



14.

Sustainable use and management of water resources

The environmental condition of waterways depends on the total volume of water taken for consumptive use (i.e. the SDL) and when water is taken.

View north from Grampians (Gariwerd) with Wartook Reservoir by Natasha Docking.



Part 4 of Chapter 10 of the Basin Plan requires that WRPs consider the need to include management rules to ensure that the timing of taking surface and groundwater is controlled to avoid negative impacts on the environmentally sustainable level of take at a local scale.

14.1 Basin Plan requirements

The WRP must show consideration has been given to rules that ensure that, in complying with the long-term SDLs, the operation of the WRP:

- does not compromise the environmental watering requirements of priority environmental assets and priority ecosystem functions (including those dependent on groundwater) or of groundwater that has a significant hydrological connection to surface water
- does not cause structural damage to an aquifer arising from take within the SDL
- maintains hydraulic relationships and properties in groundwater sources
- prevents elevated levels of water quality degradation, including salinity.

14.2 Victoria's arrangements

Victoria's water entitlement and water resource management arrangements need to ensure that taking water through a bulk water entitlement, environmental entitlement or take and use licence avoids negative impacts on environmental values and the condition of aquifers.

Section 40 of the Victorian Water Act lists the matters that the Minister must have regard to when considering an application for a bulk water entitlement or take and use licence, including:

40 Matters to be taken into account

(1) *In considering an application under section 36(1), the Minister must have regard to the following matters—*

- (a) ...
- (b) *the existing and projected availability of water in the area;*
- (ba) *the permissible consumptive volume, if any, for the area;*
- (c) *the existing and projected quality of water in the area;*
- (d) *any adverse effect that the allocation or use of water under the entitlement is likely to have on—*
 - (i) *existing authorised uses of water; or*
 - (ii) *a waterway or an aquifer; or*
 - (iii) *the drainage regime within the meaning of section 12(1); or*
 - (iv) *the maintenance of the environmental water reserve in accordance with the environmental water reserve objective;*
- ...
- (g) *the need to protect the environment, including the riverine and riparian environment;*
- ...
- (k) *if appropriate, the proper management of the waterway and its surrounds or of the aquifer;*

(2) *In considering an application under section 36(1), the Minister must give effect to an approved management plan for any relevant water supply protection area.*

Chapter 7 describes how these requirements are applied within the Victorian water entitlement framework. The formal requirements for the Minister to consider the matters set out in clause 40 of the Victorian Water Act above mean that the matters considered in Part 4 of Chapter 10 of the Basin Plan are already protected in the Wimmera-Mallee WRP area. No specific rules are necessary to address the requirements of clauses 10.17, 10.18, 10.19, 10.20 and 10.21 of the Basin Plan.

Supplementary information is provided in the following sections.

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**10.17(3),
10.18(3),
10.19(3) &
10.21(3)**

Given the existing arrangements in Victoria described above, it is not necessary for the Wimmera-Mallee WRP to set out additional rules that prescribe:

- the time, place and rate at which water is permitted to be taken in order to secure that the environmental watering requirements of priority environmental assets and priority ecosystem functions are met
- how water resources must be managed or used to ensure the environmental watering requirements of priority environmental assets and priority ecosystems functions are met.

14.3 Surface water

Bulk and environmental entitlements and take and use licences may include provisions that:

- require passing flows to be provided at harvesting points
- regulate the rate that water can be taken
- determine how much water is available to be allocated at any time.

These provisions enable the Minister to ensure the volume of water taken under the SDLs meets the need for sustainable management of the water resources and control the negative impacts on the environmentally sustainable level of take.

In addition to the requirements of the Victorian Water Act, the Victorian Waterway Management Strategy (Policy 8.15) (DEPI, 2013) states that:

In unregulated systems the focus is on maintaining and managing environmental water by strengthening existing processes relating to trade and allocation of water entitlements and conditions on water entitlements, to ensure the availability of environmental water is maintained. Local management plans will be developed that consider environmental water requirements of waterways and surrounding land as appropriate.

14.4 Groundwater

The Basin Plan requires that WRPs be prepared having regard to priority environmental assets and ecosystem functions identified in the long-term watering plans that depend on groundwater.

No priority groundwater-dependent environmental assets and ecosystem functions are identified in the Wimmera-Mallee long-term watering plan. Instead, the *Guidelines for groundwater licensing and the protection of groundwater dependent ecosystems 2015* requires the licensing authority to assess the risks to groundwater-dependent ecosystems associated with the issue or transfer of licences. Risks identified through this process need to be managed through licensing conditions.

The following outlines how the use of groundwater will not compromise the environmental watering requirements of the regulated surface water systems:

- Wimmera-Mallee Sedimentary Plains - no significant usable groundwater resources in this system are connected to the regulated surface water system

- Wimmera-Mallee Deep - there is no connection between groundwater and the regulated surface water system
- Wimmera-Mallee Highlands - there may be limited local connection between groundwater and surface water but given the small volume available for use and the large area it could be taken from, it is not expected to have a significant effect on environmental watering requirements.

There are no structural risks to the aquifers because the amount of take under the SDLs will not cause significant aquifer drawdown and therefore structural risk to the aquifers. There are no structural risks in the fractured rock aquifers of the Highlands groundwater system.

The Victorian Water Act requires the landholder to decommission failed and redundant bores that may present a risk to aquifers. The draft Murrayville local management plan notes the risk of naturally occurring lateral movement of saltier water from the east. These risks are managed by the local management plan and so it is not necessary to include rules in the Wimmera-Mallee WRP.

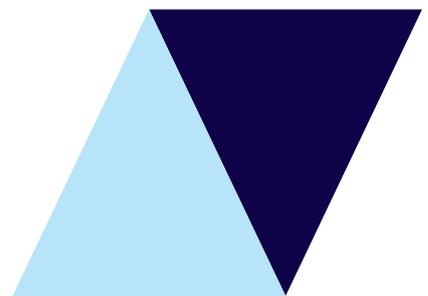
14.5 How requirements have been met

Chapter 18 sets out the current and future risks to the condition and continued availability of water resources.

Mitigation measures are in place for all medium and high risks, rules will not be imposed to address risks identified in the assessment for clause 10.41 of the Basin Plan. Instead, as demonstrated in, the appropriate approach to managing risks is through Victoria's water resource management framework that includes:

- the periodic review of regional catchment strategies required by Division 1 of Part 4 of the *Catchment and Land Protection Act 1994 (Vic)*
- regional sustainable water strategies required by Division 1B of Part 3 of the Victorian Water Act
- long-term water resource assessments required by Division 1C of Part 3 of the Victorian Water Act
- regional waterway strategies required by the Victorian Water Act (clause 190)
- planning duties of the VEWH required by Division 5 of Part 3AA of the Victorian Water Act

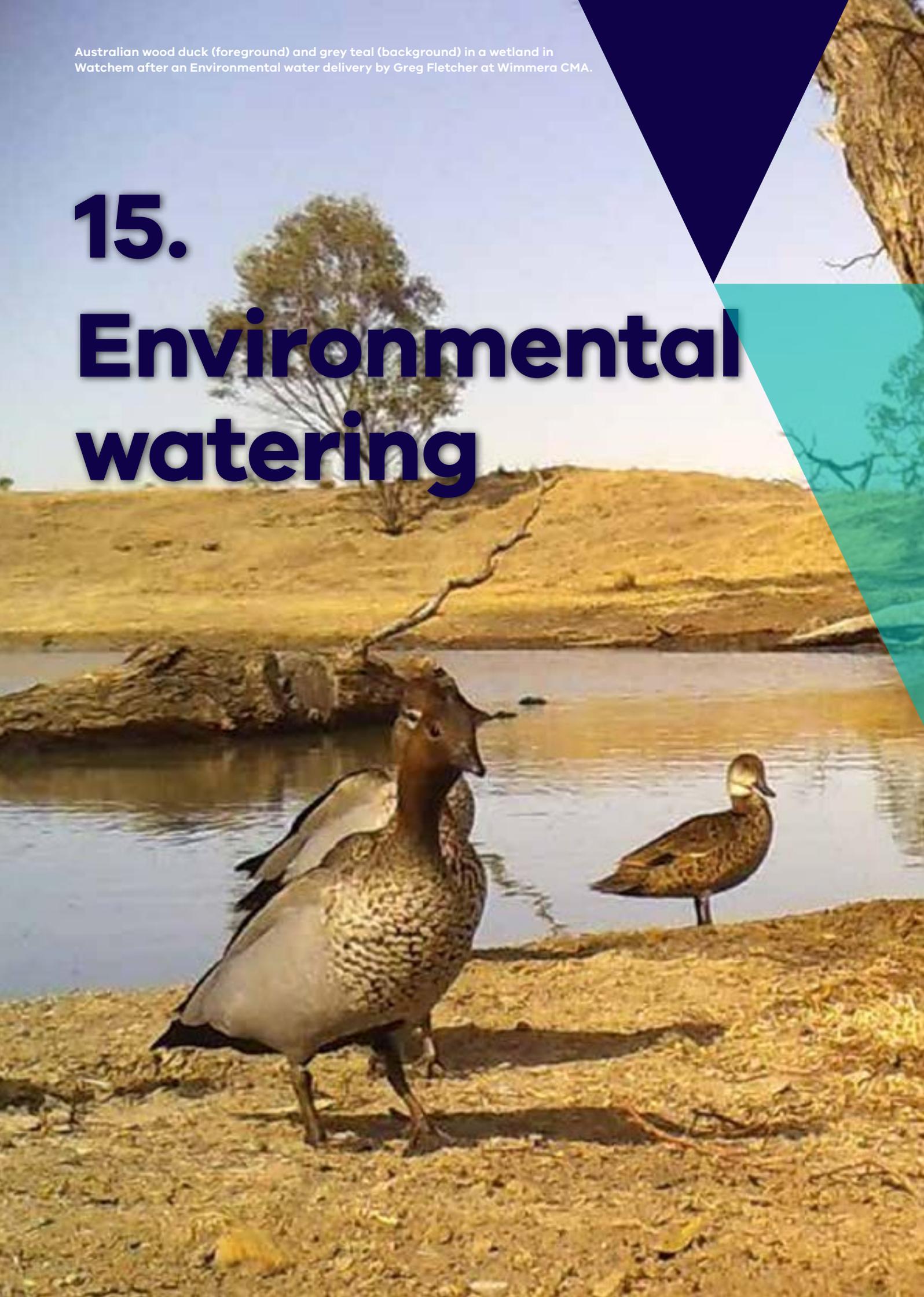
BASIN PLAN 10.22 Rules for managing risks identified in subsection 10.41(1) of the Basin Plan are not included in the Wimmera-Mallee WRP because the risks are managed through Victoria's the arrangements listed above.





Australian wood duck (foreground) and grey teal (background) in a wetland in Watchem after an Environmental water delivery by Greg Fletcher at Wimmera CMA.

15. Environmental watering





The Basin Plan sets objectives and targets to guide the use of water recovered for the environment. The planning processes of the Commonwealth and state environmental water holders are used to meet the Basin Plan's environmental objectives and outcomes. The functions and powers available to the Victorian Environmental Water Holder and CMAs under state law are then used to supply and manage environmental water in Victoria.

The VEWH has direct control over the Victorian Water Holdings (see chapter 15.1.1) and is responsible for planning how its environmental water allocations will be used in Victoria within a year or season. It does this as part of the annual seasonal watering plan. It also authorises CMAs to use environmental water allocations by issuing seasonal watering statements.

The VEWH works closely with the Commonwealth Environmental Water Holder in areas where Commonwealth water holdings may be used in Victoria. The VEWH and CEWH have an agreement to collaborate and coordinate their activities. Each year the CEWH transfers its water allocations to be used in Victoria to the VEWH, which takes responsibility for delivering that water in Victoria. CMAs have operational responsibility for delivering and managing the environmental water allocations controlled and authorised by the VEWH.

Victoria's water planning and management frameworks, including regional waterway strategies¹⁷ and sustainable water strategies, have taken initial steps towards recognising Aboriginal values and knowledge. Chapter 6 of *Water for Victoria* outlines actions to improve how the water sector recognises and manages for Aboriginal values, including environmental watering. Details about how this is being done in the Wimmera-Mallee WRP area are discussed in **Chapter 9**.

The Victorian Water Register contains the details of the characteristics of Held Environmental Water in the W-M WRP area and identifies who holds the entitlements to the water. The Victorian Water Register is published at <http://waterregister.vic.gov.au>.

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15.1 Principal management entities

The Victorian Water Act and subsidiary instruments establish Victoria's legal framework for managing environmental flows. The Act pre-dates the Basin Plan, nevertheless the powers and functions for managing environmental water allocations closely align with Basin Plan requirements.

15.1.1 The Victorian Environmental Water Holder

The Victorian Water Act was amended to establish the VEWH on 1 July 2011 as a statutory body responsible for holding and managing water entitlements that are used for the environment. Bulk entitlements, environmental entitlements and water shares have been assigned to the VEWH. Collectively these entitlements are called the Water Holdings.

The objectives of the VEWH set out in the Victorian Water Act are to:

"manage the Water Holdings for the purposes of:

- a. *maintaining the environmental water reserve in accordance with the environmental water reserve objective*
- b. *improving the environmental values of water ecosystems, including their biodiversity, ecological functioning and water quality, and other uses that depend on environmental condition."*

¹⁷ Documents relevant to the Wimmera-Mallee WRP area include the Wimmera, Mallee and North Central Waterway Strategies and Western Region Sustainable Water Strategy

The functions of the VEWH described in section 33DD of the Victorian Water Act are to:

- a. *“apply and use water in the Water Holdings and otherwise exercise rights in the Water Holdings in accordance with the Water Act*
- b. *acquire and purchase rights and entitlements for the Water Holdings and dispose of and otherwise deal in rights and entitlements in the Water Holdings in accordance with the Water Act*
- c. *plan for the purposes of paragraphs (a) and (b)*
- d. *enter into any agreements for the purposes of paragraphs (a) and (b)*
- e. *enter into any agreements for the purposes of the co-ordination of the exercise of rights under any water right or entitlement held by another person, including the Commonwealth Environmental Water Holder*
- f. *enter into any agreements with any person for the provision of works by that person to enable the efficient application or use of water in the Water Holdings.”*

The Victorian Water Act also describes the planning and reporting framework within which the VEWH is required to operate. This includes the requirement to develop:

- a four-year corporate plan
- an annual seasonal watering plan
- seasonal watering statements as required
- an annual report (required under the *Financial Management Act 1994*).

The Government’s expectations of the VEWH are elaborated in the statutory *Ministerial rules relating to the Victorian Environmental Water Resource Holder, 2014* issued by the Minister for the Environment. Clause 12.1(c) requires the VEWH to have regard to objectives and requirements of the Murray-Darling Basin Plan and any instruments made under it, including this WRP.

The VEWH’s role is to:

- prepare the statewide seasonal watering plan each year in accordance with the policies and framework established by the Victorian Water Act, the Ministerial rules, and the Victorian Waterway Management Strategy (and interstate requirements where these apply)
- authorise use of the Water Holdings in accordance with the above plans and seasonal conditions by issuing seasonal watering statements.

15.1.2 Catchment management authorities

CMAs are statutory bodies established by the *Catchment and Land Protection Act 1994*. They also have functions and powers under Part 10 of the Victorian Water Act. See Chapter 6.3 on page 63 for more information on catchment management authorities.

15.2 Victoria’s planning framework for environmental flows

The following sections describe Victoria’s environmental flows planning hierarchy and how the environmental water management objectives and targets of the Basin Plan are incorporated into decision making. The key elements of the planning framework are:

- Basin-wide planning arrangements
- long-term watering plans
- Victorian Waterway Management Strategy
- regional waterway strategies
- environmental water management plans
- seasonal watering proposals
- seasonal water plans.

Environmental Water Management Plans for individual Victorian priority environmental assets have been collated to develop the long-term watering plan. The long-term watering plan is consistent with Chapter 8 of the Basin Plan - Environmental watering plan, as well as the Basin-wide Environmental Watering Strategy developed by the MDBA Authority for the whole Basin.

Obligations for annual watering priorities are met by Victoria's seasonal watering plan, consistent with Chapter 8 of Basin Plan - Environmental watering plan, and with the Basin-wide Environmental Watering Strategy.

These documents, along with the Victorian Water Act and the Victorian environmental water planning and management framework, contribute to the achievement of the objectives in Part 2 of Chapter 8 of the Basin Plan.

Figure 24 illustrates how they work together.

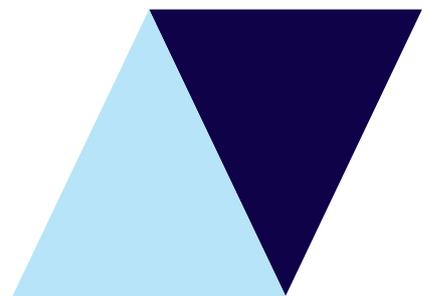
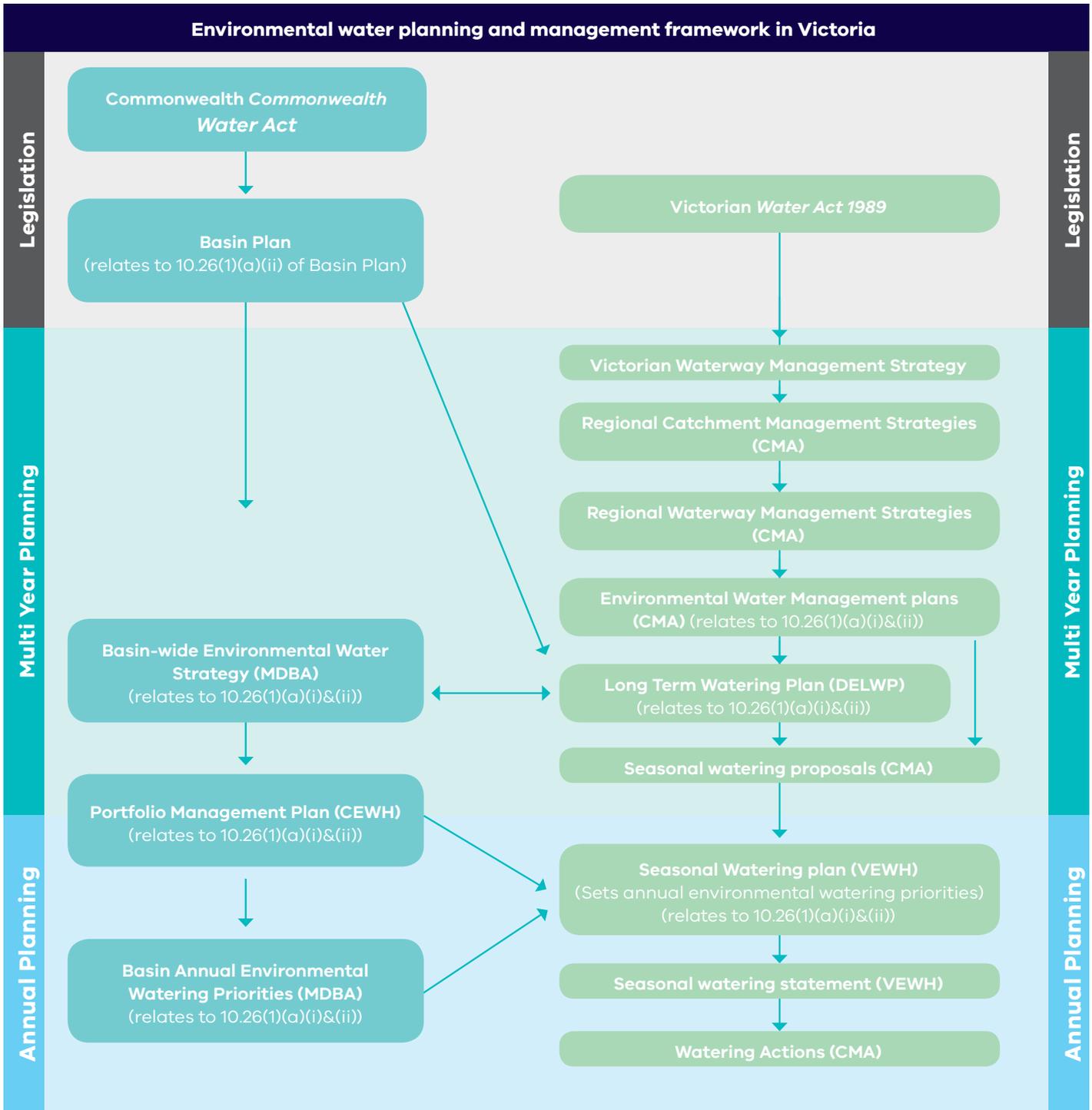


Figure 24 – Environmental water planning and management framework in Victoria – basin, state and region scales



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Environmental water managers in the Wimmera-Mallee water resource plan area must comply with the environmental watering planning and management framework under the *Water Act 1989* (Vic), which is consistent with:

- (i) the environmental watering plan; and
- (ii) the Basin-wide environmental watering strategy,

as set out in **Table 24**. In doing so, environmental watering will contribute to the achievement of the objectives in Part 2 of Chapter 8 of the Basin Plan.

15.2.1 The Basin Plan Environmental Management Framework

Chapter 8 of the Basin Plan sets out the environmental management framework and plan for the Basin. The objectives of this framework are stated in clause 8.11 of the Basin Plan:

- a. *co-ordinate the planning, prioritisation and use of environmental water on both a long-term and an annual basis; and*
- b. *enable adaptive management to be applied to the planning, prioritisation and use of environmental water; and*
- c. *facilitate consultation, co-ordination and co-operative arrangements between the Authority, the Commonwealth Environmental Water Holder and Basin states*

Basin Plan clause 8.02 establishes:

The overall environmental objectives for the water-dependent ecosystems of the Murray-Darling Basin are, within the context of a working Murray-Darling Basin:

- a. *to protect and restore water-dependent ecosystems of the Murray-Darling Basin; and*
- b. *to protect and restore the ecosystem functions of water-dependent ecosystems; and*
- c. *to ensure that water-dependent ecosystems are resilient to climate change and other risks and threats.*

These have been integrated into Victoria's management arrangements through the Victorian Waterway Management Strategy – Victoria's principal strategy and policy for waterway management and are consistent with requirements in the Victorian Water Act.

Basin-wide environmental watering strategy

The MDBA has published the Basin-wide environmental watering strategy to achieve the environmental objectives listed above. These objectives inform Victoria's environmental water planning at a statewide and local level.

The key actions to achieve the objectives of environmental watering in the Basin-wide environmental watering strategy include:

- harnessing local community land and water knowledge
- managing all water to benefit the environment where possible – such as cooperating to divert consumptive water deliveries through a wetland *en route*
- managing in harmony with biological cues (including responses to flow) to restore elements of a more natural flow regime – for example, high river flows or flow release into a wetland at times when it would have occurred naturally (before river regulation), to trigger vegetation, fish or bird breeding
- coordinating between stakeholders to achieve the best outcomes and target multiple sites with deliveries of water (in and between rivers) where possible

- managing any risks associated with the delivery of environmental water
- applying adaptive management (learning from doing) when planning and prioritising the next use of environmental water.

These Basin environmental actions and planning arrangements are also consistent with the requirements of the Victorian Water Act and are reflected in Victoria's environmental water planning framework for northern Victoria as detailed in the long-term watering plans.

Long-term watering plans

Long-term watering plans (LTWPs) will assist planning for environmental water outcomes, help meet the Basin Plan objectives and targets, and the overall environmental objectives for water-dependent ecosystems outlined in Part 2 of Chapter 8 of the Basin Plan (DELWP, 2015). The Basin Plan requires that:

"10.26 Planning for environmental watering

(1) A water resource plan must provide for environmental watering to occur in a way that:

- a. *is consistent with:*
 - i. *the environmental watering plan; and*
 - ii. *the Basin-wide environmental watering strategy; and*
- b. *contributes to the achievement of the objectives in Part 2 of Chapter 8.*

Under Chapter 8 of the Basin Plan, each Basin state must prepare a LTWP for each WRP area that contains surface water, consistent with the Basin-wide environmental watering strategy.

The LTWP for the Wimmera-Mallee WRP area has been prepared (DELWP, 2015). Appendix 1 of the W-M LTWP clearly shows how it meets the requirements of Division 3 of Part 4 of Chapter 8 of the Basin Plan, including:

- using methods specified for identifying priority environmental assets and ecosystem functions and their water requirements
- having regard to the Basin-wide environmental watering strategy
- not being inconsistent with relevant international agreements.

The Wimmera-Mallee LTWP collated long-term environmental water planning information for priority rivers, wetlands and ecosystem functions in the Wimmera-Mallee WRP area and informs:

- Victoria's annual watering priorities (**Figure 24**)
- the Basin-wide environmental watering strategy and Basin annual watering priorities (**Figure 24**)
- the Wimmera-Mallee WRP, particularly environmental watering requirements.

15.2.2 Victorian Waterway Management Strategy

The Victorian Waterway Management Strategy (DEPI, 2013) provides the Government's statewide objectives and policies for managing waterways. It also provides the Government's policies for maintaining and improving the condition of the state's rivers, estuaries and wetlands to provide environmental, social, cultural and economic values for all Victorians.

The Minister is responsible for overseeing and funding the strategy with the support of DELWP. DELWP issues guidance documents to ensure regional plans align with the state framework and policies.

The strategy references and makes explicit links to the Basin Plan. Chapter 4 of the strategy sets

out the state policies, principles and processes to be followed by CMAs when preparing regional waterway strategies, building Basin Plan considerations into Victoria's regional waterway strategies.

Water for Victoria (DELWP, 2016) reiterates actions in the Victorian Waterway Management Strategy, and further emphasises Traditional Owner roles and engagement in waterway management.

15.2.3 Regional waterway strategies

The CMAs use a risk-based approach to identify high value waterways and priority management activities (DEPI, 2013). The strategies are required to integrate on-ground works with environmental water management and ensure efficient and effective management of environmental water. For each management unit (i.e. river reach or wetland) these strategies:

- describe the environmental values of waterways
- identify threats to these values
- after consultation, establish management objectives for the waterways
- determine priorities for management
- establish targets – primarily for sub-components of the Index of Stream Condition (e.g. ISC hydrology sub-index average score improves to 7)
- identify activities to achieve targets
- estimate the costs of the activities.

The Wimmera, Mallee and North Central waterway strategies apply to the Wimmera-Mallee WRP area.

Improving the environmental values of waterways often requires investment in intervention. To enable environmental watering outcomes, works are used to improve the watering regime, enable the efficient use of the Water Holdings, and overcome barriers to flora and fauna migration. On-ground works are also used to improve the biophysical condition, such as reinstating instream woody vegetation habitat or fencing out cattle. These latter works are considered 'complementary measures' to environmental watering, and are as vital to environmental outcomes and condition as flows.

The VEWH may comment on proposed regional waterway strategies. The strategies are approved by the Environment Minister and the Minister administering the Victorian Water Act¹⁸.

15.2.4 Environmental water management plans

Environmental watering management plans (EWMPs) outline how waterway managers will meet long-term ecological objectives and required watering regimes.

Waterway managers prepare EWMPs in accordance with guidelines issued by DELWP. The guidelines were prepared in collaboration with waterway managers and the VEWH. DELWP provides the funds to prepare the plans.

EWMPs are prepared only for waterways that can be watered from environmental water holdings (i.e. can be specifically managed for environmental outcomes using held environmental water). The plans set out:

- long-term environmental flow objectives
- constraints on managing flows
- measures to use available water efficiently

¹⁸ Victorian Water Act clause 190(1)

- desired flow regimes
- management arrangements.

The EWMPs draw on environmental flow studies that are prepared using the best available information. Environmental flow studies, which have been prepared for regulated and unregulated systems throughout Victoria, are periodically updated. The Wimmera–Glenelg and Dock Lake flow studies have recently been updated. DELWP is responsible for preparing guidelines, obtaining funding and coordinating the preparation of environmental flow studies.

EWMPs are prepared by CMAs using the best available information. A collaborative process is used to prepare the EWMPs involving community members, water holders, Traditional Owners, DELWP, storage managers, subject experts and a scientific expert review panel. EWMPs are approved by CMAs.

EWMPs provide the detailed analysis used by CMAs to prepare seasonal watering proposals each year. An EWMP has been prepared for the Wimmera River system (WCMA, 2015) and the Wimmera–Mallee Pipeline Wetlands (WCMA, MCMA, NCCMA, 2016).

15.2.5 Seasonal watering proposals

CMAs prepare seasonal watering proposals each year using the objectives and flow regimes identified in EWMPs and through annual community consultation, in accordance with guidelines issued by the VEWH. The proposals describe desired watering regimes for different climate-based scenarios and take into account:

- the objectives and flow regimes identified in EWMPs
- the actual watering regimes of waterways in recent year(s) and their current condition
- the likely amount of water available at the start of the year
- scenarios for seasonal conditions and water availability over the coming year.
- A risk assessment for any proposed watering events

CMAs consult with key local stakeholders including storage managers, public land managers, Traditional Owners, and local interest groups such as Environment Victoria, Victorian Recreational Fishing and Field, Game Management Australia and representatives of the local community (through groups such as Environmental Water Advisory Groups) when preparing seasonal watering proposals.

These seasonal watering proposals form the basis for the statewide seasonal watering plan prepared each year by the VEWH. The VEWH engages with state stakeholder representatives when preparing the state seasonal watering plan.

Seasonal watering proposals for the Wimmera River and Wimmera Mallee Pipeline Wetlands are available at <http://www.wcma.vic.gov.au/publications>.

15.2.6 Seasonal watering plan

The seasonal watering plan prepared by the VEWH previews the potential environmental watering that could be implemented using water available under the Water Holdings and water held by other environmental water holders. The CMA seasonal watering proposals, together with the MDBA's annual environmental watering priorities and the CEWH's portfolio management priorities inform the seasonal watering plans ([Figure 24](#)).

The objectives of the seasonal watering plan are set out in the Victorian Water Act. The plan aims to achieve the objectives by ensuring that decisions to use the Water Holdings are based on a systematic, science-based approach to identify environmental values and desired flow regimes. The plan also sets out the operational priorities for using the environmental water allocations.

The VEWH's seasonal watering plan is prepared for different water availability scenarios (Drought, dry, average and wet). Different environmental watering actions are developed for each scenario. The plan informs the real time operational decisions that are made as the season progresses. Actions identified in the scenarios are converted to firm environmental watering commitments based on actual conditions and water allocations. The conditions that emerge over the year can be dynamic and are influenced by:

- weather conditions and forecasts
- catchment conditions
- water availability
- river and system operations (such as unregulated flows, catchment inflows, storage levels, other water users' needs and potential delivery constraints)
- ecological or biological factors and triggers (such as plant and animal responses to natural flows or temperature)
- risks associated with environmental watering actions (such as deteriorating water quality).

Efficiency tools for managing environmental water

The VEWH trades and carries over water allocations in accordance with its published water allocation trading strategy (VEWH, 2016). The following types of water transfers¹⁹ and trades are used to manage the Water Holdings:

- operational transfers of the VEWH, Commonwealth Environmental Water Office and the Living Murray allocations to deliver environmental flows (i.e. from the Goulburn system to the Loddon system)
- operational transfers to ensure environmental flows and return flows are not re-regulated for consumptive use as they move downstream (i.e. from the Goulburn to the Murray)
- operational transfers of VEWH Snowy entitlements in the Campaspe, Goulburn and Murray allocations for environmental flows in the Snowy River
- transfers of the VEWH, Commonwealth Environmental Water Office and the Living Murray allocations to enable carryover of environmental allocations from one season to the next
- buying and selling water allocations on the temporary market.

The largest transfers are the Commonwealth environmental water holdings that are transferred to the VEWH for use in Victoria. Unused Commonwealth allocations are transferred back to the CEWH if they are no longer needed in Victoria.

Water transfers and trades conducted by the VEWH must comply with trading rules that apply to all water entitlements and allocations.

The VEWH's framework for deciding whether to carryover water is also published in its water allocation trading strategy. Transfers to enable carryover are normally undertaken at the end of the water year (June) to ensure environmental water availability is optimised for the start of the following season.

The VEWH's carryover decisions are undertaken to maximise benefit to the environment. Water is carried over:

- to build a drought reserve for the following year to meet critical environmental needs should conditions be dry²⁰
- to enable early season watering to be undertaken in the following year (i.e. before the full seasonal allocations for that year are available)

¹⁹ The term 'transfer' is used to describe non-commercial administrative actions used to deploy environmental water allocations. The term 'trade' is used where water allocations are bought or sold on the water market.

²⁰ The process diagram in the water allocation trading strategy 2015-16 does not include the step of carrying over water to build a drought reserve for the following year

- because there is more than sufficient water available for high priority watering actions in the current year.

Carryover and trade provide greater flexibility to manage water availability between seasons, for example, by trading water where better outcomes can be achieved from the funds generated by trade compared with outcomes that could be achieved from surplus water.

Other tools to improve the efficiency of managing environmental water include:

- reuse of return flows – return flows are the portion of water that ‘returns’ to the river (or water supply) system after an environmental water delivery. This water can be reused for floods and other environmental watering downstream
- using consumptive water *en route* – use of consumptive water on its way to being delivered to water users via rivers, creeks and wetlands to provide environmental benefit, or ‘piggybacking’ environmental water on consumptive water that is being delivered to increase flowrates and for environmental benefits.

These two tools can significantly reduce the amount of environmental water required to meet environmental objectives and increases efficiencies. They can also be an effective alternative with less economic impact than recovering additional water to meet environmental flow objectives.

Section 8.5 of the Victorian Waterway Management Strategy (DEPI, 2013) discusses the above tools in more detail.

15.3 Operational arrangements

The VEWH issues seasonal watering statements to the CMAs to authorise the use of environmental water. The CMAs have operational management responsibilities for providing the watering regimes determined by the planning processes described in the previous section. Seasonal watering statements for 2016-17 issued to the Wimmera CMA are available at <http://www.vevh.vic.gov.au/news-and-publications/seasonal-watering-statements>.

CMAs must coordinate with storage and land managers to deliver the proposed watering regimes over the year. In practice, local watering decisions are made jointly because the environmental water holder, the storage manager and the land manager (in the case of wetlands) can veto a proposed watering action in some circumstances.

The VEWH aims to commit water as early as possible to provide waterway managers with the certainty needed to proceed with the planned environmental watering actions. However, a seasonal watering statement may be issued at any time and if necessary, superseded.

The VEWH tracks the amount of water used and the return flows that can be used at downstream sites to maximise benefits. It must also monitor changes to the operational context over the year and revise or issue new seasonal watering statements to maximise environmental outcomes. The management arrangements need to be tailored to the institutional boundaries of the CMAs and the physical boundaries of waterways that can be supplied by the particular water holdings because these determine basic accountabilities. The complexity of decisions increases with the number of:

- governments involved in the decision
- water holders involved in the decision
- waterways that can be watered
- waterway managers.

Management actions through the year vary from the seasonal watering plan for good reasons. Every effort is made to inform those affected so that the changes don’t come as a surprise to the local community.

Under the Commonwealth definition of planned environmental water, water that is committed or preserved for environmental purposes but that can be used, once it is released, for purposes other than those environmental purposes, is not PEW. For this reason, no planned environmental water exists in the Wimmera-Mallee water resource plan area under the Commonwealth definition.

15.4 Environmental watering priorities

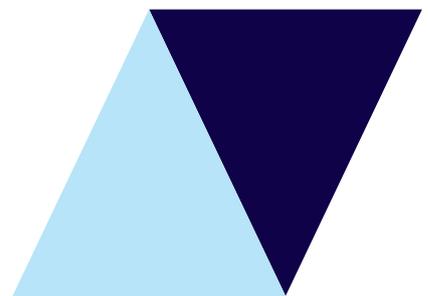
The priority environmental assets and ecosystem functions that may benefit from the planning and management arrangements discussed above are detailed in the Wimmera-Mallee long-term watering plan (DELWP, 2015). Associated environmental watering requirements are also discussed. This section provides an overview of the content of the LTWP.

Chapter 10 of the Basin Plan has specific requirements about priority environmental assets and ecosystem functions that are to be enhanced and protected in the Wimmera-Mallee WRP area.

A wide range of environmental features in the Wimmera-Mallee WRP area are part of, or rely on, wetlands and waterways. They can be categorised as environmental assets, ecological values or ecosystem functions.

The priority environmental assets listed here are water-dependent ecosystems that can be managed with environmental water. Many wetlands and waterways in the Wimmera-Mallee WRP area are not connected to regulated water supply systems and cannot receive managed environmental flows. These environmental assets are not included in the Wimmera-Mallee LTWP (DELWP, 2015) and are not considered priorities for the purposes of the Basin Plan.

An asset may be a single wetland or waterbody, a wetland complex (e.g. Wimmera-Mallee Pipeline Wetlands), or a river at a geographic location (e.g. Mt William Creek). The priority assets are shown in **Figure 25**. Some assets that cross over the northern boundary of the Wimmera-Mallee WRP area (e.g. Hattah Lakes) are included in the Victorian Murray WRP area because they receive water from the Murray River. DELWP (2015) provides a more comprehensive description of environmental assets.



The priority assets of the Wimmera-Mallee WRP area support ecological values²¹ that are significant at Commonwealth and state level. Values in parts of the catchment that can be managed with environmental water are located in the regulated section of the Wimmera River and its tributaries (MacKenzie River and Mt William, Burnt and Bungallaly creeks).

These rivers and creeks are home to many significant native fish populations including one of Victoria's few self-sustaining populations of freshwater catfish. The MacKenzie River contains the only stable population of platypus in the Wimmera and also supports good populations of native fish, as well as macroinvertebrates and turtles. Given the diverse habitat and fish species found in the MacKenzie River, in dry times in particular, it acts as a refuge for fish populations.

The lower Wimmera River from Polkemmet Bridge to Outlet Creek at the northern end of Lake Albacutya was declared a heritage river due to its significant environmental (particularly areas with river red gum open forests and woodlands with an intact understorey and waterbird habitat) and social values (LCC, 1991). The Wimmera River has also been declared a Wetland of National Importance.

The most recent Index of Stream Condition results indicate that most of the Wimmera River is in moderate to poor environmental condition (DEPI, 2013).

The two terminal lakes at the end of the Wimmera River (Lakes Hindmarsh and Albacutya) fill only rarely, during very high flows from upstream. This wet-dry cycle produces an environment where the beds of the lakes are often colonised by vegetation. Filling leads to replacement with aquatic species (such as water milfoil and emergent reeds). When inundated, the central areas of the lakes provide open water habitat for large fish, including Murray cod, freshwater catfish and golden perch, and large numbers of birds such as the Australian pelican, pied cormorant and black swan (MDBA, 2010). Aquatic vegetation in the lakes provides habitat for smaller fish.

Lake Albacutya was declared a Ramsar wetland site of international importance as a representative near-natural example of a 'seasonal intermittent freshwater lake' supporting vulnerable, endangered or critically endangered species or threatened ecological communities and high numbers of waterbirds. Lake Hindmarsh and Lake Albacutya are Wetlands of National Importance.

The Wimmera-Mallee Wetlands include 51 dams and wetlands spread across the dry north-western area of Victoria on public and private land, and are sourced from the Wimmera Mallee Pipeline. They vary widely in wetland types (such as freshwater meadows, open freshwater lakes and freshwater marshes), size and vegetation communities (such as lignum and black box-dominated ecological vegetation classes). As a group, they are home to native waterbird populations including brolga, egret, heron, blue-billed duck, freckled duck, Australian painted snipe and glossy ibis. Other biota present include the vulnerable growling grass frog, turtles and many other species.

Watered on a priority basis from the Wimmera Mallee Pipeline system, these wetlands act as important refuges and drinking holes throughout dry times in the region.

Ecosystem functions are the fundamental physical, chemical and biological processes that support environmental assets; for example, the transport of nutrients, organic matter and sediment in rivers, wetting and drying cycles, provision for migration and re-colonisation by plants and animals along rivers and across floodplains (MDBA, 2010). **Table 13.** DELWP (2015) provides a more comprehensive description of ecosystem values and functions in the region.

²¹ Ecological value is the worth attributed to an organism, ecosystem, product, resource or activity, in terms of benefits to the environment.

Table 13 – Priority ecosystem functions in the Wimmera-Mallee WRP area (Source: Table 3 DELWP (2015))

Ecosystem function	Function characteristics
Longitudinal hydrological connectivity (between river reaches for fish movement)	Supports the transportation and dilution of nutrients, organic matter and sediment Provides connections along a watercourse (longitudinal connections)
Surface water salinity (for growth and reproduction of aquatic vegetation)	Supports the creation and maintenance of vital habitats
Refuges (for native fish species)	Supports the creation and maintenance of vital habitats and populations
Geomorphic habitat	Supports the creation and maintenance of vital habitats

Groundwater-dependent ecosystems (GDEs) are also important environmental features. GDEs rely on groundwater for all or part of their water needs such as river reaches that gain or lose groundwater, wetlands that rely on shallow aquifers, or terrestrial vegetation that relies on shallow or deeper aquifers.

Management of GDEs in Victoria requires continued improvement in the knowledge of the distribution, condition and environmental values of GDEs, including information about groundwater and surface water interactions. Actions in the Victorian Waterway Management Strategy (DEPI, 2013) direct establishment of knowledge for high priority, high risk GDEs, which is currently underway.

A close-up photograph of a tree trunk in a body of water. The tree trunk is the central focus, showing its rough, textured bark. The water is a murky, brownish-green color. In the top right corner, there is a large, dark blue triangle pointing downwards, and below it, a teal triangle pointing upwards, creating a geometric overlay. The text is overlaid on the bottom left of the image.

16.
**Managing
water quality
and salinity**



Blue green algae by Craig Moodie.

16.1 Basin Plan requirements

The overall objective and outcome of the Basin Plan for water quality and salinity is (clause 5.04):

- i. *The objective in relation to water quality and salinity is to maintain appropriate water quality, including salinity levels, for environmental, social, cultural and economic activity in the Murray-Darling Basin. Note: See also the water quality objectives for Basin water resources in Part 3 of Chapter 9.*
- ii. *The outcome in relation to water quality and salinity is that Basin water resources remain fit for purpose.*

Part 3 of Chapter 9 of the Basin Plan then sets out particular objectives for:

- declared Ramsar wetlands and other water-dependent ecosystems (set out in Schedule 11 of the Basin Plan)
- objectives for raw water for treatment for human consumption (set out in the Australian Drinking Water Guidelines)
- irrigation water
- recreational water quality (target values for blue-green algae that are not to be exceeded)
- maintaining good levels of water quality
- salt export from the Murray River to the Southern Ocean of an average of two million tonnes a year.

The Basin Plan requires that regard be given to two types of water quality targets when managing flows in the Murray River (clause 9.14):

- salinity defined at five reporting sites on the Murray River
- dissolved oxygen of 50 percent saturation at 25OC.

In addition, the end-of-valley targets for salinity set out in Appendix 1 of schedule B to the Murray-Darling Basin Agreement as amended from time to time, guide long-term salinity planning and management.

There are two end-of-valley targets in the Wimmera-Mallee WRP area. One is the Wimmera River (gauging site 415200) at Horsham:

median concentration:	1,380 (EC us/cm)
80th percentile concentration:	1,720 EC us/cm)
mean salt load	31,000 tonnes per year

The other is on Avoca River at Quambatook (gauging site 408203) where the target is:

median concentration:	2,096 (EC us/cm)
80th percentile concentration:	no target
mean salt load:	no target

Victoria reports annually on these targets. The most recent report, Murray-Darling Basin Salinity Management Strategy – Victoria’s 2014-15 Annual Report, is available at http://www.depi.vic.gov.au/__data/assets/pdf_file/0003/190803/Murray-Darling-Basin-Salinity-Management-Strategy-Victorias-Annual-Report-2014-2015.pdf.

A salinity target of 833 EC is set for irrigation water extracted for an irrigation infrastructure operator for the purpose of irrigation. There is no irrigation infrastructure operator in the Wimmera-Mallee WRP area.

The Chapter 10, Part 7 of the Basin Plan sets out that a water quality management plan must include:

- key causes of water quality degradation
- measures addressing the risks of water quality degradation
- water quality target values
- measures to achieve water quality objectives and outcomes
- locations for targets for irrigation water
- impact of water quality management on another state.

A water quality management plan in a WRP may specify alternatives to target values. Importantly, the Basin Plan makes it clear that:

9.11 *The failure to achieve a target does not in itself mean that:*

- a. *a person has acted inconsistently with the water quality and salinity management plan;*
or
- b. *a person is required to take particular action or refrain from taking particular action in response to the failure.*

16.2 Victoria's framework for managing water quality and salinity

16.2.1 Water quality

Victoria's water quality protection framework is established by the *Environment Protection Act 1970* (EP Act). The EP Act establishes the powers, duties and functions of the Environment Protection Authority, Victoria, as well as the state's policy and regulatory regime for controlling pollution.

The state's water quality policies are formally set out in the:

- State Environment Protection Policy (Waters of Victoria) 2003 (SEPP (WoV)) (EPA, 2003) and
- State Environment Protection Policy (Groundwaters of Victoria) 1997 as amended in 2002 (SEPP GoV) (EPA, 1997).

SEPP (WOV) and (GoV) are being reviewed, updated and consolidated.

The EP Act and the State Environment Protection Policies apply to the whole Wimmera-Mallee WRP area.

SEPP (WoV) aims to safeguard environmental values and human activities that need protection from the effect of pollution and waste. It defines beneficial uses for the waters of Victoria and sets out water quality standards to be protected. surface water catchments into defined segments.

It divides the Wimmera-Mallee WRP area, these include the:

- aquatic reserves segment
- wetlands and lakes segment
- rivers and streams segment
 - Murray and Western Plains
 - Cleared hills and coastal plans

SEPP (WoV) defines the beneficial uses to be protected in each surface water segment. Possible beneficial uses in a segment include:

- primary contact recreation
- secondary contact recreation
- aesthetic enjoyment
- indigenous cultural and spiritual values
- non-Indigenous cultural and spiritual values
- agriculture and irrigation
- aquaculture
- industrial and commercial use
- human consumption after appropriate treatment
- fish, crustacea and molluscs for human consumption.

Water quality indicators and environmental objectives (target levels) are defined for each beneficial use in each segment. They inform the EPA's regulatory decision making about significant point source wastewater discharges. The indicators and environmental objectives are consistent with the National Water Quality Management Strategy (NWQMS, 2016) and the various guidelines produced under this strategy.

Groundwater quality is regulated by the Victorian Water Act and SEPP (GoV) (EPA, 1997). Five groundwater segments and the protected beneficial uses are defined on the basis of the salinity (TDS) of the groundwater. Direct disposal of waste to groundwater via a bore is prohibited (with few exceptions).

The licensing regime of the EPA regulates significant point source discharges. Small point source discharges (i.e. from septic tanks) and diffuse sources (i.e. stormwater runoff) cannot be efficiently and effectively controlled by licensing regimes and remain an issue.

Chapter 10 of the Victorian Waterway Management Strategy outlines the framework for managing water quality in Victoria, including the roles and responsibilities for water quality management. It contains specific actions and timelines for implementation that will help achieve Basin Plan outcomes.

Agencies, such as CMAs, water corporations, government departments, local government and the VEWH are obliged to have regard to the beneficial uses and water quality objectives set out in the water SEPPs when planning and carrying out their functions. **Figure 26** provides a high level overview of the framework that protects and enhances water quality in Victoria.

The SEPP (WoV) and the Basin Plan draw heavily on the National Water Quality Management Strategy and so are closely aligned.

CMAs are responsible for identifying risks of diffuse pollution and, where benefits exceed costs, seek funding from the Commonwealth and state governments to take action to minimise these risks.

The VEWH also has regard to water quality objectives in SEPP (WoV) when implementing environmental watering plans for stream reaches that can be supplied from the Water Holdings. In particular, VEWH may supply water to improve water quality at priority sites (i.e. to increase dissolved oxygen levels, reduce temperature and reduce salinity and nutrient levels).

16.2.2 Drinking water quality

The quality of drinking water in Victoria is regulated by the *Safe Drinking Water Act 2003* and associated regulations. The Minister for Health is the responsible Minister.

This Act takes a catchment-to-tap approach and:

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

16.2.3 Regional catchment strategies

Victoria's CMAs are responsible for preparing regional catchment strategies (RCS). These strategies provide an overarching framework for land, water and biodiversity management in each of the 10 catchment management regions in Victoria. The RCSs (VCMC, 2011):

- a. assess the land and water resources of the catchments in the region and how they are used
- b. assess the nature, causes, extent and severity of land degradation of the catchments in the region and identify areas for priority attention
- c. identify objectives for the quality of the land and water resources of the catchments in the region
- d. set a program of measures to promote improved use of land and water resources and to treat land degradation
- e. state the action necessary to implement the strategy and who should take it
- f. specify procedures for monitoring the implementation of the strategy, achieving the land and water resource quality objectives and assessing the effectiveness of the program outlined in (d)
- g. provide for the strategy to be reviewed.

The RCSs have regard to the SEPPs and end-of-valley salinity targets. They consider water quality and salinity issues and may identify these as priority issues for the region.

The RCSs provide the overarching strategic framework and priorities for catchment management. More detailed sub-strategies and plans such as waterway management strategies and land and water management plans sit under the RCSs. Land and water management plans are prepared for high priority issues and areas. They have been prepared for irrigation areas with significant water quality and salinity risks. They have not been prepared to address the water quality and salinity issues found in dryland catchments where economic impacts are lower and cost-effective management actions are unavailable. There is no land and water management plan for the Wimmera-Mallee WRP area.

The RCSs were updated in 2012-13 following extensive community and stakeholder consultation. RCSs covering the Wimmera-Mallee WRP area are the:

- Wimmera Regional Catchment Strategy 2013-19
- Mallee Regional Catchment Strategy 2013-19
- North Central Regional Catchment Strategy 2013-19.

16.2.4 Murray River salinity

Victoria supports and complies with Schedule B to the Murray-Darling Basin Agreement (Schedule 1 to the Commonwealth Water Act (DELWP, 2016). Schedule B sets out the formal accountability framework for managing salinity in the Basin. Management arrangements in the Basin are periodically reviewed and updated. The Basin Salinity Management 2030 strategy (BSM2030) (MDBMC, 2015) reflects the outcomes of the most recent review. Schedule B of the Agreement and its associated operational protocols continue to apply.

16.3 The integrating framework

Victoria's framework for managing water quality and salinity is based on aligning the objectives and actions of many entities that affect water quality at the catchment scale. The water quality and salinity requirements of the Basin Plan are built into this framework.

The management of surface water and groundwater quality and salinity requires an integrated approach because it is affected by many natural and anthropogenic factors including:

- natural catchment processes (e.g. runoff from uncleared catchments and groundwater discharges to waterways)
- licensed point source discharges
- small dispersed point source discharges such as septic tanks
- diffuse sources:
 - wash off from dryland farms
 - drainage from irrigated land
 - stormwater from roads and towns
- changes in catchment water balances (e.g. dryland salinity).

Figure 28 shows the connections between Basin, state and regional water quality, salinity objectives and planning arrangements.

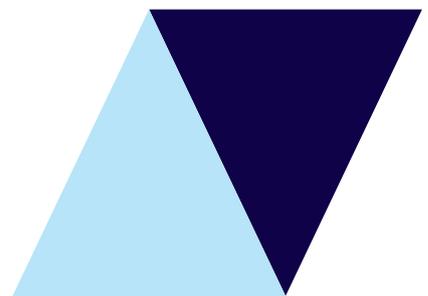
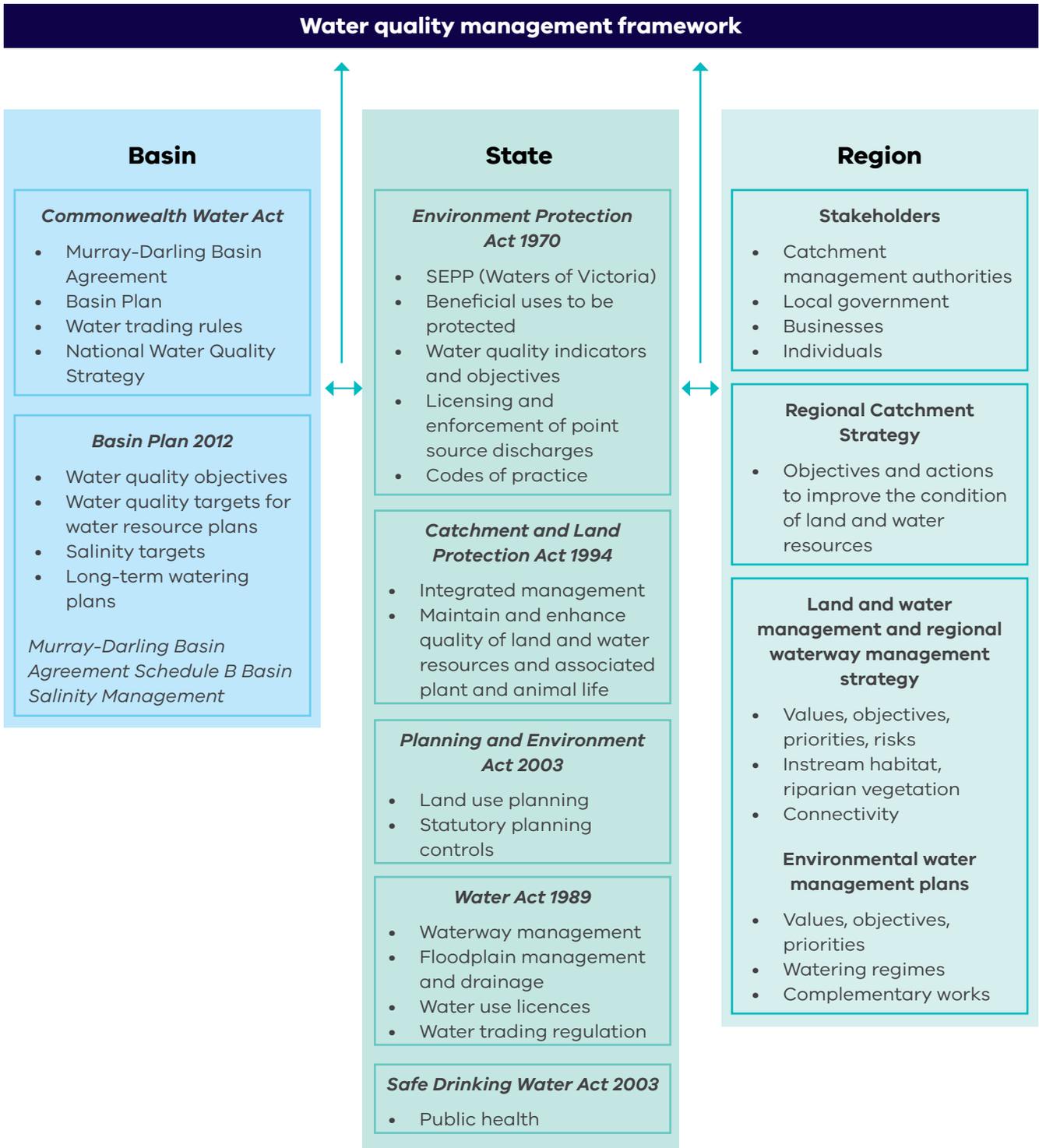


Figure 26 – Victoria’s water quality management framework



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16.4 Wimmera-Mallee WRP Water Quality Management Plan

Appendix 1 contains the Wimmera-Mallee WRP Water Quality Management Plan

This section summarises the main accreditation requirements contained in the Wimmera-Mallee WRP Water Quality Management Plan.

16.4.1 Key causes of water quality degradation

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The key causes of water quality degradation are listed and discussed in Table 14.

Table 14 – Key causes of water quality degradation in the Wimmera-Mallee WRP area (prepared by DELWP in alignment with section 10.30 of the Basin Plan)

Water quality degradation type (Basin Plan category)	Cause Basin Plan category	Comments
Elevated levels of salinity	Water tables intersecting surface water	Naturally saline groundwater systems intercept the surface in parts of the area i.e. at Lake Tyrrell. Long-term increases in regional groundwater levels as a result of catchment clearing cause saline pools in some northern parts of the Wimmera River and other waterways
	Reduction in streamflows, limiting dilution	Salinity levels may increase in rivers that intercept groundwater during periods of low or zero flow Salinity levels increase in the region's ephemeral wetlands and waterways as they dry out
Elevated levels of suspended sediments	Overgrazing, riparian grazing	An endemic issue in the cleared parts of the area
	Poor soil conservation	An endemic issue in the middle and southern parts of the area
	Decline in stream geomorphology	An issue in cleared sections of the middle and southern parts of the area because of increases in runoff, riparian grazing and dryland salinity
	Stormwater drains*	A local issue because of the low level of urbanisation in the area
	Rural drains*	A local issue because of the low level of irrigation and rural drainage in the area
	Impacts of carp	Future management depends on national carp strategy
	Ash from bushfires	A periodic issue in the Grampians waterways

Elevated levels of nutrients from point and diffuse sources	Farm runoff	Catchment management issue – not related to water allocation management
	Fertilisers	Catchment management issue – not related to water allocation management
	Sewage	Regulated and controlled by the EPA licensing regime
Elevated levels of cyanobacteria	Low flow	Occurs in many unregulated waterways and wetlands. Very little ability to control through flow management
	Sunlight	Catchment management issue – not related to water allocation management
	Availability of nitrogen and phosphorus	Catchment management issue – not related to water allocation management
Dissolved oxygen outside ranges	Micro-organisms consuming oxygen (including after algal blooms)	Common part of natural wetting and drying cycle of ephemeral wetlands and waterways. Considered when determining seasonal environmental watering proposals
	Eutrophication (creating algal/cyanobacterial blooms)	Common part of natural wetting and drying cycle of ephemeral wetlands and waterways. Very little ability to control through flow management
	Low flows including impacts of stratification*	Common part of natural wetting and drying cycle of ephemeral wetlands and waterways. Considered when determining seasonal environmental watering proposals
Pesticides and other contaminants	Surface water runoff (pesticides from farmland)	Catchment management issue – not related to water allocation management. Little evidence of pesticide pollution of waterways and wetlands
	Point source (industrial waste)	Regulated and controlled by EPA licensing regime

*Not listed in the Basin Plan as a cause

16.4.2 Measures addressing the risks of water quality degradation

Measures addressing the risks of water quality degradation are listed in **Chapter 18**.

16.4.3 Water quality target values

The water quality objectives (targets) in SEPP (WoV) were derived using the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC), Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000 and Australian Health and Medical Research Council (NH&MRC) 2011 approach. Water quality objectives (targets) are based on the 75th percentile of the assessment data, which is more stringent than the 50th percentile used by the Basin Plan.

SEPP (WoV) is being reviewed and is expected to be updated in 2018. Victoria will consider whether to adopt the updated SEPP (WoV) water quality objectives (targets) for Basin Plan purposes when they are finalised in 2018.

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The water quality targets set out in the Basin Plan and reproduced in **Table 15** are adopted as the target values for the Wimmera-Mallee WRP.

Table 15 – Water quality target values for the Wimmera-Mallee WRP area (DELWP)

Use	MDBP indicator	Target for target application zones (TAZ)		
		TAZ 1m	TAZ A4	TAZ B4
Water-dependent ecosystems	pH	>6.5 <9.0	>6.5 <8.3	>6.5 <8.3
	Turbidity	<50 NTU	<30 NTU	<10 NTU
	Total phosphorus	<100 µ g/L	<45 µ g/L	<25 µ g/L
	Total nitrogen	<1000 µ g /L	<900 µ g /L	<600 µ g/L
	Dissolved oxygen	>85 and max. 110% saturation	>80 and max. 110% saturation	>80 and max. 110% saturation
	Temperature	>20%ile <80%ile monthly water temperature	>20%ile <80%ile monthly water temperature	>20%ile <80%ile monthly water temperature
	Toxicants	Table 3.4.1, ANZECC and ARMCANZ (2000); use 99% species protection level		
Lake Albacutya				
	pH	>6.5 <8.3		
	Turbidity	<20 NTU		
	Total phosphorus	<10 µ g/L		
	Total nitrogen	<350 µ g/L		
	Dissolved oxygen	>90 and max. 110% saturation		

	Temperature	>20%ile <80%ile monthly water temperature
	Toxicants	Table 3.4.1, ANZECC and ARMCANZ (2000); use 99% species protection level
Avoca Marshes, Kerang Wetlands		
	pH	>6.5<8.0
	Turbidity	<20 NTU
	Total phosphorus	<10 µ g/L
	Total nitrogen	<350 µ g/L
	Dissolved oxygen	>90 and max. 110% saturation
	Temperature	>20%ile <80%ile monthly water temperature
	Toxicants	Table 3.4.1, ANZECC and ARMCANZ (2000); use 99% species protection level
Recreational waters	Cyanobacteria	Chapter 6, NHMRC (2008)
Irrigation waters	EC	833 µ S/cm
Salinity (end-of-valley)	EC	MDBP, at specific sites every 10 years

16.4.4 Measures to achieve water quality objectives and outcomes

The Wimmera RCS identifies water quality and salinity issues within the region (WCMA, 2013).

High salinity in the lower Wimmera River is identified as a major threat. This is exacerbated by reduced flows due to drought, variable climatic patterns and water extraction and drought that affect aquatic species and riparian habitat. Protection of water quality and habitat values in the upper catchment of the Wimmera River are a high priority and addressed through erosion control, revegetation works and stock control, and suitable land use planning around Horsham.

Managing water quality and salinity are also included as environmental flow objectives in the Wimmera CMA seasonal watering proposals (WCMA, 2016). Examples of these environmental flow objectives include:

- providing adequate water quality and habitat for fish refuge locations in dry periods
- minimising the impact of dry conditions on macroinvertebrate populations in the Wimmera and MacKenzie rivers by providing flows for habitat and water quality
- providing sufficient in-channel inundation to reduce scalding from saline groundwater
- maintaining adequate surface water salinity in the Wimmera River to enable growth and reproduction of submerged aquatic macrophytes and emergent vegetation
- providing flows for the lower Wimmera River to try to prevent the exponential increase of salinity, which causes fish kills and dieback of fringing and emergent vegetation and macroinvertebrate communities.

Note that these objectives are a subset of the environmental flow objectives used by the Wimmera CMA to develop its seasonal watering proposals.

The Avoca River is an unregulated system and so there are no environmental water holdings and therefore no seasonal watering proposals or environmental flow objectives.

The North Central RCS includes the Avoca Basin (NCCMA, 2013). This strategy explicitly recognises land management activities such as erosion control, fencing and grazing management as the key land management activities to improve water quality in streams. The strategy sets aspirational objectives to improve the Index of Stream riparian zone sub-index. Water quality and salinity were not identified as a priority threat.

The Mallee Regional Catchment Strategy (RCS) is the principal planning tool and strategic focus for land and water management in the Victorian Mallee. It provides a framework for all the existing and developing regional action plans to be implemented, including the Land and Water Management Plan (LWMP).

The Mallee LWMP comprises actions to manage salinity resulting from human activity (secondary salinity) and land use in dryland areas. These include dryland farming and agronomic practices that aim to minimise expansion of secondary salinity by improving crop use of natural rainfall and reducing groundwater recharge. Dryland salinity management strategies include managing discharge sites and revegetation of waterlogged areas with salt-tolerant species to mitigate the spread of secondary salinity.

BASIN PLAN 10.33(1) Specific measures contributing to water quality objectives are listed in **Table 16**. These measures have been prepared having regard to the causes of water quality degradation listed in **Table 14** and the water quality target values listed in **Table 16**.

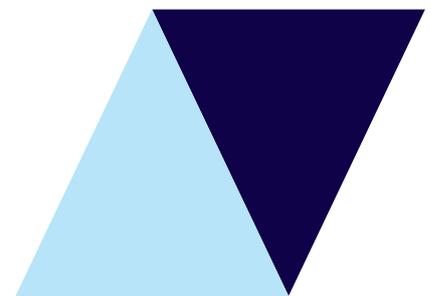


Table 16 – Measures contributing to water quality objectives

Water quality objective for:	Measures
Water-dependent ecosystems	Implementation of the Lake Albacutya Ramsar Site Strategic Management Plan (DSE, 2003) Implementation of Mallee Regional Catchment Strategy Implementation of Wimmera Regional Catchment Strategy Implementation of North Central Catchment Strategy Implementation of SEPP (WoV) requirements Implementation of the Victorian Waterway Management Strategy Implementation of the Wimmera Waterway Strategy Implementation of the North Central Waterway Strategy Implementation of the Victorian environmental watering program (refer to Chapter 15)
Raw water treatment for human consumption	Compliance with the <i>Safe Drinking Water Act 2003</i> and associated regulations Achievement of storage management objectives (Minister for Water, 2010) and implementation of storage management rules (GWMWater, 2016) Implementation of the measures identified in (a) above
Irrigation water	There is very little use of surface water for irrigation in the Wimmera-Mallee WRP area
Recreational water quality	Achievement of storage management objectives (Minister for Water, 2010) and implementation of storage management rules (GWMWater, 2016) Implementation of statewide coordination plan for blue-green algae management as per the blue-green algae circular (DELWP, 2016)
Maintaining good levels of water quality	Measures listed in (a) to (d) above
Salt export	Not applicable

16.4.5 Locations for targets for irrigation water (BP 10.34)

No irrigation infrastructure operators deliver services in the Wimmera-Mallee WRP area.

16.4.6 Impact of water quality management on another state (BP 10.35)

Surface water within the Wimmera-Mallee WRP area is essentially internally draining. Flows from the Wimmera and Avoca rivers have no impact on water resources in another state. The only hydrological connectivity with Basin water resources in another state is groundwater along the South Australian-Victorian border. As detailed in Chapter 2, the groundwater resources along this border are managed under the *Groundwater (Border Agreement) Act 1985*. This agreement is considered an adequate safeguard to ensure that measures in the Wimmera-Mallee WRP will not pose any risk to the ability of South Australia to meet Basin Plan water quality targets or have any adverse impact on water resources in that state. The South Australian Department of Environment, Water and Natural Resources was consulted on water quality management in the Wimmera-Mallee WRP area and was comfortable with Victoria's approach.