powers to address water shortages.
- Water supplies supported by the River Murray fall under the responsibility of the Basin Plan and the Murray-Darling Basin Agreement which work together to prioritise water for critical human needs by establishing a tiered response to water sharing in the River Murray System.

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

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

Victoria’s water planning framework is designed to enable critical human water needs to be met throughout extremes of climate. It does this by integrating long-term planning, short-term planning and contingency planning, which is explained further in Section 10.3.1.2 of this chapter. These arrangements complement Victoria’s water entitlement framework which provides the legal basis for how water is shared (see Chapter 7).

As well as addressing the extreme events specified in the Basin Plan, Victoria has reviewed its strategies and measures for other types of extreme events. These additional events are outlined in the risk assessment at Appendix B and were assessed as a combination of their impact on consumptive uses. The strategies identified in those tables are outlined in Table 4.2.1 of Appendix B.

10.3.1 Managing a water shortage

The Victorian Water Act provides for a range of tools to manage access to water during water shortages.

10.3.1.1 Managing domestic and stock supply

Individuals accessing water under statutory under section 8 of the Victorian Water Act rights are responsible for their own water supply and are not subjected to restrictions or bans. Individuals bear the risk of reduced water availability. Therefore if aquifer levels drop and extraction is not possible, or surface water becomes unavailable, individuals are responsible for carting water to their properties.

Local government authorities and water corporations own and manage water supply points to provide water supplies for water carting during drought. Urban and rural water corporations offer access to potable and non-potable water respectively from standpipes connected to their water supplies.
urban and rural reticulation systems for water carting. Fees apply as per the corporations’ schedule of tariffs.

Many domestic and stock users who are not connected to reticulated pipelines can often store large volumes of water on site to alleviate the risks of an extreme dry period. It is not uncommon for individuals to be able to store up to five months’ supply in dams or tanks on their properties, and many have extra supply available through rainwater tanks or from groundwater bores in areas where the groundwater is of acceptable quality.

Some domestic and stock users are supplied under an entitlement (either a take and use licence or water share) or a supply by agreement. Rural domestic and stock supply pipelines are managed by rural water corporations to supply domestic and stock water within waterworks districts. The water corporation manages the supply of water to these customers and rural pipeline users are required to have four days’ on-farm storage.

In some cases domestic and stock customers hold water shares to meet their needs and can manage their own supplies through trade. These are customers connected to the declared water systems. However this may be an unrealistic expectation for some small domestic holdings, given the small volume of entitlement.

10.3.1.2 Victoria’s water planning framework

Since the early 1990s state and federal water management policy has put measures in place to give individuals the responsibility and tools to manage their farming practices in response to climate variability, especially drought. These policies recognise that individuals are best placed to make decisions that affect their livelihoods.

These responsibilities are conferred on all entitlement holders, including urban water corporations and the Victorian Environmental Water Holder, to manage their water security with the necessary tools and by considering their own unique needs and requirements (see Chapter 7).

The conditions of the Millennium Drought required special measures, sometimes on an unprecedented scale, so that essential water needs could be met. Significant lessons were learned about delivering water for entitlement holders on regulated systems under low water availability scenarios.

The Victorian Water Act prescribes the review of regional sustainable water strategies every 10 years. These forward-looking strategies guide water management from a longer-term perspective through the collaborative development of policies.

The Northern Region Sustainable Water Strategy (DSE, 2009) took proactive steps to increase individual entitlement holders’ ability to manage their own water supply risks. These reforms made sure entitlement holders have improved choice and flexibility to help manage water related business risks, by removing barriers to trade, improving carryover arrangements and introducing an early reserve so the distribution system can be run, even in severe drought years.

Trade and carryover are water management options available to water share holders, urban water corporations and environmental water managers in all the declared systems of northern Victoria. Setting reserves aside earlier in the season offers insurance against drought and variations in climate. Early reserves were also introduced in the Goulburn and Murray systems. Under the policy, Goulburn-Murray Water builds reserves for the following season to ensure there is enough water to operate the distribution system (including storages, rivers and irrigation delivery systems). Once allocations reach 30 percent of High-Reliability Water Shares, inflows are assigned equally to the reserve and to increasing current season allocations until the maximum early reserve volume for that system is set aside. This means that setting aside water in the early reserve finishes before allocations reach 50 percent of High-Reliability Water Shares.
10.3.1.3 Urban water planning

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

Urban water corporations have a vital role in water security and managing the supply of water to meet the needs of their urban customers. Under the statement of obligations issued by the Minister for Water to all water corporations in 2015, urban water corporations must prepare a strategy for managing water security to provide water services in the towns and cities in their area now and in the future.

All urban water corporations prepared an urban water strategy in 2017 to fulfil this requirement. These documents have a long-term outlook of 50 years and are based on the latest scientific research on future water availability scenarios and include drought preparedness plans. Water corporations are required to identify a range of short and medium-term water supply measures to meet urban demands, based on predicted impacts to streamflow under climate change scenarios. These plans must be reviewed every five years.

Urban water corporations in Victoria’s North and Murray water resource plan area rely on surface water from regulated and unregulated rivers and creeks and groundwater to supply the towns. Some towns like Bendigo are connected to multiple regulated systems and can get water from multiple sources, while other towns rely on water from only one regulated system, like Castlemaine, or a combination of regulated system water and groundwater, such as Wangaratta. Some towns are solely connected to unregulated streams, as with Bright, or connected to unregulated streams but have back up supply from regulated systems, like Broadford. Others rely solely on groundwater, like Trentham.

The urban water corporations engage in extensive community consultation when preparing their urban water strategies. Water corporations must consult their customers on the agreed levels of service, taking into account customers’ ability and preparedness to pay for increased water security.

As well as the long-term outlook, urban water corporations must prepare the following short-term planning strategies described in Table 10-4.

10.3.1.4 Impact on the environment during a water shortage

Chapter 12 outlines how environmental water is used to improve the environmental health of rivers and wetlands in Victoria’s North and Murray water resource plan area. This includes how environmental water can be used to mitigate against the impact of extreme dry conditions. The VEWH’s seasonal watering plan is prepared for the different water availability scenarios of drought, dry, average and wet, and planned actions are constantly updated based on projected conditions. Environmental watering actions are developed for each scenario, for example, during dry conditions watering actions are focused on providing refuges for plants and animals to avoid critical losses, rather than on providing breeding opportunities. This plan informs the real-time operational decisions that are made to address needs with limited resources as the season progresses.
<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emergency management plans</strong></td>
<td>Emergency management plans provide guidance in response to sudden and severe water shortages due to emergencies such as bushfire, water quality events or terrorism.</td>
</tr>
<tr>
<td><strong>Drought preparedness plans/drought response plans</strong></td>
<td>Drought preparedness plans or drought response 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 (urban water restrictions, education programs), 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 lessons of the Millennium Drought and again in 2017-18 as part of their five-yearly review.</td>
</tr>
<tr>
<td><strong>Annual water outlooks</strong></td>
<td>Urban water corporations also prepare an annual water outlook in December each year. The objective of the annual water outlook 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. Annual water outlooks also identify demand management measures like water restrictions, water efficiency programs and 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.</td>
</tr>
<tr>
<td><strong>Contingency plans</strong></td>
<td>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 lessons back into short-term planning assumptions where relevant.</td>
</tr>
</tbody>
</table>
**Case study**

During the Millennium Drought urban water corporations’ ability to supply many towns were severely compromised. Urban water corporations had to adapt to changing conditions to make sure that towns did not run out of water. The course of action to maintain critical human water needs depended on the design of the supply system, entitlement rules and towns’ needs. As well as demand management through water restrictions and water efficiency programs, many short-term and long-term supply augmentation measures were completed.

Goulburn Valley Water’s Sunday Creek system supplies Kilmore, Broadford, Wandong, Heathcote Junction and the surrounding area. The Sunday Creek system experienced extreme water shortages several times during the Millennium Drought and towns were on severe water restrictions for long periods. As a result of extremely low winter and spring rainfall in 2006, the situation deteriorated very quickly moving into summer. Towns supplied by the Sunday Creek system progressed rapidly through restriction levels as storage levels fell, shifting from stages 1 to 4 restrictions between November 2006 and February 2007. By the end of March 2007, Goulburn Valley Water had to use a range of measures to make sure the town did not run out of water.

During 2007-08 Goulburn Valley Water resorted to carting water from Seymour to supply Broadford, resulting in very high costs. Additional infrastructure was required for the carted water to be unloaded from tankers at the Broadford treatment plant. From July 2007 to December 2008, Goulburn Valley Water also pumped water from Wallan to supply Kilmore under agreement with Yarra Valley Water. Wallan is supplied from the Melbourne system and Goulburn Valley Water was able to use the pipeline that formerly supplied Wallan from the Sunday Creek system.

In December 2008 Goulburn Valley Water completed a pump station on the Goulburn River at Tallarook and a pipeline capable of supplying up to 12 ML a day to Broadford. This enabled an easing of restrictions to stage 2 in early January 2009 and the pump station and pipeline now provide increased water security to these towns.

### 10.3.2 Statutory powers – restricting use

The Victorian Water Act provides these powers to support a more equitable distribution of scarce water resources during a declared water shortage:

- the Minister may declare a water shortage to temporarily qualify rights under section 33AAA
- a water corporation may reduce or restrict water delivered to a serviced property under section 231 of the Victorian Water Act
- a water corporation may reduce or restrict water supplied to a serviced property under section 141 of the Victorian Water Act
- water restrictions may be applied to water supplied to serviced properties in urban areas under section 171 of the Victorian Water Act

Temporary qualification of rights may occur where the Minister has declared a water shortage exists in an area or a system. The qualification provisions of the Victorian Water Act are very broad and could be applied in many different situations and to entitlements from surface water and groundwater. This flexibility is a strength of the qualification provisions, but to ensure they are applied consistently the Victorian Government has produced guidelines to describe the circumstances in which qualifications can be issued the Temporary Qualification of Rights to Surface Water – Responsibilities of the Proponent – a guide for water corporations (DELWP, 2016).
Qualifications by nature involve a temporary change in water sharing arrangements in a given system and generally reduce one user’s or class of users’ rights to water to provide more water to another user or class of user. For example, a qualification of rights may involve temporarily increasing an urban water corporation’s access to water in a waterway for urban supplies by reducing the required minimum passing flows downstream of the relevant harvesting point, which is a condition of the urban water corporation’s bulk entitlement. Another qualification may involve temporarily reducing rural water users’ access to water in one system to increase an urban water corporation’s access to water in another connected system. The arrangements will apply for a determined period of time.

The water corporation may also reduce, restrict or discontinue the amount 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 can reduce or restrict the delivery of water to customers in an irrigation district. Similarly section 141 of the Act sets out the circumstances for reducing, restricting or discontinuing the supply of water to any person. Water delivery typically refers to irrigation water or water delivered to an entitlement holder under a bulk entitlement. Water supply typically refers 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) of the Victorian Water Act)
- necessity to avoid future water shortages (section 141(1)(b)(i) of the Victorian Water Act)
- the quality of water available for supply does not meet the standards for its intended authorised use (section 141(1)(c) of the Victorian Water Act)

The ability to reduce, restrict or discontinue water supply in urban areas is supplemented further by permanent water saving rules and staged water restrictions. Implementation of permanent water saving rules and staged water restrictions were part of the response to the Millennium Drought. They worked to reduce the use of drinking water supplies to make sure water corporations could meet critical human needs in such times of low water availability.

Victoria’s permanent water saving 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 urban water corporation’s permanent water saving plan. These rules took effect from November 2011.

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.

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

These measures are designed to ensure the limited amount of drinking water available is secured for critical human needs for a longer period of time.
1. Water corporations may reduce or restrict the delivery of water to rural customers where there is insufficient capacity in the system. Water corporations may reduce, restrict or discontinue the supply of water to towns where there is insufficient capacity to meet critical human needs.

2. Permanent water saving rules have been in place since the Millennium Drought which provide permanent restrictions on how drinking water can be used outside the home. Water corporations may also apply staged water restrictions as water availability reduces to further restrict the use of drinking water to protect the availability of water for critical human need long term.

3. 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 to meet critical human needs within those events that can be predicted. This planning includes a drought response plan for urban systems, and emergency management plans.

4. Where the measures employed by water corporations are 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.

5. Table 10-4 of Section 10.3.1.4 of Victoria’s North and Murray Comprehensive Report also contains a range of short-term planning strategies to manage urban water during extreme dry periods.

Section 10.3.3 of Victoria’s North and Murray Comprehensive Report outlines the arrangements for managing extreme dry events in the River Murray under the Murray-Darling Basin Agreement.

<<end of accredited text for s10.51(1)(a) of the Basin Plan>>

10.3.3 Management of the River Murray during extreme dry periods

If water resources are sourced from Victorian rivers, then the arrangements as described in this section solely direct Victoria’s response to water shortages. However if the resources are sourced from the River Murray the Basin Plan (Chapter 11), the Murray-Darling Basin Agreement (Schedule H) and the Commonwealth Water Act (Part 2A) work together to provide for the availability of water resources for different users during extreme events.

The MDBA adopts a tiered approach to water sharing to prioritise water for critical human needs. There are three water sharing tiers and the Basin Plan sets triggers for moving between these tiers (see Figure 10-1). These triggers are based on the risks to meeting and/or delivering critical human water needs, and also considers the quality of water available.

Section 11.05 of the Basin Plan establishes triggers for when water quality becomes unsuitable for critical human water needs and an emergency response is required under section 86F of the Commonwealth Water Act. The Basin Officials Committee (BOC) is responsible for the emergency response under section 86F and for managing periods of Tier 3 water sharing arrangements. To ensure an effective response, the water quality and salinity triggers for an emergency response are the same as those that trigger Tier 3 water sharing arrangements.

• under Tier 1 arrangements normal water sharing arrangements apply and Victorian entitlements can support all critical human water needs. Tier 1 arrangements also mean that conveyancing reserves such as passing flows and losses can be met for the next water year as well.
• Tier 2 arrangements are triggered when volumes can be met for critical human water needs, but changes to water sharing arrangements are needed to provide conveyance water and or reserves.

• Tier 3 arrangements are only triggered in extreme and unprecedented circumstances. Under Tier 3 conditions emergency responses will be agreed by the Murray-Darling Basin Ministerial Council. This would occur if there is an extremely high risk that there will not be enough water to meet critical human water needs in the next 12 months.

Tier 3 is declared if:

• there are circumstances of extreme and unprecedented low levels of water availability in the system

• there is an extremely high risk that water will not be available to meet critical human water needs in the next 12 months

• either one of the following applies:
  - at least one of the states is not able to meet the volumes required for its critical human water needs
  - there is not enough conveyance water after taking available remedial action into account
  - water quality is not suitable for critical human water needs even after being treated

Each year under clause 102A of the Murray-Darling Basin Agreement the MDBA must determine how much water is needed to meet critical human water needs along the Murray. Under clause 102B of the Murray-Darling Basin Agreement the states are required to inform the MDBA of the volume and location of water needed to be set aside for the following year to meet critical human water needs.

For Victoria this task is done by the Victorian Murray Resource Manager (Goulburn-Murray Water). This volume is calculated to be sufficient to meet stage 4 water restrictions for all urban Victorian needs supplied by the River Murray in an extreme drought.
TIER 1 - NORMAL WATER AVAILABILITY
Normal water sharing arrangements apply unless otherwise determined by the Basin Officials Committee or Ministerial Council. Covers very wet to very dry scenarios.

Negative impacts start to occur at the dry end of Tier 1

At times, special accounting between South Australia and Victoria and/or New South Wales may apply.

CRITICAL HUMAN WATER NEEDS

TIER 2 - VERY LOW WATER AVAILABILITY
Distribution of water to ensure critical human water needs are met. Allows for advances between States and implementation of remedial actions.

TIER 3 - EXTREMELY LOW WATER AVAILABILITY
Distribution of water in extreme or unprecedented circumstances. Insufficient water to provide and deliver critical human water needs for current year or inadequate water quality.

Figure 10-1: Tiered approach to water sharing under the Basin Plan 2012 (Chapter 11) and the Murray–Darling Basin Agreement (Schedule H)

10.3.4 Management of water resources during an extreme water quality event
During an extreme water quality event the water resource may not be suitable for use. Water quality issues include blue-green algae, blackwater, ash and sedimentation following a bushfire or the release of other pollutants. Water quality events can impact rural stock and domestic, rural irrigators and urban water customers.
**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 managing emergencies
- Victoria has a statewide coordination plan for water quality incidents which details prevention, response and recovery
- 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 the Department of Environment, Land, Water and Planning
  - These arrangements include the roles and responsibilities of state and local government agencies, water managers and catchment management authorities regarding 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
  - Regional emergency arrangements are put into action during a substantial regional blue-green algal bloom

**Surface water quality risks from extreme events**

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 Victoria’s North and Murray water resource plan area.

**Groundwater quality risks from extreme events**

In the Goulburn-Murray water resource plan area for groundwater, bushfires, extreme drought, extreme wet periods, flooding and overbank inundation, major asset failure and point source discharges were found to have medium or higher-level risks to Aboriginal uses because of a lack of knowledge and understanding about these values.

**10.3.4.1 Roles and responsibilities**

**Emergency Management Victoria**


Victoria’s *Emergency Management Manual* classifies blue-green algae events as a Class 2 emergency and nominates the Department of Environment, Land, Water and Planning (DELWP) as the agency with the primary responsibility for responding to the emergency.

DELWP has produced a *Blue-Green Algae Circular: Management Plan* to describe how the state responds to incidents in line with the manual. This document applies to all water bodies accessible to the public or wetlands that discharge into publicly accessible water bodies, but excludes the coast, closed water storages and storages and marinas on private land.

DELWP is the control agency for blue-green algae management and it collects data on blue-green algae and monitors trends throughout the state. During an algal bloom DELWP coordinates management activities so that all relevant stakeholders can perform their respective roles and responsibilities at the regional level.
**Water corporations**

Water corporations are required to comply with the standards in the *Safe Drinking Water Act 2003* for urban town supply, and water quality events may require water corporations to operate differently. Water corporations are required to facilitate regional coordination planning and arrangements for monitoring and managing blue-green algal outbreaks. A regional coordinator is appointed for the area of the incident. Goulburn-Murray Water, Lower Murray Water and Grampians Wimmera Mallee Water are designated regional coordinators for major blue-green algae outbreaks in waterways within their boundaries, as in Figure 10-2. They coordinate the management of major outbreaks across these areas. If the outbreaks are confined to a water body or a section of a waterway, a local water manager is responsible for managing the event.

The regional coordinator or local water manager has the main responsibility of communicating the extent and severity of the blue-green algae bloom and coordinating the response of multiple agencies.

Management of the River Murray falls under New South Wales’ jurisdiction. However as the River Murray is the water supply source for many Victorian towns and regional cities and receives flows from Victorian waterways, the New South Wales Murray and Sunraysia regional algal coordinating committees include representatives from regional coordinators in Victoria. Likewise, if a blue-green algae bloom in Victoria poses a risk to the River Murray, the relevant agencies in New South Wales are to be included in the regional response group.

New South Wales has produced Guidelines to Management Response to Harmful Algal Blooms to apply in the Murray Region. When blue-green algae levels in the River Murray are above the trigger level, WaterNSW will inform all stakeholders.

Consequently, management of a blue-green algae bloom in the River Murray in Victoria will be done by declaring an area of operation within the Victorian Emergency Management Arrangements (see item 22 in Table 4.2.1 of Appendix B and the Murray River Regional Blue-Green Algae Response Arrangements). The lead agency WaterNSW describes the proposed incident management arrangements and how the Victorian water corporations North East Water, Goulburn-Murray Water, Goulburn Valley Water, Coliban Water, Grampians Wimmera Mallee Water and Lower Murray Water will be working with WaterNSW in managing their areas of interest.

If a blue-green algae bloom is likely to impact on South Australian waters the relevant water manager is to notify SA Health.
Figure 10-2: Regional coordinator boundaries

Table 10-5: Regional coordinator drainage basins

<table>
<thead>
<tr>
<th>Regional Coordinator</th>
<th>Drainage Basin or Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goulburn-Murray Water</td>
<td>1, 2, 3, 4, 5, 6, 7, Pt* 8</td>
</tr>
<tr>
<td>Grampians Wimmera Mallee Water</td>
<td>Pt 8, Pt 14, 15, Pt 38, 39</td>
</tr>
<tr>
<td>Lower Murray Urban &amp; Rural Water</td>
<td>Pt 14</td>
</tr>
</tbody>
</table>

Environment Protection Authority

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 (EPA) is to manage pollution-related water quality events. 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 on-site 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
- verbal or written directions to immediately stop an activity, address an incident or undertake an activity to prevent imminent danger to life, limb or the environment
10.3.4.2 Impact on drinking water

Extreme water quality events, including blackwater and blue-green algae blooms can be a risk to drinking water and public health. The Safe Drinking Water Act 2003 identifies that the Department of Health and Human Services must be immediately notified when a blue-green algae bloom occurs, or if water contains other substances that may pose a health risk to the public.

Urban water corporations may need to restrict demand as a result of a water quality event because water treatment plants can have reduced output, and clear water storages may be depleted if demand is not restricted. Demand is unlikely to be restricted during a blackwater event, however, water treatment plants may need to slow down operationally to closely monitor water quality.

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

10.3.4.3 Impacts on other uses

Chapter 13 outlines the recreational water values in Victoria’s North and Murray water resource plan area and identifies how water is made available for recreational uses and how risks to recreational users are addressed. Improving understanding of Aboriginal values and uses of water will increase our capacity to plan and manage the impacts of extreme events on those values and uses. There is more detail on how this will be done in Chapter 8.

10.3.4.4 Impact on the environment

Chapter 12 outlines how environmental water is used to improve the environmental health of rivers and wetlands in Victoria’s North and Murray water resource plan area. This includes how environmental water can be used to mitigate against the impact of water quality events. Extreme water quality events including blue-green algae and blackwater events can have negative impacts on the environmental health of rivers and wetlands. Catchment management authorities and environmental water holders may have a role to play in mitigating the impacts of water quality events through providing dilution flows. However this may not always be possible due to the volume of water needed particularly in the larger systems. Catchment management authorities work with the water corporations and the water holders to identify and implement feasible options to limit the impact of water quality events on the environment. This includes: reducing organic material load on the floodplain through regular wetland flooding; timing environmental flows to reduce risks such of poor water quality events; maintaining healthy refuges, or using small freshening flows to provide refuges during extreme events; restoring fish passage to allow movement away from poor water quality events; and if possible, containing poor water quality by closing regulators.

1. Where water is no longer fit for purpose due to a water quality event, some of the powers outlined for extreme dry events may also be used to respond to water quality events in order to protect the availability of water for critical human need.

2. 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 towns where the quality of the water does not meet the standards for authorised use.

3. 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.
There is insufficient data relating to the impact of water quality events on a variety of users. Blue-green algae is the predominant water quality event and it is unclear what impact that has on domestic and stock use and irrigation. As identified in Victoria's North and Murray Risk Assessment there is insufficient information regarding Aboriginal values and uses of water to have an adequate strategy for management of the impacts of water quality events on their values and uses. As information about the impacts on these values improves, management strategies to respond to water quality events will be developed.

5. Water corporations develop management plans to manage risks to water resources. Throughout the region there are several reservoirs which offer access for recreational use. These are monitored for water quality by the respective managers who 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 may occur to prevent harm to individuals as a result of contact with contaminated water.

Cyanobacteria (also known as blue-green algae) is the predominant water quality event that can occur in Victoria. Responses to cyanobacteria events relate to recreational use and public health and safety. Emergency response roles and responsibilities are set out in the Blue-Green Algae Circular: Management Plan 2016-17 (2015) and relate to establishing a process to ensure appropriate communications and planning for cyanobacteria events. Water corporations coordinate the management of major outbreaks while local water managers (water corporations, catchment management authorities, local councils, Parks Victoria, Alpine Resort Management Boards and private companies) monitor and manage local blooms under their own emergency plans.

Section 10.3.3 of Victoria's North and Murray Comprehensive Report outlines the arrangements for managing extreme dry events in the River Murray under the Murray-Darling Basin Agreement.

10.3.5 Measures to meet critical human needs

Section 10.51(2) of the Basin Plan requires Victoria’s North and Murray Water Resource Plan to set out measures to meet critical human water needs during the extreme events listed in this chapter where such events would compromise Victoria’s ability to meet critical human water needs.

Given the arrangements outlined here 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 already outlined would compromise Victoria’s ability to meet critical human water needs.

The response to section 10.51(1)(a) and 10.51(1)(b) of the Basin Plan in Column 3 of Victoria’s North and Murray Index Table sets out the existing measures within the Victorian water management framework which serve to protect critical human water needs in Victoria’s North and Murray water resource plan area. As these existing measures are sufficient, it is not necessary to specify additional measures in this WRP in response to this section. The situation described in section 10.51(1)(c) of the Basin Plan is not relevant to Victoria’s North and Murray water resource plan area.
10.4 New scientific information

Section 10.51(3) of the Basin Plan requires that Victoria’s North and Murray 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.

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 percent or more over the past 20 years.

The Millennium Drought was characterised by a seasonal shift towards less rainfall during the cooler months of April to October when runoff was greatest and storages usually filled. Climate science predicts this is the new reality, with more extreme events such as floods, droughts and bushfires also likely to happen and 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’s severity has been linked to human-induced climate change. That 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.

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 the Commonwealth Scientific and Industrial Research Organisation (CSIRO) has invested in developing an understanding of climate change and its impacts on water resources in Victoria.

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.

Water for Victoria aims to improve Victoria’s ability to apply this research to water management policy, planning and practice. 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. DELWP 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 strategy 8 of the risk assessment, which ties to action 2.2 in Water for Victoria. See Table 4.2.1 of Appendix B.

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

<<end of accredited text for s10.51(3) of the Basin Plan>>