Department of Sustainability and Environment

Gippsland Region Sustainable Water Strategy

Victoria

Volumes of water
Different volumes of water are referred to in this document. Volumes of water are measured in litres.

One litre	1 litre	1 litre	1 L
One thousand litres	1,000 litres	1 kilolitre	1 KL
One million litres	1,000,000 litres	1 megalitre	1 ML
One billion litres	1,000,000,000 litres	1 gigalitre	1 GL

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Clockwise from left: Wilsons Promontory (Tourism Victoria), Inverloch (DSE), Metung (Tourism Victoria), Watering potatoes (Thordale VFF), Strzelecki farmland, DSE.

Gippsland Region Sustainable **Water** Strategy

Consultative Committee Chair's foreword

It has been my pleasure to represent the Gippsland community as chair of the Consultative Committee responsible for guiding the development of this Strategy. It has been developed over almost three years with the help of farmers, industry, urban water users, councils, local community members and environmental groups across our region.

Gippsland is home to a wide range of industries, businesses and communities. Our particular needs are very different, but we all rely on secure supplies of water. This fifty year Strategy represents the culmination of the Consultative Committee's efforts to ensure that Gippsland's water resources are managed sustainably, so that the benefits we receive from them can continue into the future.

In directing the actions and policies that form this Strategy, the committee members focused on giving water users greater opportunities to manage their water needs. A robust review of these commitments is planned after the first 10 years. The Strategy provides flexibility to deal with uncertainties about future climate conditions or economic circumstances.

Implementation of the Strategy over time will involve many individuals and organisations across Gippsland. The responsibility for delivering many of the actions sits primarily with a range of Government bodies, including Catchment Management Authorities, Urban Water Corporations, Southern Rural Water, the Department of Primary Industries and the Department of Sustainability and Environment.

As a Gippslander, I was proud of the quality of the submissions received by the Consultative Committee in response to both the Discussion Paper and the Draft Strategy. The Consultative Committee considered all the submissions made in response to the Draft Strategy in detail, and discussed the actions and policies in the Strategy at great length. As representatives of different interest groups within Gippsland, the members of the Consultative Committee often held opposing views from each other, but they shared a commitment to fairness that resulted in a very high level of agreement on the final actions and policies. I thank all members of the committee and the support team from the Department of Sustainability and Environment for their hard work, commitment and the way they approached the task.

On behalf of the Consultative Committee, I would like to thank all those who made submissions, as well as those who attended the public meetings held across Gippsland during the course of the Strategy development. I would also like to thank those who contributed to the working groups that reported to the Consultative Committee.

Llew Vale OAM

Chair, Gippsland Region Sustainable Water Strategy Consultative Committee

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Executive Summary

The Gippsland Region Sustainable Water Strategy identifies the challenges for water management and opportunities to secure the region's water supplies for the next 50 years. It outlines policies and actions to ensure sustainable water supply and management over that period.

Consultation with regional water managers and the community helped to develop the policies and actions in this Strategy. There were nine public meetings with local communities and two public comment periods that drew more than 150 submissions to a Discussion Paper, released in July 2009, and the Draft Strategy, which was released for comment in September 2010. These comments helped to determine how best to share water between agriculture, towns, industry and the environment, and improve water resource management in the region.

The Gippsland Region

The Gippsland Region, as considered in this Strategy, spans the area south of the Great Dividing Range in Victoria from the Strzelecki Ranges and the Latrobe catchment to the New South Wales border in the east (see Figure E1). The region's water resources support important industries such as electricity generation, oil and gas production, dairying, fisheries, tourism, horticulture and forestry plantations.

The region boasts the largest estuarine lagoon system in Australia, the Gippsland Lakes – which is a major tourism destination. Gippsland has some of Victoria's best preserved natural environments including forested catchments and heritage-listed rivers that are still in their near pristine condition. It also contains Victoria's largest free-flowing river, the Mitchell, with upper reaches of high environmental significance.

This Strategy considers:

- **Part One** – pressures and risks to water availability.
- **Part Two** – policies and actions that apply to all entitlement holders in response to challenges and opportunities.
- **Part Three** – how these policies and actions will be applied in:

  – South Gippsland;
  – Catchments of the Gippsland Lakes; and
  – Far East Gippsland.

Gippsland Region sustainable water strategy

The proposals in the Gippsland Region Sustainable Water Strategy are designed to:

- provide increased certainty to water users and the environment;
- promote sustainable water use; and
- protect and improve the health of waterways, aquifers, wetlands and estuaries.

Actions to increase certainty

- Recognising existing rights and confirming that permanent changes to existing entitlements cannot be made arbitrarily.
- Developing local management plans to manage licensed water use more responsively and document rules for sharing water in times of shortage.
- Monitoring water use outside the entitlement framework and managing the adverse impacts of significant land use change on water availability.

Actions to promote sustainable water use

- Making the best use of existing supplies by:
  - continuing to promote water efficiency by urban, industrial and rural users;
  - exploring opportunities to improve storage capacity by using off-stream storages or managed aquifer recharge, and potentially allowing high flows to be harvested on a year round basis; and
  - encouraging water users to trade water or carryover water from year to year where feasible.
- Exploring the potential to use alternative, fit-for-purpose supplies by:
  - encouraging water corporations to evaluate and use alternative supplies;
  - facilitating integrated water planning by local governments and water corporations; and
  - improving processes for allocating stormwater.
- Making more water available for sustainable use by:
  - adopting a balanced approach to the release of unallocated water on rivers where water is still available under the sustainable diversion limit. The region's unallocated water includes:
    - > **6 GL** available in the Mitchell catchment, and **1.5 GL** in the Tambo catchment;
    - > **500 ML** across each of the Genoa and Cann catchments, and a total of **500 ML** across remaining catchments in Far East Gippsland;
    - > **2.5 GL** in the Tarwin catchment, **500 ML** in the Powlett catchment, **300 ML** in each of the Franklin, Albert, Ten Mile Creek, Dividing Creek and Nine Mile Creek/ Shady Creek catchments, and **500 ML** across other catchments in South Gippsland; and
  - making some water available from Blue Rock Reservoir for urban and irrigation use; and
  - confirming groundwater availability in the Moe, Leongatha, Tarwin and Wa De Lock Groundwater Management Areas.

Actions to protect and improve the region's waterways, aquifers, wetlands and estuaries

- Increasing and protecting the environment's share of water by:
  - making additional water available in the Thomson Reservoir (8 GL), and Blue Rock Reservoir (10 GL);
  - confirming the water available for the Macalister River (5.5 GL), and confirming that Victoria has achieved the 2012 targets for water recovery (311 GL) for the Snowy River; and
  - establishing precautionary caps for unregulated rivers considering the likely demand, potential benefits of using the water, risks to existing users and the environment, and uncertainty about future water availability.
- Making the best use of environmental water by:
  - managing environmental entitlements to get the most environmental benefit for the Latrobe, Thomson and Macalister systems; and
  - maximising the benefits of environmental water with structural works, carrying over water and using consumptive water *en route*.
- Adopting an adaptive and integrated management approach by:
  - undertaking complementary river restoration activities; and
  - using a seasonally adaptive approach to make the best use of available water.

The Strategy also identifies key policies and actions in relation to:

Establishing a drought reserve in Blue Rock Reservoir

- The Government holds a 35 per cent share of unallocated water in Blue Rock Reservoir. The Strategy includes an action to use the unallocated water to establish a drought reserve in Blue Rock Reservoir to give consumptive users the ability to buy this water during droughts.

Executive summary

- The drought reserve will be created after allocations have been made available for:
  - purchase of up to **3 GL** by Gippsland Water for urban and industrial use;
  - an auction of up to **800 ML** to the Latrobe irrigators; and
  - a permanent high reliability environmental entitlement equivalent to an annual **10 GL** of water (9 per cent share of Blue Rock inflows and storage space) for the Latrobe River system.
- As part of establishing a drought reserve, the strategy provides for improved recreational opportunities on Lake Narracan between December and April.

Managing extractive industries and the impacts of mining on other groundwater users

- The Strategy recognises that extractive industries contribute significantly to the regional economy but have the potential to impact on the quantity and quality of the region's water resources. The strategy includes policies and actions to protect the region's water resources by:
  - ensuring that any proponents of new earth resources projects are aware of the potential impacts of mining and other earth resource developments on water resources and the environment;
  - advocating for environmental management plans to be revised if significant new risks associated with oil and gas projects are identified, including risks associated with the Latrobe Group aquifer; and
  - reviewing the licensing requirements under the *Water Act 1989* for mines and quarries and taking steps to ensure they are applied consistently throughout Victoria.

Managing the adverse impacts of significant land-use change on water availability

- The Strategy proposes changes to the *Water Act 1989* so that the Minister for Water can declare 'intensive management' areas to control the expansion of new forestry developments by requiring approval by the relevant rural water corporation for developments covering at least 20 ha or more than 10 per cent of a property, whichever is greater. The Minister for Water would appoint a regional committee to assess the need to declare an area. When areas are declared, existing use (including future rotations) would be recognised.
- At the current time the Government does not consider there to be a need to declare any intensive management areas in Gippsland.

Improving groundwater management

- The Strategy recognises that groundwater will become an increasingly important resource for the region. It aims to improve groundwater management by aligning licensed groundwater management units with the characteristics of each groundwater system, promoting sustainable use of the resource, and protecting the health of groundwater resources.

Greater involvement of Traditional Owners

- Traditional Owners and Indigenous communities have a strong link to the region's water resources. The Strategy includes an action to develop the capacity for Indigenous involvement in water management through scholarships, cadetships and traineeships in the water sector.

Chapter overview

Chapter 1: What is the Gippsland Region Sustainable Water Strategy?

Sustainable water strategies are a key part of Victoria's water resource planning framework.

The Strategy examines the water needs of the region's towns, industry, agriculture and the environment over the next 50 years under a range of possible future climate scenarios, and sets water resource management priorities and actions. The Strategy will guide the development, integration and implementation of local plans prepared by water managers in the region.

Chapter 1 describes the role of regional sustainable water strategies, the guiding principles of the Strategy, the process used to develop it and the way it will be implemented.

Chapter 2: Gippsland's water resources now, and in the future

Better water management must be based on a sound understanding of how water is sourced, allocated and used in the region, and the pressures and risks to these resources.

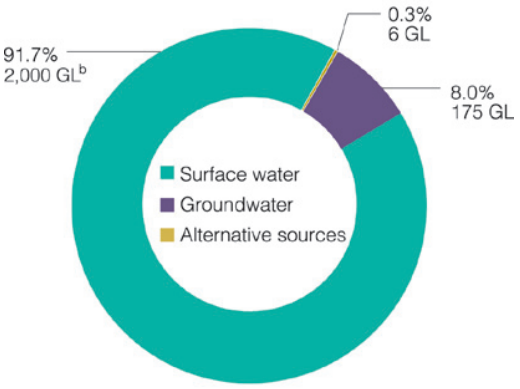
About 92 per cent of the water extracted for towns, industry and agriculture in Gippsland is sourced from waterways, with the rest drawn from groundwater and a very small proportion drawn from alternative sources such as stormwater and recycled wastewater (see Figure E2).

Chapter 2 describes the surface water and groundwater available in Gippsland and explains how this water is allocated under Victoria's water entitlement framework. The framework establishes well defined rights to water and markets to allow for water to be reallocated between different uses. The chapter

discusses how water is used by farmers, towns and industry as well as outlining the key pressures on water sources that may pose a risk to the availability of water in the future.

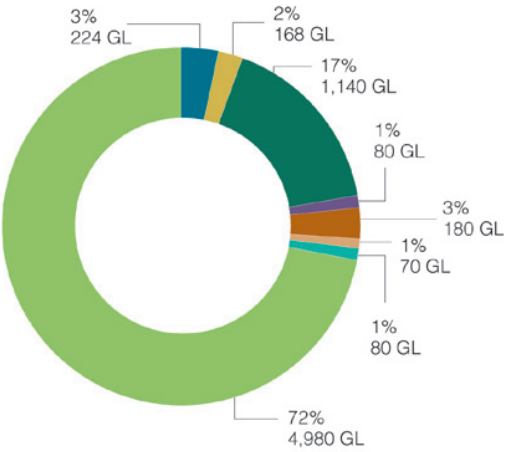
About 28 per cent of Gippsland's surface water is available for consumptive use, however this varies considerably throughout the region and also changes from year to year (see Figure E3). A significant proportion of surface water extraction occurs from the upper parts of the Snowy catchment as part of the Snowy Mountains Hydro-electric Scheme in New South Wales. In some catchments the majority of surface water use is from small farm dams (for example, in parts of South Gippsland).

Figure E2 Proportion of water that can be extracted from different sources[a]



Notes:
a Average annual estimates, based on long-term modelling. Includes unallocated surface water and groundwater.
b Includes diversions for the Snowy Mountains Hydro-electric Scheme (in NSW) and the Thomson diversion to Melbourne.

Figure E3 Average annual amount of water available for different uses in Gippsland[a]



Note:
a Average annual estimates based on long-term modelling.

Extraction as part of oil and gas production also occurs from the deeper aquifer system (the Latrobe Group aquifer) in Bass Strait, which has some interaction with the deep aquifer system under parts of Gippsland.

The exceptional climatic conditions experienced over the past 14 years have impacted heavily on the region. The recent drought from 1997 to the start of 2010 was the worst in Victoria's recent memory and in contrast, last year was the fifth wettest year on record in Victoria.

Climate variability and drought creates uncertainty about future water availability. Water resource managers need to consider the risks associated with climate variability and any possible repeats of the climate experienced over the past 14 years.

Other pressures on water availability include increased water demands from towns, agriculture and industry, and activities that intercept water before it reaches waterways and aquifers.

Chapter 3: Protecting Gippsland's water future

To protect Gippsland's water future we need to find the right balance between consumptive water extraction and protecting environmental values.

The past 14 years have highlighted opportunities to improve Victoria's water resource management to provide increased certainty for all water users and to help to secure a sustainable water future.

Sharing water resources

One of the fundamental decisions to be made for the management of Gippsland's water resources is how much water is shared between different uses in the community.

The actions and policies presented in this chapter will help to ensure that entitlement-holders have a secure right to water in any year, and will improve the way in which Gippsland's water resources are shared.

Figure E4 (over the page) shows the current share on average of water available for consumptive use and the environment. It shows that in some of the catchments with large storages in West Gippsland (the Thomson, Latrobe and Macalister), a significant share of the total available water resource is put to consumptive use. The other river basins in South and Far East Gippsland (except the Snowy) have a relatively small portion of water extracted for consumptive use.

The percentages shown in Figure E4 are based on the long-term average annual information, so do not reflect the variability experienced for individual years or seasons. The proportions are calculated for the whole of the catchment, so any particular parts of the catchment may have a different proportion of water used for consumptive use compared with environmental use.

Executive summary

The numbers shown in Figure E4 raised the following key questions:

- should more water needs to be made available for the environment?
- can more water be made available for consumptive users?

This chapter sets out a balanced approach to granting additional consumptive water entitlements, while protecting the reliability of supply to existing users and environmental values. This approach also sets out a flexible framework to allow new allocations to be made as knowledge of the resource improves over time.

Providing increased certainty for all water users

Before making decisions about how water should be managed, water users, water corporations and environmental managers need to be sure that their rights to water are secure and the rules about using water in times of shortages are clear. Entitlement-holders also need to be certain that potential risks posed by any increase in water use that is currently outside the entitlement framework (such as domestic and stock water use or land use changes that intercept significant amounts of water) are being monitored and managed appropriately.

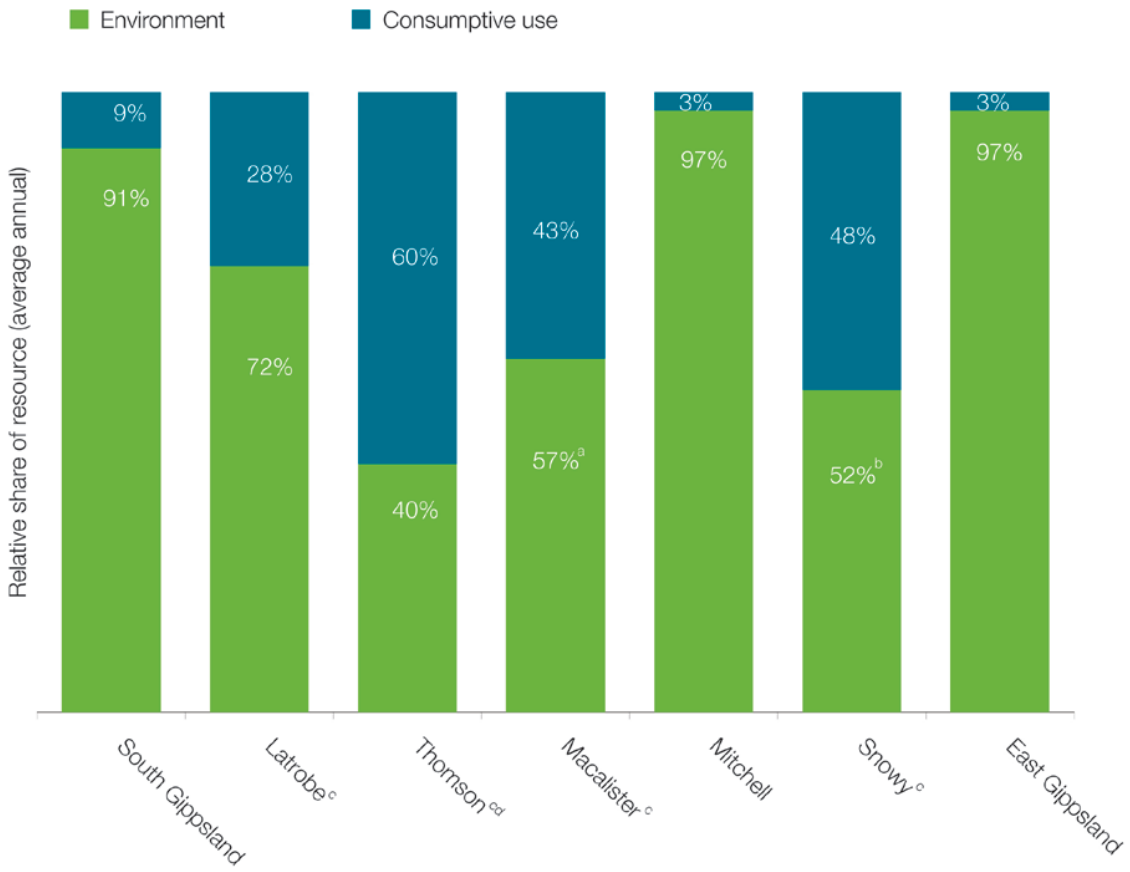
Strengthening the water entitlement framework

The Strategy strengthens the water entitlement framework by:

- ensuring the management of licensed groundwater use is better aligned with the characteristics of each groundwater system;
- monitoring water use outside the entitlement framework to assess the potential risks to water supplies, including improved information about domestic and stock water use by registering new dams in rural residential areas and registering new domestic and stock bores (these requirements will also apply when a property changes ownership); and
- establishing local management plans to clearly document water-sharing arrangements and allow management of licensed water use to be more responsive and adaptable to local conditions.

This chapter also contains actions and policies that seek to manage the impacts of extractive industries and the impacts of mining which may have an indirect or unintended impact on other groundwater users.

Figure E4 Relative average annual shares of surface water set aside for consumptive use, based on long-term climate



Notes:
a End of system flows, downstream of the MID.
b Diversions for consumptive use from the Snowy are primarily for the Snowy scheme.
c Systems with large onstream storages and sections of regulated flow.
d Diversions for consumptive use from the Thomson include diversions to Melbourne.

Chapter 4: Promoting sustainable use of water

It is important to consider the future water needs of industry, agriculture, communities and Traditional Owners when managing catchments. Gippsland's waterways, aquifers and wetlands provide significant social, cultural and environmental benefits to the community throughout the region.

Chapter 4 presents actions and policies to improve the reliability of supplies and consider the future water needs of industry, agriculture and communities. The actions and policies focus on how water users can benefit from improvements to the water entitlement framework.

Promoting sustainable development of water resources

The Strategy identifies potential increases in the water demands for urban, industrial and rural users and considers how supplies may be affected by future droughts and climate variability. The Strategy aims to help meet future demands by making the best use of existing supplies by:

- continuing to promote water conservation and efficiency, and alternative water sources;
- promoting appropriate use of alternative sources such as recycled water and stormwater;
- exploring opportunities to improve storage capacity by, for example, using off-stream storages or aquifers, or extending the supply network;
- investigating options for harvesting high flows;
- streamlining approval processes for constructing storages where this can be done at low risk to the environment and existing entitlement holders; and
- encouraging water users to trade water with other users or carryover water from year to year.

These measures will also help water users manage risks from climate variability and other pressures.

Improving reliability of supply

Existing and new agricultural industries face challenges from Gippsland's variable climate, with future droughts resulting in low allocations on regulated systems or more frequent rosters and bans on unregulated rivers and groundwater systems. Continued investment in on-farm efficiency programs and potential large-scale modernisation presents opportunities to increase production without also increasing the demand for water.

A secure water supply is critical to the future prosperity of Gippsland's urban centres. Growing populations along the coast will also increase household and industry demands. Gippsland is well placed to meet future urban supply needs through the development and implementation of each urban water corporation's water supply-demand strategy. The Department of Sustainability and Environment has prepared and issued guidelines that will help water corporations prepare, update and implement water supply-demand strategies consistent with the objectives of the *Living Melbourne, Living Victoria* initiative.

Considering the views of Traditional Owners

For many, waterways and wetlands are deeply associated with a 'sense of place' and 'belonging'. This is particularly true for Indigenous groups, for whom the health of waterways and the land are central to their identity and aspirations. Traditional Owners and Indigenous Victorians provide valuable input to water resource management in Victoria. Actions in this chapter aim to enhance Indigenous capacity within the region to assist Indigenous groups to be more involved in water resource decisions and process. The Strategy supports Indigenous Victorians to participate and share their knowledge of natural resource management.

Protecting Gippsland's waterways, wetlands, aquifers and estuaries

Communities in the region rely on healthy waterways, floodplains, aquifers and wetlands to support agricultural industries, provide safe drinking water, maintain cultural, social and heritage assets and for tourism and recreational opportunities. Actions and policies in this chapter aim to protect Gippsland's environmental values, by making additional water available for the environment in large regulated systems with major on-stream dams, and making the best use of environmental water through adaptive and integrated management. Complementary works will be carried out to ensure environmental flows achieve the greatest environmental benefit.

Executive summary

Managing pressures on water resources within specific parts of Gippsland (Chapters 5 to 7)

Given the diversity of Gippsland, the Strategy provides a snapshot of the specific water management challenges and opportunities faced within the three parts of Gippsland – South Gippsland, Catchments of the Gippsland Lakes and Far East Gippsland.

These chapters give an overview of the resources in each of these areas and consider how the policies and actions presented in Chapters 3 and 4 will be applied to address the specific challenges and opportunities.

Chapter 5: South Gippsland

South Gippsland contains many rivers and estuarine systems that support significant environmental and heritage values. Water extracted from the unregulated catchments of South Gippsland is used for agriculture, towns and local industry.

South Gippsland contains the ecologically and culturally significant Corner, Anderson and Shallow inlets and the Powlett River estuary, which are all wetlands of international importance.

There will be significant pressures on South Gippsland's future water use, including from climate risks and population growth. In recent years dry conditions posed a threat to some urban supplies in South Gippsland.

The key actions and policies presented in this chapter that aim to meet the significant pressures on South Gippsland's water resources are:

- updating water-supply demand strategies for urban supplies by March 2012, including agreed levels of service, an annual water supply outlook and an atlas of alternative supplies in the region;
- considering options to connect to the Melbourne supply system to increase urban water supply reliability;
- placing precautionary caps on unregulated rivers to protect high environmental values and tourism; and
- continuing to focus on catchment health through complementary works and programs.

Chapter 6: Catchments of the Gippsland Lakes

The catchments of the Gippsland Lakes stretch from Warragul in the west, to Lakes Entrance in the east, and from the northerly draining slopes of the Strzelecki Ranges to the Great Dividing Range in the north.

The Latrobe, Thomson, Macalister and Avon river systems that feed the Gippsland Lakes from the west support irrigation including in the Macalister Irrigation District, urban demands, and large industrial water users such as coal-fired electricity generators and paper production. The Mitchell, Nicholson and Tambo rivers further east have a much lower level of consumptive use. There are no major dams on the Mitchell, Nicholson, Tambo and Avon rivers, allowing these rivers to provide more natural patterns of flow to the Gippsland Lakes.

The Gippsland Lakes are a collection of lakes and wetlands, most of which require freshwater to maintain a healthy ecosystem. They are internationally recognised for their outstanding environmental values. Each of the major rivers that flow into the Gippsland Lakes (Latrobe, Thomson, Macalister, Avon, Mitchell, Nicholson and Tambo) contributes freshwater with different volumes, frequency, timing and duration to different parts of the Gippsland Lakes system. Rising sea levels and increases in storm surges and potential reductions in steamflows are likely to result in an increasingly marine environment in the Gippsland Lakes. The Victorian Government has committed to providing $10 million over the next four years to improve the condition of the lakes system.

The actions and policies presented in this chapter aim to meet the specific water needs in the catchments of the Gippsland Lakes. They focus on managing the reliability of supply for existing and future consumptive water users as well as protecting environmental values.

This chapter aims to respond to the significant pressures on water resources within the catchments and within the Gippsland Lakes. The key actions and policies are:

- establishing arrangements to share the unallocated water in Blue Rock Reservoir between urban and industrial use, irrigation, recreation (at Lake Narracan) and the environment, including establishing a drought reserve;
- creating a permanent high reliability environmental entitlement in Blue Rock Reservoir, and returning additional water to the Thomson River from the Thomson Reservoir;
- further progressing the MID2030 project through the preparation of a business case for government consideration;
- addressing issues specific to irrigators in the Thorpdale area, including changing the rules for trading between the creeks in the Thorpdale area as part of the development of the Latrobe basin local management plan;
- placing precautionary caps on unregulated rivers to protect high environmental values and tourism;
- managing the freshwater needs of the Gippsland Lakes' high value fringing wetlands and river estuaries, and investing in catchment management activities, continued monitoring and research;
- progressing the Lindenow Valley Water Security Project, which is investigating the best option for storing additional water to improve reliability of supply for irrigators in the Lindenow Valley;
- updating water-supply demand strategies for urban supplies by March 2012, including agreed levels of service, an annual water supply outlook and an Atlas of alternative supplies in the region;
- carrying out complementary works and catchment management programs to maximise river health benefits (such as revegetation of waterways); and
- using an adaptive approach to manage environmental values as conditions change over time.

Chapter 7: Far East Gippsland

Far East Gippsland consists largely of forested public land, which includes many relatively undisturbed waterways that are still in excellent condition. The region encompasses the towns of Bemm River, Genoa, Mallacoota, Cann River, Marlo and Orbost, and contains the Snowy River, Cape Conran, Errinundra, Croajingolong and Coopracambra national parks.

The large areas of public land supports some timber harvesting and significant recreational opportunities for tourists drawn to the pristine beaches, waterways, high country and national parks. Privately owned land is mainly used for dryland grazing, with some dairy supplemented by irrigation around Orbost.

The actions and policies presented in this chapter aim to respond to the significant pressures on Far East Gippsland's water resources to meet the specific water needs in these catchments. The key actions are:

- implementing actions set out in East Gippsland Water's water supply-demand strategy;
- placing precautionary caps on unregulated rivers to protect high environmental values and tourism;
- providing greater transparency in reports on the Snowy river's annual water allocation; and
- ensuring the Snowy environmental flows benefit the Victorian reaches, the lower Snowy estuary and wetlands.

Chapter 8: Delivering the Strategy

Chapter 8 outlines the process for implementing the Strategy. It covers the roles and responsibilities for implementing the Strategy, the review process and community involvement in water resource planning. Implementation will be monitored over the next 10 years, with the Strategy reviewed by 2022.

Strategy at a glance

Storing water extracted from rivers *(pages 123,140)*

- Providing additional water for winter-fill extractions on the Mitchell and Tambo rivers
- Investigating storage options for irrigators in the Mitchell supply system through the Lindenow Valley Water Security Project

Better use of Blue Rock Reservoir *(page 123)*

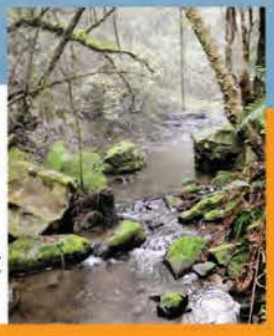
- Creating an environmental entitlement to support the health of the Latrobe catchment
- Making water available for purchase for urban use and irrigation
- Using the remaining unallocated water to establish a drought reserve to ensure consumptive users have the opportunity to access water during dry times
- Making water available for recreational use on Lake Narracan

Macalister Irrigation District *(page 136)*

- Presenting options to further progress the MID2030 project

Improving reliability of urban supplies *(page 77)*

- Updating water supply-demand strategies by March 2012
- Promoting better use of alternative water sources and integrated water management planning between local government and water corporations



Protecting waterways and estuaries in South Gippsland *(page 110)*

- Placing precautionary caps on diversions to protect environmental values and tourism
- Continuing to focus on catchment management activities

Improving opportunities for trade *(page 63)*

- Implementing a market development and education program
- Adopting risk-based trade approval processes
- Allowing licensed water users to enter into multi-year transfers or leases

Snowy River *(page 162)*

- Improving reporting on water availability for the Snowy
- Ensuring environmental flows benefit the Victorian reaches and the lower Snowy estuary

Protecting Far East Gippsland's pristine environment *(pages 156,161)*

- Placing precautionary caps on diversions from these near-pristine rivers to protect high environmental values and tourism

Managing the Gippsland Lakes system *(page 146)*

- Managing the freshwater needs of the Gippsland Lakes
- Continued investment in catchment management activities
- Continued monitoring and further research

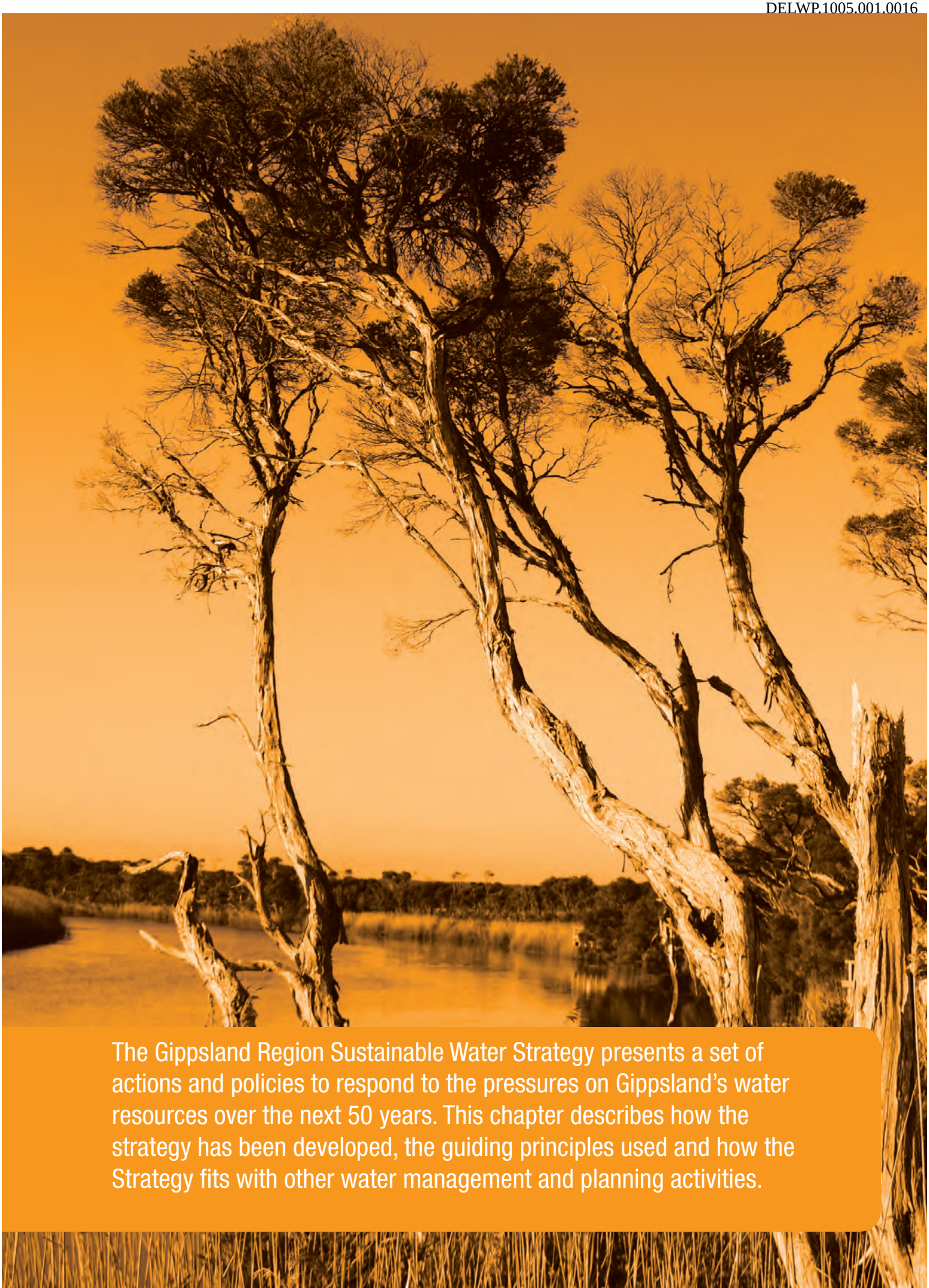
Offshore oil and gas production *(page 55)*

- Identifying and managing the impact on Gippsland's water resources

Images counter clockwise: Picking vegetables, Mitchell River Flats (SRW). Blue Rock Reservoir. Channel with automatic flume gates (SRW). Residential housing, South Gippsland. Headwaters to Tarra Falls (South Gippsland). West Tuna Platform, Bass Strait (DPI). Lakes Entrance, Gippsland Lakes. Bemm River. Snowy River (Sean Phillipson). Central Gippsland agriculture (Bruce Cumming).

Key elements of the Strategy

- Providing increased certainty to water users and the environment
- Promoting sustainable water use
- Protecting and improving the health of waterways, aquifers, wetlands and estuaries



The Gippsland Region Sustainable Water Strategy presents a set of actions and policies to respond to the pressures on Gippsland's water resources over the next 50 years. This chapter describes how the strategy has been developed, the guiding principles used and how the Strategy fits with other water management and planning activities.

What is the Gippsland Region Sustainable Water Strategy?

Guide to this chapter

1.1 Vision and guiding principles

1.2 Role of regional sustainable water strategies

1.3 The Gippsland Region

1.4 Development of the Strategy

1.5 Implementation of the Strategy

How we manage water now:

- Reference Guide 1: Water entitlements
- Reference Guide 2: Water resource management

1.1 Vision and guiding principles

Vision for Gippsland's water future:

The region will work together to achieve a future where healthy rivers, lakes, estuaries and aquifers support a healthy environment and regional prosperity, providing water security for individuals, agriculture, industry and the environment and access to water resources for the benefit of current and future generations.

Guiding principles

The following principles have been used to guide the development of the Gippsland Region Sustainable Water Strategy. These principles take into account the need to be prepared for a future with variable water availability by providing a flexible and adaptive approach to future water management. They aim to maximise benefits for all water uses, recognise existing rights of water users, and consider the regional economy, the community and the environment.

All policies and actions outlined in this Strategy have been assessed against these principles.

1. Maximising efficiency and seeking multiple benefits

- Water is scarce and will be accessed and used as efficiently and effectively as possible to maximise the benefits – for consumptive water users, the regional economy, the environment and the broader community.
- Strategy actions target multiple benefits – economic, social and environmental.

2. Shared responsibility and shared benefit

- Everyone needs to act to secure water.
- All entitlement-holders, including rural and urban water users and the environment, need to share the risk of reduced water availability caused by climate variability and other risks.
- Overall community benefits will be maximised, and the costs and benefits of managing water will be shared fairly between all groups now and in the future.
- All stakeholders will be treated equitably.

3. Recognising existing rights and entitlements

- Entitlements will remain secure with legal tenure that is certain and protected even though the reliability of entitlements will vary with seasonal conditions and other factors.
- The right to a share of the available resource will be protected, even if reliability is reduced due to climate variability and other risks.
- Any material third party impacts from the Strategy actions will be defined and minimised, mitigated, offset or compensated by the beneficiary.
- In defining impacts on existing rights, the assessment will be appropriate to the magnitude of the impact and accuracy of information available.

4. Allowing individuals to manage their own risk and exercise their choices

- As far as possible, risk will be the responsibility of those best equipped to manage it. In most cases, this will be individual entitlement-holders.
- Strategy actions aim to maximise the ability of entitlement-holders to manage their own risk.
- Strategy actions aim to facilitate informed decision-making and maximise the ability of individuals to exercise choice.

5. Being prepared without acting prematurely

- Strategy actions aim to be robust under all water availability scenarios.
- Strategy actions address the risks associated with climate variability and avoid unacceptable costs if this doesn't occur.
- Ongoing monitoring and evaluation will facilitate adaptive management to ensure that Gippsland will be prepared to respond to conditions as they unfold.

6. Maintaining healthy environments and maximising environmental outcomes

- Strategy actions, when considered together, result in net benefits to the community and, where possible, environmental gain.
- Strategy actions seek opportunities to improve water delivery and outcomes for the environment.
- Strategy actions, when considered together, aim to maintain healthy waterways and estuaries.

7. Socially responsible decision-making

- Decisions about water resource management will be socially responsible and consider economic, social and environmental impacts.
- Decisions about water resource management will include meaningful engagement with Indigenous people and provide opportunities to develop capacity within Aboriginal communities.
- Decisions about water sharing are equitable and consider community values identified through the Strategy's consultation processes, which will be open and transparent.
- Strategy actions are transparent in terms of the benefits gained or costs imposed (that is, trade-offs).
- Decisions about water sharing consider impacts at all scales, including on:
  - individuals;
  - businesses (farm and non-farm); and
  - local, regional and State communities.
- Strategy actions are based on a precautionary approach to managing water resources.

1.2 Role of regional sustainable water strategies

Sustainable water strategies take a long-term view of water resource planning, considering all water sources and the needs of towns, industry, agriculture and the environment. They guide the development, integration and implementation of management plans prepared by water corporations and catchment management authorities operating within each region.

Regional sustainable water strategies were legislated through the 2005 amendments to the *Water Act 1989*, and fulfil Victoria's commitment to the National Water Initiative to carry out open, statutory-based water planning.

Under the *Water Act 1989*, the role of sustainable water strategies is to identify:

- threats to the reliability of supply and quality of water for environmental and consumptive uses in the region;
- ways to improve and set priorities for improving the reliability of supply for existing and future consumptive users; and
- ways to improve, protect and increase water for the environment.

The Gippsland Region Sustainable Water Strategy aims to:

- identify and understand challenges to water availability and quality, including the implications of climate risk and climate variability;
- help regional communities to manage during dry periods;
- ensure secure entitlements for towns, industry and the environment;
- secure reliability of supply for economically viable and sustainable agriculture;
- improve choice and flexibility for entitlement-holders to manage climate risks, floods and drought;
- protect and improve the health of waterways, wetlands and aquifers from the impacts of climate variability and other risks; and
- recognise and respond to Indigenous and other cultural and heritage values associated with the region's rivers and catchment areas.

1.3 The Gippsland Region

The Gippsland Region Sustainable Water Strategy refers to 'Gippsland' as the area south of the Great Dividing Range in Victoria, from the Latrobe River catchment and the Strzelecki Ranges to the New South Wales border in the east.

The region includes the South Gippsland, Latrobe, Thomson, Macalister, Avon, Mitchell, Tambo and Nicholson, Snowy, and East Gippsland river basins. The Latrobe, Thomson-Macalister, Tambo and Nicholson and Mitchell river basins flow into the Gippsland Lakes, while the South Gippsland, Snowy and East Gippsland river basins flow into small estuaries or to the sea. The South Gippsland and East Gippsland river basins do not form a single river system but instead contain many smaller waterways that flow to the sea.

Urban centres include Warragul, Traralgon, Wonthaggi, Sale and Bairnsdale (see Figure 1.1). The population of Gippsland is about 225,000, which is projected to increase to about 310,000 by 2056. Population data used in this Strategy is based on *Victoria in Future*[1] estimates. This Strategy recognises that these figures are an estimate and that population growth rates may vary from projected long-term trends.

Significant recreation and tourism opportunities provide important economic benefits to the region. The region's tourism and recreation industry is built on high value environmental assets including national parks, State forests, heritage-listed rivers and internationally recognised wetlands. The tourism industry relies on the benefits provided by healthy and sustainable water resources for its viability, which in most cases is provided by the environment's water.

The region supports an important agricultural sector, with both irrigated and non-irrigated areas. The forestry industry in Gippsland makes a significant economic contribution to Gippsland, being home to Australia's largest pulp and paper mill and many small hardwood mills.

Gippsland's earth resources provide a vital contribution to the region and State's economy. Coal generators in the Latrobe Valley provide baseload power for homes and businesses across Victoria.

Offshore oil and gas production in Gippsland provides about 97 per cent of Victoria's natural gas, as well as about 20 per cent of Australia's crude oil supplies.

Water is also transferred out of Gippsland to support urban and agricultural water use outside the region.

What is the Gippsland Region Sustainable Water Strategy?

Figure 1.1 The Gippsland Region

Gippsland Water, South Gippsland Water and East Gippsland Water manage urban water supplies, while Southern Rural Water manages rural water supplies. Southern Rural Water delivers water to irrigators, harvests water for rural and urban use as well as licensing and monitoring extractions from most surface and groundwater systems south of the Great Divide. It also licenses the construction of farm dams and groundwater bores across the region.

The East Gippsland Catchment Management Authority and the West Gippsland Catchment Management Authority are responsible for protecting and improving the health of the waterways in the region.

Given the diversity in landscapes, community, climate and water uses across Gippsland, the Strategy firstly considers the policies and actions that will apply to the whole region (see Part Two) and then considers how these policies and actions will be applied to three areas across Gippsland (see Part Three). Figure 1.2 shows the three areas considered in this Strategy, which are:

- **South Gippsland** (Chapter 5): Spans from Wonthaggi to Seaspray and includes Corner Inlet and Anderson Inlet. Tailored actions focus on managing challenges on water resources that range from water extraction for agricultural use to sea-change population growth along the Bass Coast, as well as securing reliable town supplies. Offshore oil and gas extraction occurs from the deep aquifer system that extends under Bass Strait.
- **Catchments of the Gippsland Lakes** (Chapter 6): Spans from Warragul in the west to Lakes Entrance in the east. Major river systems include the Latrobe, Thomson, Macalister and Mitchell, all of which provide water to the Gippsland Lakes. There are many large industrial water users in the Latrobe Valley, including coal-fired electricity generators. Tailored actions within this chapter include actions for the Gippsland Lakes.
- **Far East Gippsland** (Chapter 7): Spans from east of the Gippsland Lakes to Mallacoota, and is largely forested public land with high conservation value. There are a relatively small number of urban water supply systems and rural water users. The river systems flow to the Southern Ocean through extensive estuarine systems. Ensuring environmental flows to the Snowy River benefit Victorian reaches are a key focus.

1.4 Development of the Strategy

The Strategy is the result of a two and a half year collaborative process involving government departments, independent experts, and key water industry stakeholders including urban, rural and environmental water users, Traditional Owner groups and the broader regional community.

The then Minister for Water appointed a Consultative Committee of regional stakeholders to provide strategic guidance and oversight of the Strategy's development (see Table 1.1). The committee met 24 times between March 2009 and September 2011. Its deliberations helped shape the required technical work and provided local perspective on the Strategy's consultation, option development and assessment processes.

In addition to the Department of Sustainability and Environment and the Department of Primary Industries, government agencies that helped develop the Strategy include the Department of Premier and Cabinet, the Department of Treasury and Finance, Regional Development Victoria, Environment Protection Authority Victoria and the Department of Planning and Community Development.

Traditional Owner groups throughout Gippsland, listed in Table 1.2, were consulted as part of developing the Strategy. Feedback from Traditional Owner groups was incorporated in the development of the Strategy. Engagement will be ongoing and will continue throughout the implementation stage.

Further information on the goals and aspirations raised by Gippsland Region Traditional Owner groups can be found throughout the document and in more detail in Technical Paper 1.

During the development of the Strategy (see Figure 1.3), nine public meetings were held with local communities and two public comment periods drew more than 150 submissions. These submissions provided perspectives from the agricultural, energy, environment, tourism, cultural, and industry sectors. Most submissions supported the proposals and proposed policies in the Draft Strategy including those to protect the Gippsland Lakes, establish a drought reserve in Blue Rock reservoir, provide freshwater flows for the lower Latrobe wetlands and improve groundwater monitoring. The submissions were used in developing and assessing options for inclusion in this Strategy.

Other opportunities for the community to provide input included briefings for boards and customer committees of water corporations and catchment management authorities, briefings and discussions with local government (including the Gippsland Local Government Network), irrigation, environment and energy peak industry groups (for example, Victorian Farmers Federation, Environment Victoria and the National Generators Forum).

What is the Gippsland Region Sustainable Water Strategy?

Table 1.1 Consultative Committee members who helped develop the Strategy

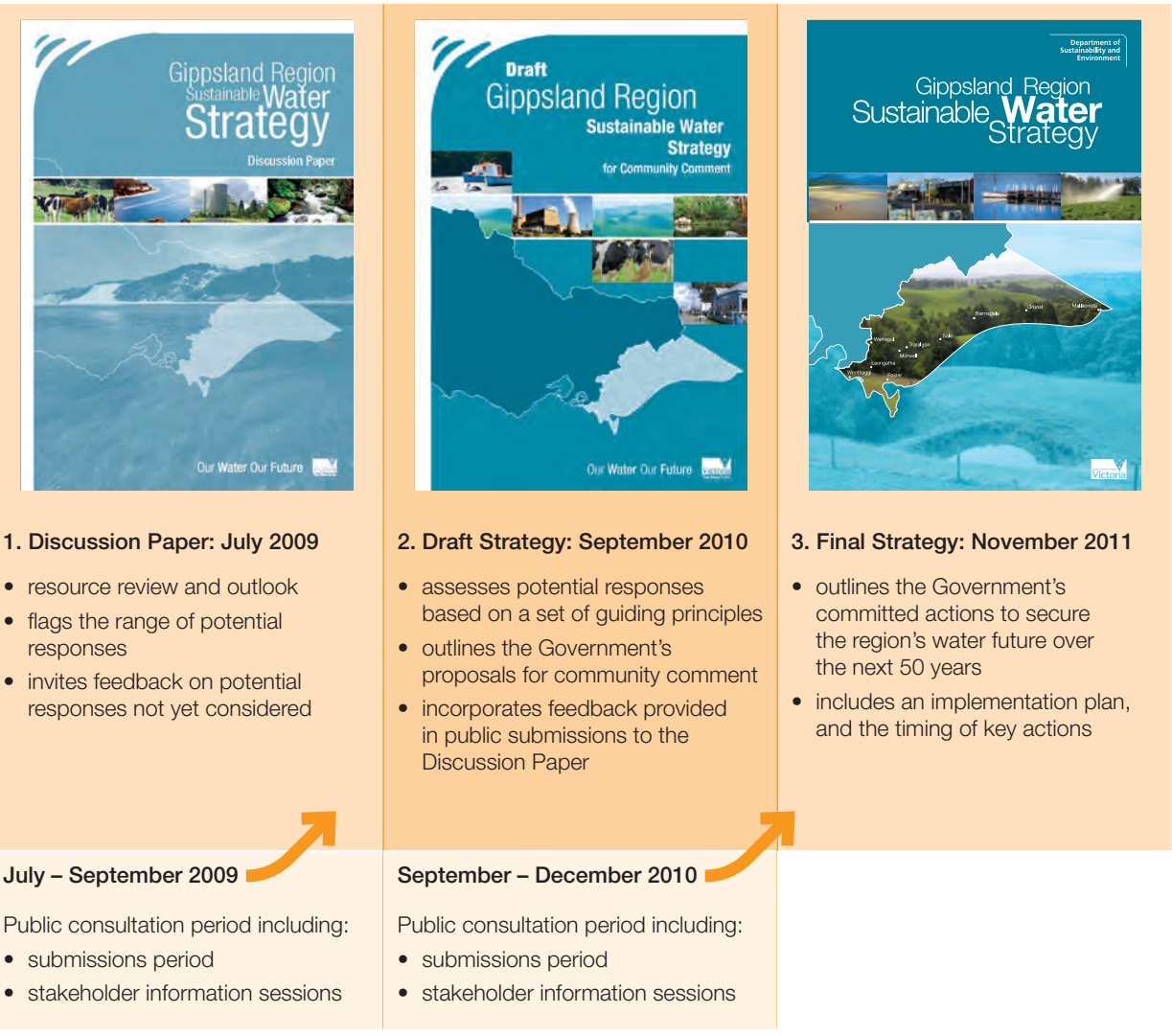
Independent Chair	Llew Vale
Government departments	
Department of Sustainability and Environment	Campbell Fitzpatrick, Daniel Mainville
Department of Primary Industries	Greg Turner
Catchment management authorities	
East Gippsland Catchment Management Authority	Graeme Dear
West Gippsland Catchment Management Authority	Geoff Hocking/Martin Fuller
Water corporations	
South Gippsland Water	Steve Evans
Southern Rural Water	Martin Kent/Clinton Rodda
Gippsland Water (Central)	David Mawer
East Gippsland Water	Les Mathieson
Local government	
South Gippsland Shire Council (Gippsland Local Government Network – South representative)	Andrew McEwen/Anthony Seabrook
East Gippsland Shire Council (Gippsland Local Government Network – East representative)	Steve Koslowski
Latrobe City Council (Gippsland Local Government Network – Central representative)	Paul Buckley
Industry and environment	
Environment Victoria	Leonie Duncan/Juliet LeFeuvre
Gippsland Coastal Board	Duncan Malcolm/Helen Martin
Gippsland Lakes Taskforce	Barry Hart
Victorian Farmers Federation/ Macalister Customer Consultative Committee	David Hotchkin, Graeme Anderson/ Iain Stewart
National Generators Forum, Victorian Employers Chamber of Commerce and Industry	Richard Elkington
Observers	
GippsDairy	Danielle Auldist
Victorian Environment Assessment Council	Duncan Malcolm

Table 1.2 Traditional Owner groups consulted in the development of the Strategy

Gunaikurnai Land and Waters Aboriginal Corporation[a]
Nindi-N gujarn Ngarigo Monero Aboriginal Corporation[b]
Bidwell-Maap Aboriginal Corporation[c]

Notes:
a Registered Aboriginal Party (RAP).
b RAP application before the Aboriginal Heritage Council as at May 2011.
c RAP application before the Aboriginal Heritage Council as at October 2007.

Figure 1.3 How the Gippsland Region Sustainable Water Strategy was developed



Assessing potential responses

The consultation processes helped to identify and assess key proposals (from the Draft Strategy) into the actions and policy commitments in this Strategy (see Figure 1.4). In particular, deliberations by the Consultative Committee and working groups helped to assess each option against the Strategy's guiding principles and identify where further hydrological modelling and socio-economic data was needed. Technical Paper 2 provides more information about the results of this analysis and additional analysis completed for this Strategy.

An Independent Panel was appointed by the Minister for Water to consider public submissions and other feedback from the consultation program (see Table 1.3). The Independent Panel were all former members of the Victorian Water Trust Advisory Council. Appendix 1 provides more information on the Independent Panel's role, details of the Panel's credentials and outlines the Government's response to its key findings on the Draft Strategy submissions. Public submissions and the Panel's reports are available at www.water.vic.gov.au/programs/sws/gippsland.

This Strategy incorporates feedback from the public meetings and submissions, as well as comments and recommendations from the Independent Panel.

Figure 1.4 Process to develop Draft Strategy proposals into Strategy actions

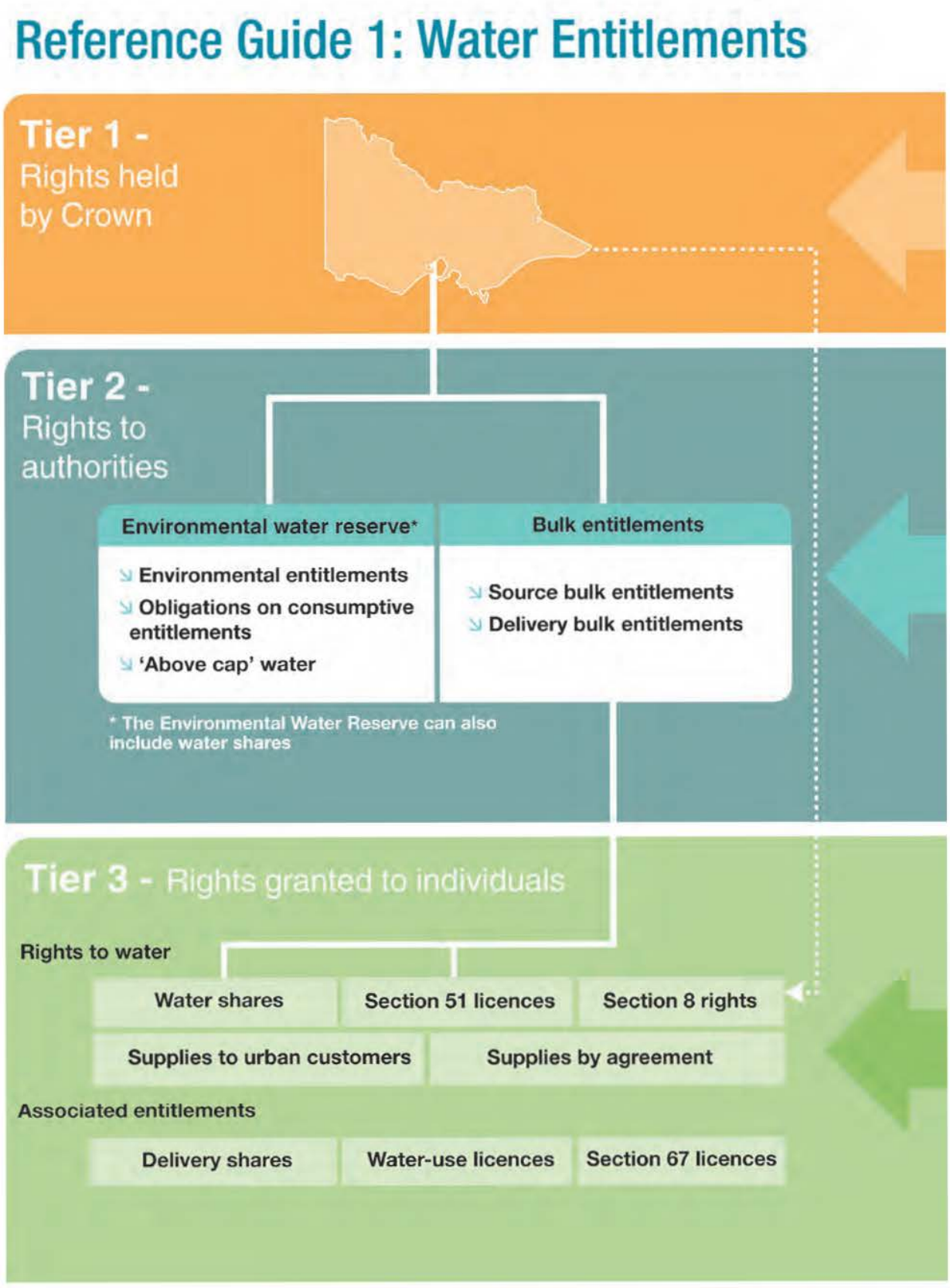
Dairy cows, Bruce Cumming

Table 1.3 Members of the Independent Panel and summary of their role in the water industry

Christine Forster AM (Chair)	Member of the Ministerial Reference Council on Climate Change Adaptation and the Future Farming Advisory Panel Chair of former Victorian Water Trust Advisory Council 2003 Centenary Medal Member of the Order of Australia (2006)
Professor John Langford AM FTSE	Director of Uniwater, University of Melbourne and Monash University Recipient of the Peter Hughes Award for contribution to the Australian water industry 2003 Centenary Medal Member of the Order of Australia (2005)
Barry Steggall	Former State Deputy Leader of the National Party and Member of Parliament for Swan Hill from 1983 to 2002 Board member for Northern Victoria Infrastructure Renewal Project
Sally Farrier	Commissioner of the National Water Commission Non-executive director of Hydro Tasmania Non-executive director of Manidis Roberts Founding director of Farrier Swier Consulting Member of the International Water Association

1.5 Implementation of the Strategy

This Strategy sets out the actions and policies that will be implemented to improve reliability of supply for all water users. Where the actions are presented in this document, there is also a description of how the action will be implemented, who will be responsible for delivering it, and the timeframe in which it will be completed. Chapter 8 outlines how the Strategy will be delivered. A list of the actions and policies is also presented in Appendix 2.


Reference Guide 1: Water Entitlements
Tier 1 - Rights held by Crown
Tier 2 - Rights to authorities
Environmental water reserve*
Environmental entitlements
Obligations on consumptive entitlements
'Above cap' water
Bulk entitlements
Source bulk entitlements
Delivery bulk entitlements
* The Environmental Water Reserve can also include water shares
Tier 3 - Rights granted to individuals
Rights to water
Water shares
Section 51 licences
Section 8 rights
Supplies to urban customers
Supplies by agreement
Associated entitlements
Delivery shares
Water-use licences
Section 67 licences

Water entitlements are defined in the *Water Act 1989* and are issued by the Minister for Water. A water entitlement is the amount of water authorised to be stored, taken and used by a person under specific conditions. Associated entitlements set conditions for water delivery or use.

Environmental water reserve (EWR)

The EWR is the legally recognised amount of water set aside to meet environmental needs. The objective of the EWR is to preserve the environmental values and health of water ecosystems.

Environmental entitlements are generally identical in nature to bulk entitlements. They provide for a share of the available resource.

Obligations on entitlements include the passing flows that water corporations or licensed diverters are obliged to provide out of storage or past a diversion point. The portion of passing flows that is provided to meet environmental needs is considered a part of the EWR.

'Above cap' water includes water that is left over after limits on diversions have been reached and unregulated flows which cannot be kept in storage. Most of the EWR is comprised of 'above cap' water, and this component is most susceptible to climate change.

Bulk entitlements

Held by water corporations with secure tenure in perpetuity. They provide the right to water for system operations, seasonal allocations and other rights and obligations.

Source bulk entitlements provide a share of inflows, storage capacity (if applicable) and releases.

Delivery bulk entitlements provide a set volume of water each year, subject to defined restrictions during periods of water shortages.

Water shares have secure tenure held in perpetuity. A share of the available resource in most regulated systems is allocated annually (through seasonal allocations), which can then be ordered to a specified location, at a specified time and rate.

Section 51 take and use licences allow for diversions from unregulated (and some regulated river systems) and extractions of groundwater. Licences are issued for a specified volume, period of time and with a range of conditions.

Section 8 rights provide for an individual to take and use water from a range of surface and groundwater sources for domestic and stock use under certain circumstances without a licence.

Supplies to urban customers must be provided by water corporations throughout their defined districts.

Supplies by agreement are arranged by water corporations to provide water outside of defined districts, and recycled and drainage water in special circumstances.

Delivery shares provide for water to be delivered to land in an irrigation district via a channel. Delivery shares are linked to delivery infrastructure and stay with the property if the water share is traded.

Water-use licences allow an irrigator to use water to irrigate land up to an annual use limit.

Section 67 licences provide for the construction and operation of a groundwater bore or any works on a waterway, such as a private pump or dam, when a section 51 licence is required.

Reference Guide 2: Water Resource Management

Limits on water entitlements

It is important that water allocation and diversions do not reduce reliability of supply for other entitlement-holders or impact on important environmental values. There are a range of tools to limit water entitlements to achieve this.

Permissible consumptive volumes (PCVs) are the maximum volume of water that can be used for consumptive purposes for groundwater or surface water. PCVs are progressively being set for all groundwater management areas and water supply protection areas. For these areas, licences are not issued if the PCV is already reached or if licences would cause it to be exceeded.

Sustainable diversion limits (SDLs) limit water use in unregulated systems. They prevent the issuing of summer licences and determine the upper limit on winter-fill diversions, beyond which there is an unacceptable risk to the environment. SDLs have been set for 1,584 sub-catchments across Victoria. They determine if a licence can be traded from one sub-catchment to another.

Key processes to change entitlements

To protect the integrity of Victoria's entitlements, the Water Act 1989 outlines clear, consultative processes that must be undertaken before entitlements can be changed.

Permanent changes

15-year review of water resources

A water resource assessment must be undertaken every 15 years to identify if there has been any long-term reduction in water availability and whether this has fallen disproportionately on water users or the environment. It will also identify any flow-related deterioration in waterway health. If either is the case, a review must be undertaken to determine the appropriate action considering social, economic and environmental values. This could include a permanent change to entitlements. The first 15-year review is due in 2019.

Management plans for water supply protection areas

In highly stressed groundwater and unregulated river systems, a management plan can be used to change conditions on Section 51 licences to ensure long-term sustainable use.

Temporary changes

Qualification of rights

The Water Act 1989 provides the Minister for Water, (as a last resort under severe conditions) with powers to declare a water shortage and temporarily override existing water entitlements to reallocate water to priority uses. This process is known as a qualification of rights. In effect, water is taken from some entitlement-holders and used to supply others; normally to meet critical human needs.

Critical human needs can be defined as the amount of water required to meet Stage 4 restricted demand in urban areas, supply domestic and stock needs and operate the distribution system to deliver that water.

As qualifications advantage one group of water users at the expense of another, generally with no compensation, qualifying rights is undertaken only in line with clear and transparent guidelines.

Victorian Water Register

To improve the recording and transparency of its water entitlements, Victoria has developed the Victorian Water Register (see www.waterregister.vic.gov.au). The register records bulk entitlements, environmental entitlements, water shares and licences to improve integrity and enable proper water accounting. It keeps track of the water market and produces crucial information for managing the State's water resources.

Water trading

Trading water entitlements is a process that allows water to be reallocated between users. The water market allows for water to move from lower value to higher value uses, boosting the regional economic returns that can be made from the available water. Water trading also allows new developments to occur in systems where all available resources have been allocated, and helps individuals to manage their own water supplies.

Management areas

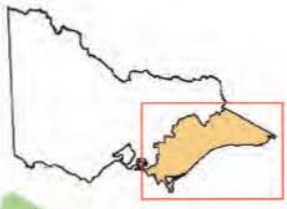
Management areas define the scale at which diversion limits and other plans will be applied.

A river basin or system is the area of land where surface water run-off drains into streams and creeks that eventually flow into a single river. These streams and creeks are known as 'tributaries'.

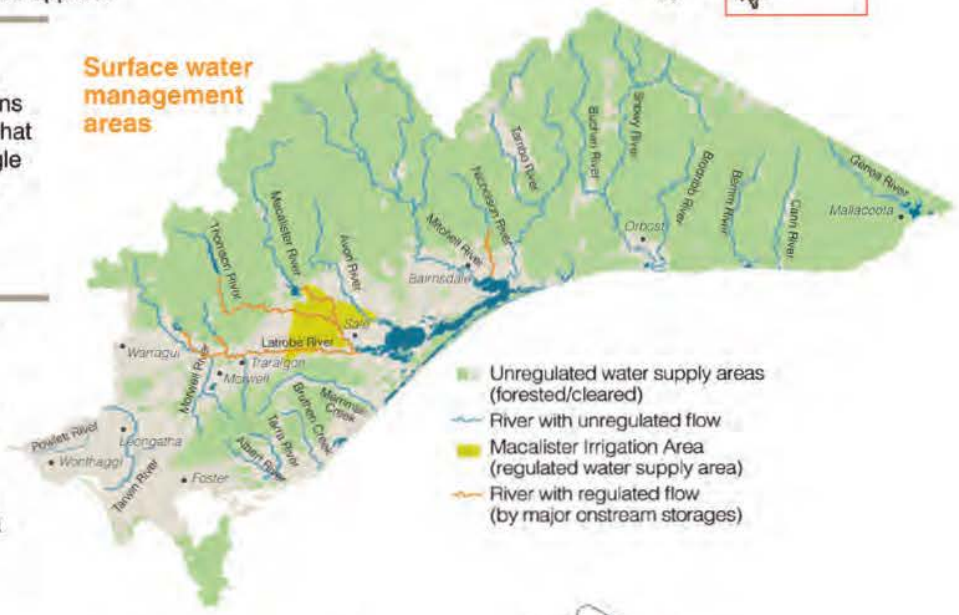
Water supply protection areas (WSPAs) can be declared where strict management is required to protect the groundwater and/or surface water resources in the area. Once an area has been declared, a management plan is prepared.

Groundwater management areas (GMAs) are the defined areas from which water is extracted from an aquifer, generally where groundwater has been well developed or has the potential to be developed.

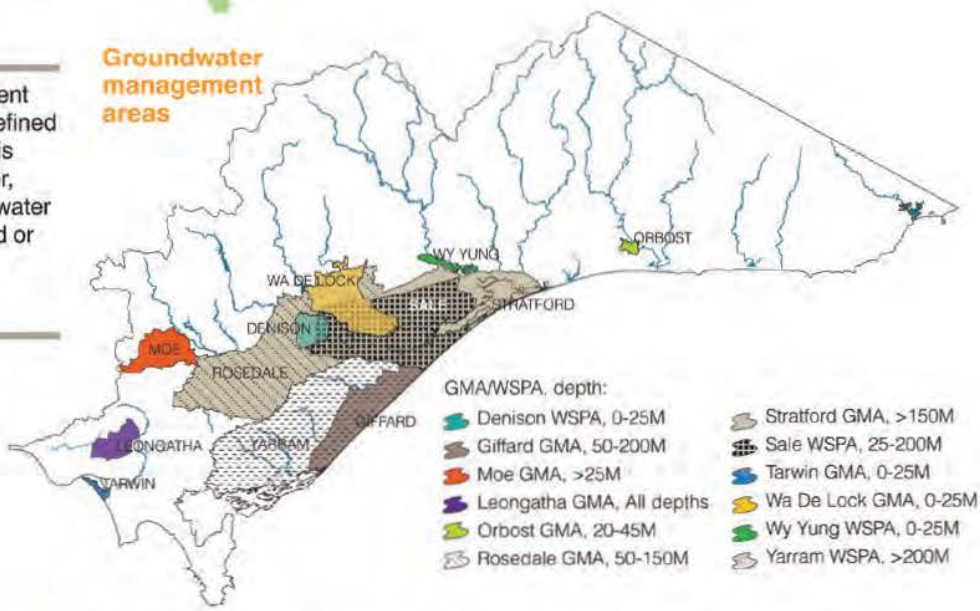
Unincorporated areas are generally areas in which groundwater resources are of poor quality and yield.



Surface water management areas



Groundwater management areas



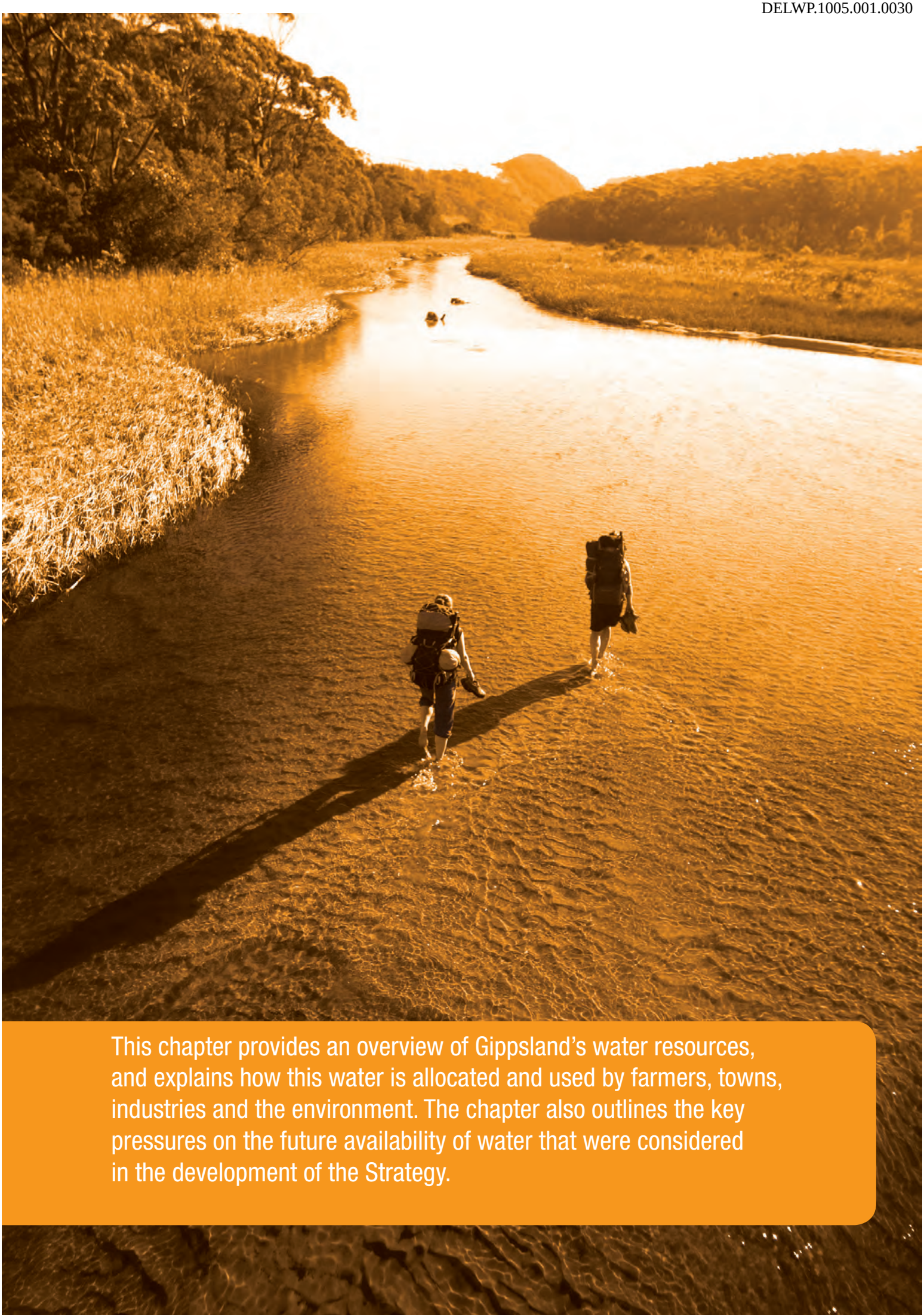
Responding to seasonal variability

Water availability varies considerably from year to year. This means an entitlement-holder may not always have access to their full entitlement volume. Annual use is determined by the following methods.

Seasonal allocations are the volume of water provided to water shareholders in a given year, expressed as a percentage of the total entitlement volume.

Urban water restrictions are introduced by water corporations in towns and cities to restrict outdoor use in times of shortage.

Rosters, restrictions and bans are applied in unregulated river and groundwater systems to limit the timing or amount of water extraction. The rules for applying these are documented in local management rules, or management plans.



This chapter provides an overview of Gippsland's water resources, and explains how this water is allocated and used by farmers, towns, industries and the environment. The chapter also outlines the key pressures on the future availability of water that were considered in the development of the Strategy.

Gippsland's water resources now, and in the future

Guide to this chapter

2.1 Overview of water resources in Gippsland

- Surface water and groundwater availability
- How Gippsland's water is used now

2.2 Drought, climate risk and variability

- Recent climate extremes – the past 14 years
- Changes in climate over the longer term

2.3 Other pressures on water resources

- Population growth
- Changing industrial water needs
- Future food and fibre needs
- Increasing domestic and stock water use
- Land use changes
- Declining groundwater levels in the Latrobe Group aquifer
- Emerging groundwater and mining technologies
- Bushfires
- Point source pollution
- Agricultural run-off and streamside grazing
- Land salinisation
- Saltwater intrusion
- Acid sulfate soils

2.1 Overview of water resources in Gippsland

2.1.1 Surface water and groundwater

Surface water availability

Surface water is created by rain that falls on the land and flows to streams, wetlands, estuaries and reservoirs. In some instances, surface water flows are also created by groundwater that seeps to the surface and becomes part of streamflow.

Waterways in the region are described as **regulated systems**, where water flow is regulated through the operation of large dams or weirs, or **unregulated systems**, where water flow is not regulated by a major dam or weir.

The regulated rivers in Gippsland are the Latrobe, Thomson and Macalister systems. The main stem of the Snowy River also has significant flow regulation as a result of the Snowy Mountains Hydro-electric Scheme on the upper section of the Snowy River in New South Wales. About 90 per cent of water used from Gippsland's waterways is taken from rivers with significant flow regulation. However, most of the rivers in Gippsland are unregulated, and only about 10 per cent of surface water extraction in Gippsland occurs from these unregulated rivers.

Surface water transfers

Surface water is transferred between river basins in Gippsland and from Gippsland rivers to rivers outside Gippsland. Figure 2.1 shows the current and historical water transfers across catchments that occur regularly.

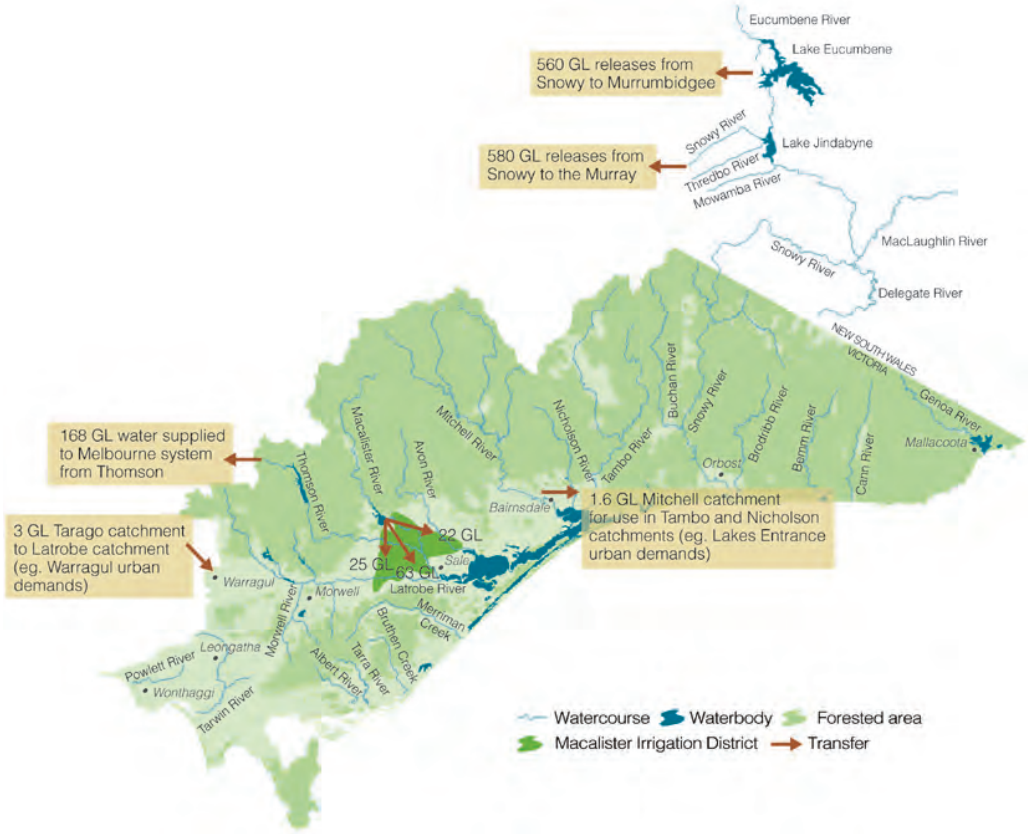
The major transfers of water from Gippsland are from the Thomson River to Melbourne, supporting urban water use in Melbourne, and from the Snowy River to the River Murray and Murrumbidgee River, to support agricultural water use and hydroelectric power.

Groundwater availability

Groundwater provides water for domestic and stock, town, irrigation and industrial use. It is also pumped out of open-cut mines to enable safe coal mining in the Latrobe Valley, and as part of oil and gas extraction in Bass Strait.

Groundwater contributes to the environmental values of some ecosystems. These are known as groundwater dependent ecosystems (GDEs) and can include waterways, wetlands, estuaries and vegetation.

Figure 2.1 Main transfers between the maior catchments[a]



Note:
a Figures are average annual estimates, based on long-term modelling, and include unallocated surface water and groundwater.

Groundwater in Gippsland is contained in layers of sedimentary sand, gravel, clay, limestone and coal, and in fractured rock. An example cross-section of groundwater systems in the Latrobe Valley is shown in Figure 2.2.

Groundwater levels are generally stable but some areas are declining. Management of groundwater needs to take into account the amount of water that enters and is lost from the aquifer each year and how much water is stored in the aquifer. The process of water entering the ground to become groundwater is called recharge. The volume of recharge and how fast it enters groundwater depends on climate, aquifer depth, the types of plants that use water from the soil and the types of soil and rock through which the water must pass.

Surface and groundwater extractions

About 92 per cent of the water extracted for towns, industry and agriculture in Gippsland is sourced from waterways, with about 8 per cent sourced from groundwater and a very small proportion drawn from alternative sources such as stormwater and recycled wastewater (see Figure 2.3).

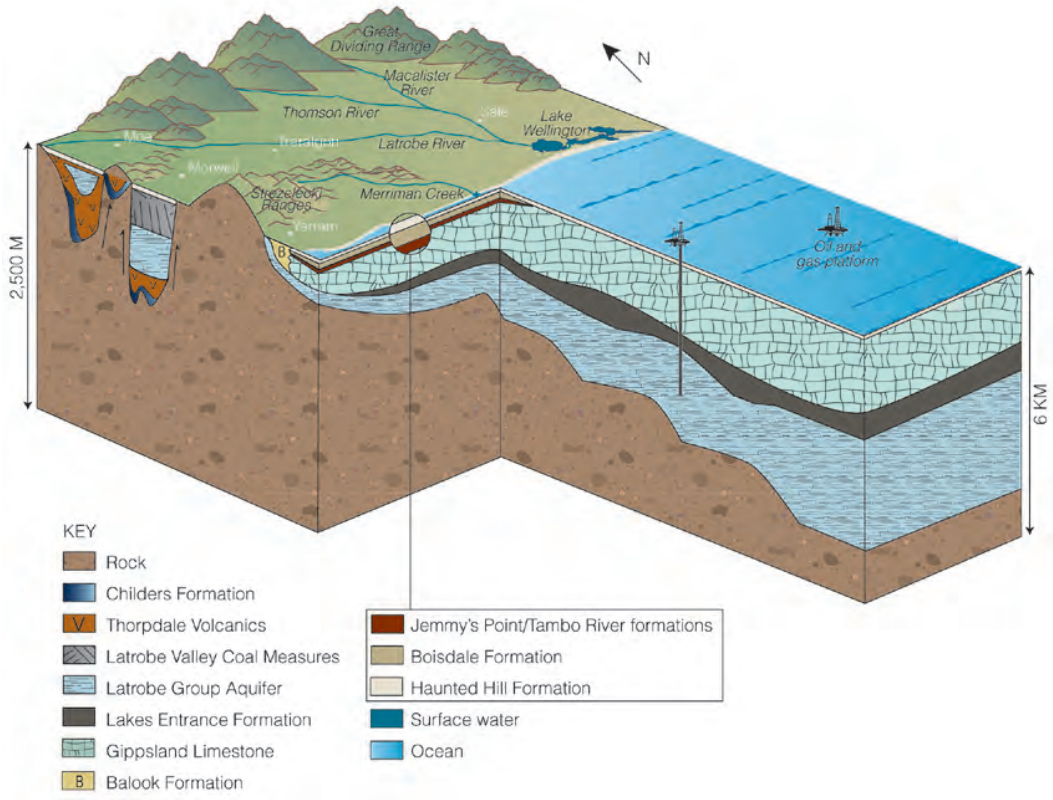
There are about 162 GL of licensed groundwater entitlements in Gippsland. In any managed groundwater area, the licensed entitlement is capped at the permissible consumptive volume (PCV). The total PCV for Gippsland is about 175 GL (see Appendix 3).

Records based on the climate of the past 50 years show that there is an average of about 7,000 GL a year of surface water in Gippsland. Surface water availability varies considerably across the region and between different years and seasons. Environmental water makes up about 72 per cent of Gippsland's surface water flows; about 27 per cent is available for consumption, and there is a small amount of unallocated water (see Figure 2.4 and Appendix 3).

Figure 2.4 shows the annual average volume of surface water available for consumptive water use and the environment based on long-term annual averages of about 50 years. These estimates reflect the maximum that can be taken where as actual use varies between summer and winter and between wet and dry years.

Urban and industrial entitlements account for about 180 GL, excluding diversions to Melbourne. Most irrigation water in Gippsland is used within the regulated Macalister Irrigation District (MID), although irrigation from unregulated waterways occurs across much of Gippsland. The water provides environmental benefits before its point of extraction for consumptive use. For example, most of the Macalister catchment is upstream from Lake Glenmaggie where natural flows provide high environmental benefits before the water reaches the MID.

Figure 2.2 Example of groundwater systems in Gippsland



Gippsland's water resources now, and in the future

Gippsland is one of the few regions in Victoria that has some water still available for new allocations. This water is in parts of the South Gippsland, Mitchell, Tambo and Nicholson and East Gippsland basins and an unallocated share of Blue Rock Reservoir exists in the Latrobe Basin. Groundwater is also available for allocation in some areas.

Alternative sources

The main alternative water sources include rainwater collection, recycled water, stormwater and desalination. These types of water can be used provided the quality is appropriate (that is, 'fit-for-purpose'). Use of these water sources can help reduce reliance on water from rivers, reservoirs and groundwater.

Alternative water sources are becoming increasingly important in Gippsland and throughout Victoria in response to prolonged drought. Examples include the construction of a wastewater recycling plant in the Latrobe Valley (the Gippsland Water Factory) and urban stormwater harvesting projects.

2.1.2 How Gippsland's water is used now

Agriculture, towns, cities and industry are all major water users in Gippsland. Water plays an important role in supporting the region's many social, economic, environmental and cultural values (see Figure 2.5).

Use of water by households, irrigation and industry

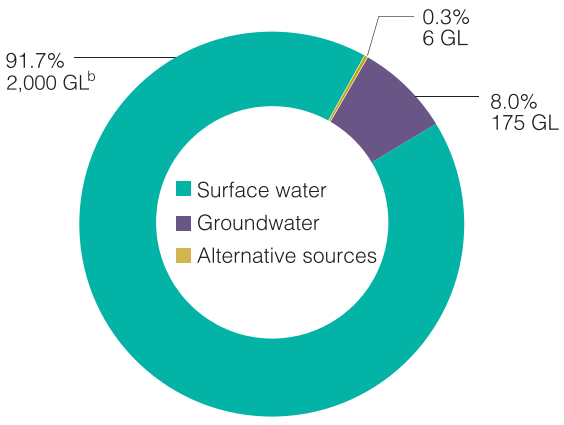
Water use in urban systems

Urban water supply in Gippsland is characterised by a mix of interconnected and smaller standalone systems. These systems service the dispersed population in the towns. Gippsland Water's Latrobe system is the largest urban water supply system in the region, and includes a large component of power generation and industrial use.

Some supply systems have relatively small storages, for example in South Gippsland, that rely on consistent winter inflows to meet demand the following summer. Low winter inflows experienced in some recent years have made it difficult to supply summer demand in these systems.

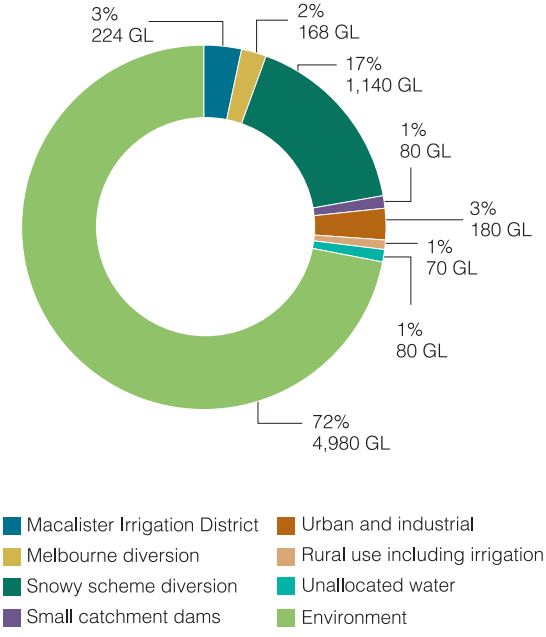
Water for urban systems is sourced primarily from rivers but some urban centres, including Sale, draw on groundwater for their supply. Groundwater systems may provide important reserves of water that can be used for urban supply when bushfires reduce water quality or when drought reduces the availability of surface water.

Figure 2.3 Proportion of water that can be extracted from different sources[a]



Notes:
a Figures are average annual estimates, based on long-term modelling, and include unallocated surface water and groundwater.
b Includes the Snowy Mountains Hydro-electric scheme diversion (in NSW) and Thomson diversion to Melbourne.

Figure 2.4 Average annual amount of water available for different uses[a]



Note:
a Figures are average annual estimates based on long-term modelling

Water use by agriculture

The main agricultural industries in Gippsland are dairy, grazing and meat production, forestry and vegetable production. The dairy industry is the highest value agribusiness industry in the region, producing one-third of Victoria's and 23 per cent of Australia's dairy production. Gippsland has a significant grazing and meat processing industry based predominantly on beef, but also wool and prime lamb production. In many areas of Gippsland, these agricultural industries depend on rainfall for their water needs. In other areas, irrigation is used to supplement rainfall using water extracted from rivers, groundwater, farm dams or recycled water sources.

The Macalister Irrigation District (MID), centred in Maffra, is the only regulated irrigation district in Gippsland, and is the largest irrigation area in southern Victoria. The main agricultural industry in the MID is dairy production. Southern Rural Water supplies irrigation water to the MID from the Macalister River harvested at Lake Glenmaggie, and the Thomson River at Cowwarr Weir. The river flats of the Latrobe, Avon, Mitchell and Snowy rivers and the Thorpdale area are also irrigated.

The Gippsland forestry industry encompasses a wide variety of operations, from Australia's largest pulp and paper mill to many small hardwood mills, and makes a significant economic contribution to Gippsland.

Water use by the power industry

Brown coal located in the Latrobe Valley is used to generate about 90 per cent of Victoria's electricity. The existing power generation plants require large volumes of lower quality water for cooling, as well as a small volume of high quality water for their boilers and on-site water use.

Gippsland Water supplies almost all the surface water for power generation companies at Morwell (Energy Brix) and Hazelwood (International Power). Gippsland Water also meets the high quality water needs at Yallourn (TruEnergy), Loy Yang A (Great Energy Alliance Corporation) and Loy Yang B (International Power/ Mitsui), but these companies pump their own lower quality cooling water from the Latrobe River.

Water entitlements in the Latrobe system provide power generators with a proportional share of the storage capacity of, and inflows to, Blue Rock Reservoir and Lake Narracan. Power generators' water entitlements do not guarantee a minimum annual volume so they must manage the risks of drought within their individual shares. Surface water use for power generation is typically about 95 GL per year. The Jeeralang gas power plant uses a minimal amount of water.

Yallourn, Morwell and Loy Yang A power generation companies also hold licences to pump about 45 GL per year of groundwater to drain and stabilise their open-cut coal mines. In recent years the volume of groundwater extracted has been up to about 30 GL per year.

Figure 2.5 Why Gippsland depends on water

Agriculture
Agricultural production, sustained by rainfall and supplemented in some areas by irrigation, is a key factor in Victoria's ongoing prosperity.

Towns, cities and industry
Households, businesses and urban communities rely on safe, secure supplies for drinking, washing, maintaining sports grounds and open spaces, and manufacturing and other industrial uses.

Environment
Healthy rivers, wetlands and estuaries are home to important flora and fauna such as black bream, Australian grayling and migratory birds.

Power industry
Brown coal located in the Latrobe Valley is used to generate about 90 per cent of Victoria's electricity.

Indigenous culture
The health of waterways and land remains central to Indigenous culture, particularly significant fish and bird species, plant foods and medicines.

Recreation and tourism
Important recreational activities take place on or near rivers and wetlands, including fishing, water-skiing, boating, camping and picnicking. The resulting tourism supports regional economies.

Gippsland's water resources now, and in the future

The power industry in the Latrobe Valley may be subject to significant changes over the coming years which may, in turn, impact on its water use and water demands. Examples of changes that could influence the water demands of the power industry include end-of-life mine closures, the introduction of a price on carbon emissions, and any improvements in carbon capture and sequestration technologies. These changes could lead to water being shifted between industries.

Extractions from aquifer systems for oil and gas production

Offshore oil and gas produced from the Gippsland Basin is an important natural resource in the region. It provides 20 per cent of Australia's crude oil requirements and a significant proportion of gas for other States.

Oil and gas is generally produced from the same geological formation, the Latrobe Group aquifer, which is used by some groundwater users onshore. Wells are drilled into the aquifer up to 100 km from the coast to enable the production of oil and gas. Saline groundwater is produced as part of the process, which is then discharged into the sea near the oil platforms. As oil, gas and water are extracted from the aquifer, the pressure in the aquifer decreases causing onshore groundwater to move to replace the extracted volumes. The level of connection between different parts of the aquifer is not uniform, so the impact of extractions in one location is not the same as the impact of extractions in another location.

The effective volume of oil, gas and groundwater extracted offshore is estimated at 100 GL per year since the early 1990s.

Water available for the environment

The environmental water reserve (EWR) is the term used to describe the water set aside by law to meet environmental benefits. The Snowy and Thomson are the only rivers in the region that have explicit volumetric environmental entitlements. These entitlements allow water to be held in storages for environmental purposes. Environmental water in all other river systems is provided by passing flow conditions on bulk entitlements, minimum flows set by Southern Rural Water and flows above consumptive caps. However, it is important to note that all water remaining in a river system contributes to the water available for supporting environmental values.

The regulated river systems (Latrobe, Thomson, Macalister and Snowy) have reduced flows due to water extraction. Most of the rivers in South and East Gippsland have no significant level of flow regulation and relatively low levels of consumptive use, making nutrient run-off, erosion and loss of riparian vegetation the main issues threatening the environmental health of these systems. However, some consumptive water use pressures still exist in these systems from the impact of water captured in private dams and increased water interception from land use changes.

Gippsland is particularly rich in estuaries and inlets, including Corner Inlet and the Gippsland Lakes system, which are both listed as being of international importance (Ramsar-listed). The opening of the channel at Lakes Entrance more than 100 years ago allowed the intrusion of seawater into the Gippsland Lakes system. The artificial opening dramatically changed the interchange of saltwater and freshwater, transforming what was once a predominately brackish-freshwater lake and marsh system to an estuarine environment. The environmental health of these estuaries and inlets is partly influenced by the quantity and quality of water flowing into them.

The water needs of groundwater dependent ecosystems are protected by managing the amount of groundwater extracted and the impacts on groundwater levels.

Water for recreation and cultural values

The region's recreation and tourism industries rely on the benefits provided by a healthy environment and sustainable use of water resources. Gippsland has a diverse tourism industry, both natural and cultural. It includes rivers, lakes, parks, mountains and coastlines, and attracts beach lovers, bushwalkers, skiers, boating and fishing enthusiasts and day-trippers. About four million tourists visit Gippsland per year (including daytrip visits), making the industry an important economic asset to the community[2].

Water holds a significant place in Aboriginal culture and is generally considered the source of cultural heritage. Water is intimately linked to the health of Country and life and Traditional Owner groups each have responsibility and obligations under their Lore and custom to protect, conserve and maintain the environment and the ecosystems in their natural state to ensure the sustainability of the whole environment.

Many Indigenous cultural sites in Gippsland are located on or near waterways, and streams and water bodies are still important sources of food and medicine. Waterways are important meeting places for families and communities for cultural, social and recreational activities. Access to healthy waterways is vitally important for these activities.

Boats at Lakes Entrance, Tourism Victoria

2.2 Drought, climate risk and variability

Gippsland faces a range of pressures on its water resources, and these pose a risk to the availability of water in the future. Drought presents the most significant risk to Gippsland's future water availability.

2.2.1 Recent climate extremes – the past 14 years

The past 14 years have been exceptional – the recent prolonged drought from 1997 to 2009 was the worst in recent memory. It was followed by wetter than average conditions and severe floods in western and northern Victoria.

The recent drought

The recent drought began in late 2006 and ended in early 2010. In most of Gippsland, every year from 1997 through to the end of 2009 recorded less rainfall than the long-term annual average. Figure 2.6 shows rainfall over the drought.

Victoria has experienced periods of below average rainfall before, notably in the mid-1890s to early 1900s (the Federation drought) and from the mid-1930s to mid-1940s (the World War 2 drought), but the average rainfall reduction from 1997 to 2009 was greater than during these earlier droughts. This recent drought was also the longest on record, and there were no wet years to replenish depleted soil moisture reserves and offset the dry years.

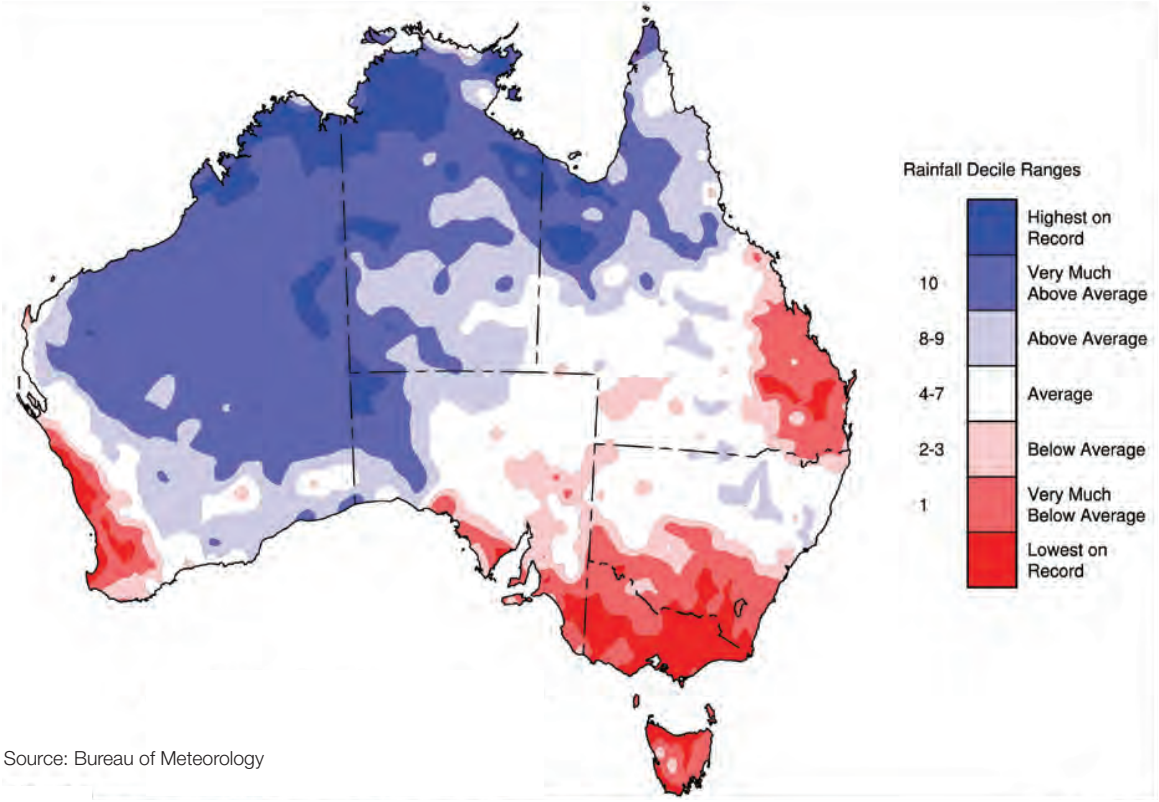
In addition to the length and severity, the recent drought is unusual historically because of the shift in the seasonality of rainfall, with the biggest decreases in rainfall occurring in autumn, followed by spring and winter. The reduction in autumn rainfall meant that the catchments tended to be drier at the beginning of winter, which resulted in relatively less run-off from winter and spring rainfall.

Along with reduced rainfall, temperatures were above average across Victoria from 1997 to 2010 (see Figure 2.9, page 24), which compounded the impact of reduced rainfall and exacerbated the drying of the landscape. Increased temperatures also led to increases in crop water demands and a greater risk of bushfires.

A return to average and wetter conditions – 2010 to mid 2011

In contrast to 1997 to 2009, 2010 was the fifth wettest on record in Victoria and the summer of 2010/11 was the wettest in Victoria since records began. Almost two-thirds of the State received rainfall totals very much above the long-term average in 2010, and the statewide rainfall total for 2010/11 was more than double the long-term average and more than 25 per cent above the previous record high, set 100 years ago in 1910/11[3].

Figure 2.6 Rainfall over the recent drought (1 Oct 1996 – 31 Jan 2010) in the context of the historical record[4]



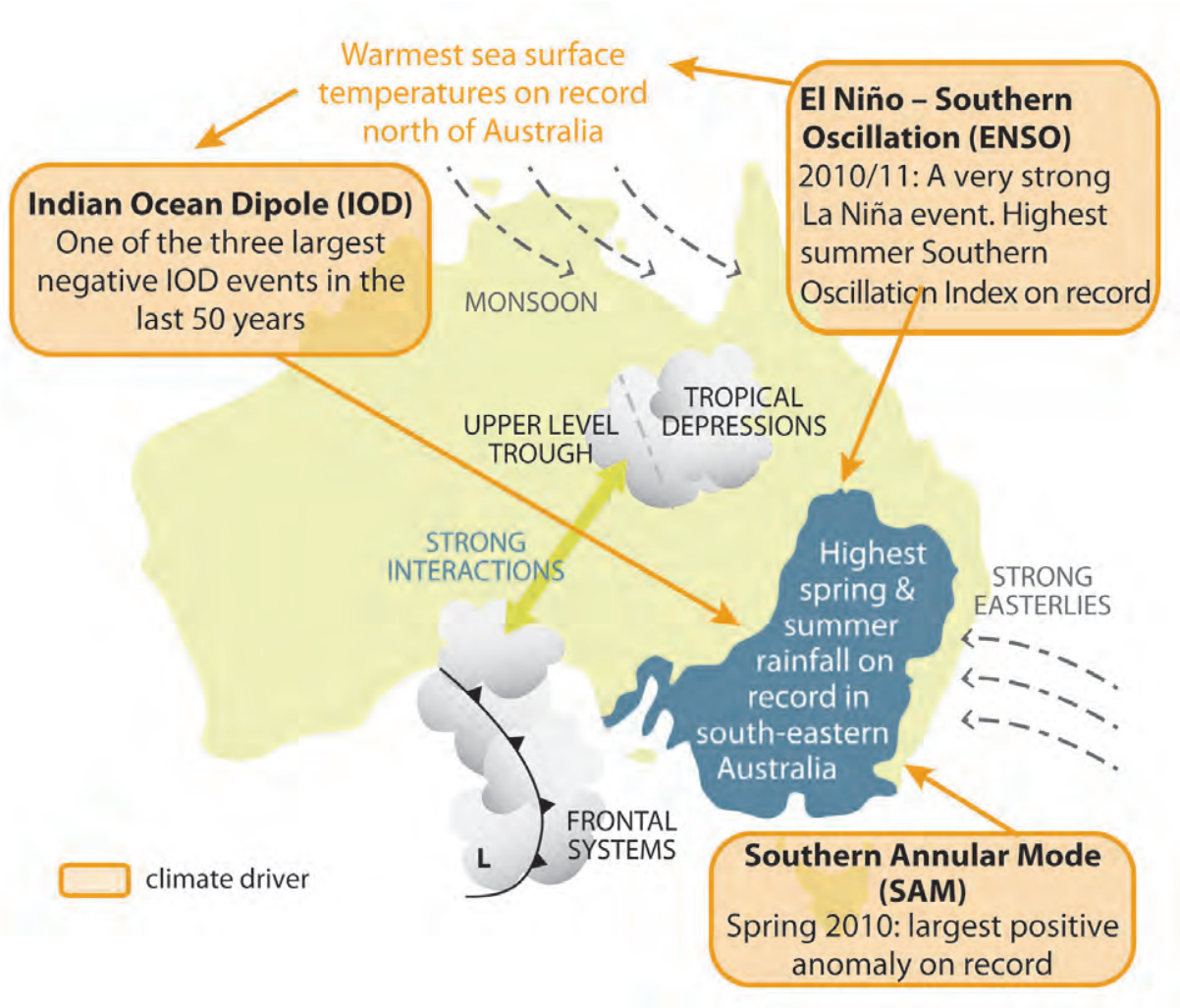
Source: Bureau of Meteorology

What has caused the recent high rainfall[5]?

Persistent wet conditions in the second half of 2010 and early 2011 resulted from a combination of the 'wet' phases of the three large-scale drivers of climate variability known to influence the year-to-year variability of rainfall in south-eastern Australia –the El Niño Southern Oscillation (ENSO), the Indian Ocean Dipole (IOD) and the Southern Annular Mode (SAM) (see Figure 2.7 and Appendix 4).

Sea surface temperatures in the tropical waters around northern Australia were the highest on record, providing a source of tropical moisture which penetrated into Victoria. One of the strongest La Niña events (the wet phase of ENSO) on record occurred in 2010/11. La Niña events are typically associated with above average rainfall over much of eastern Australia, although a few La Niña events during the recent drought did not bring significant rainfall to Victoria. The impacts of the strong La Niña event in 2010/11 were exacerbated by one of the largest negative IOD events (the wet phase of the IOD) of the past 50 years. This created conditions conducive to the formation of north-west cloudbands and contributed to the high spring rainfalls. In addition, SAM reached record positive values in late spring and early summer of 2010 resulting in moist on-shore easterlies.

Figure 2.7 Influences contributing to high rainfall in spring and summer 2010/11[6]



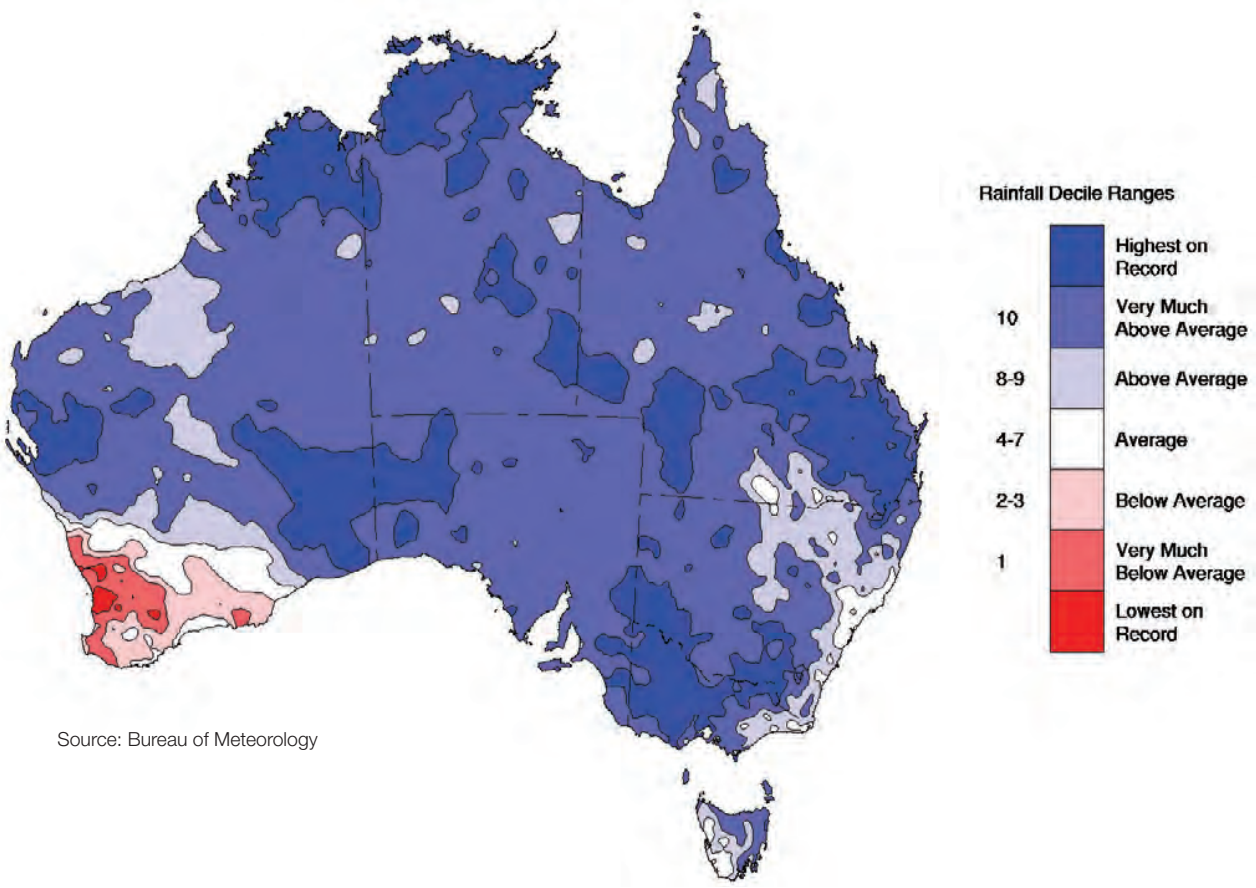
Together, these influences resulted in more frequent and intense low pressure systems and much cloudier and more humid conditions than usual, resulting in very much above average rainfall across much of south-eastern Australia (see Figure 2.8).

A diagram describing these key influences on Victoria's climate is presented in Appendix 4.

Moist air moved into the region from the north-west, rather than from the south-west as it normally would as part of frontal systems associated with low pressure systems embedded in the westerly wind belt. It brought severe flooding throughout the region.

While any one event (or sequence of events such as occurred in 2010/11) cannot be attributed directly to climate change, around the globe there has been an increase in the frequency of extreme weather over recent decades, and this trend is consistent with what can be expected in response to human-induced climate change[7].

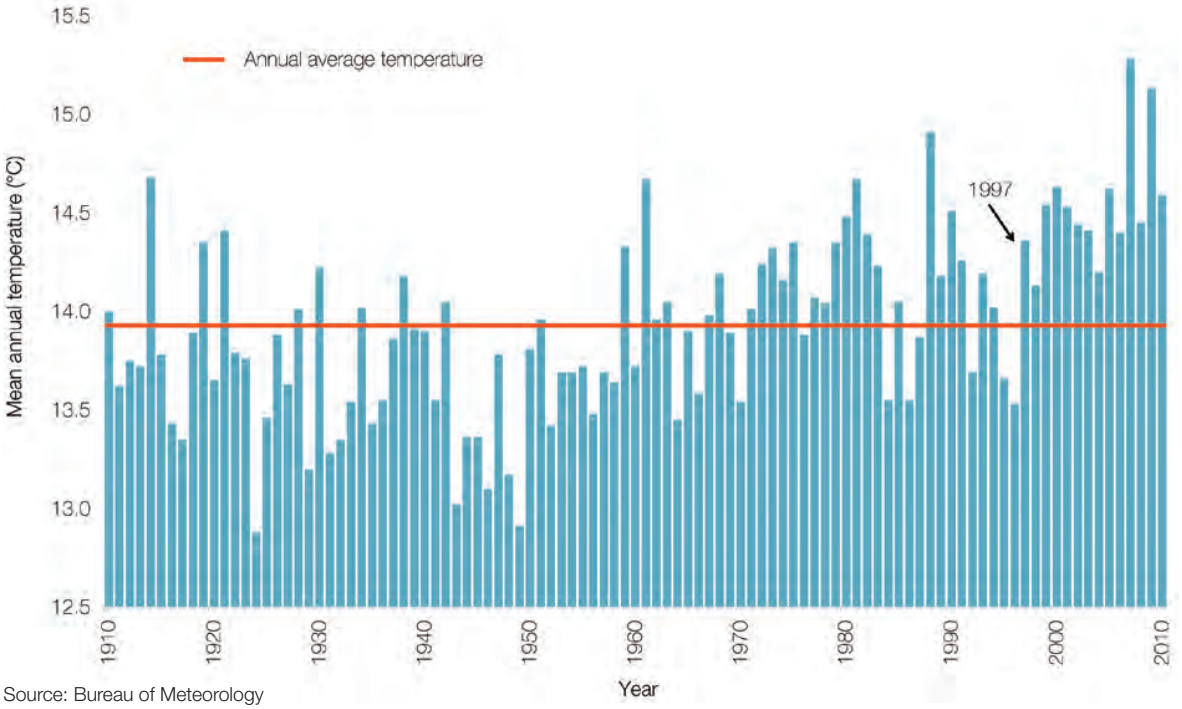
Figure 2.8 Rainfall for the period August 2010 to April 2011



Source: Bureau of Meteorology

Gippsland's water resources now, and in the future

Figure 2.9 Annual mean temperature in Victoria



Source: Bureau of Meteorology

Although Gippsland did not receive as much of the recent rain as other parts of Victoria, rainfall has matched the long-term average across Gippsland, with some areas above average, particularly in west and south Gippsland. Flooding has occurred in some catchments, including at Wilsons Promontory in March 2011 where 370 mm of rainfall in 24 hours resulted in extreme local flooding, landslips and damage to infrastructure.

Flood debris, Tidal River, Parks Victoria

Lessons from the past 14 years

Several important lessons have been learned in the region from experiences over the past 14 years. Water supplies across Victoria were tested during the recent drought, particularly during very dry years such as 2006. Many of the region's communities and farms suffered greatly during this time but many have proven resilient and are recovering from these hardships. Communities, farmers, industry, environmental water managers and water corporations needed to deal with the dry conditions, with many investing in improvements to water supply reliability or water use efficiency.

Many emergency actions were undertaken including:

- South Gippsland Water implemented emergency supply measures in addition to enforcing long periods of Stage 4 restrictions when some town supplies were threatened by particularly dry conditions in 2006.
- Some power generators in the Latrobe Valley bought water from the Government-owned share of Blue Rock Reservoir in 2006, when their ability to source their own cooling water was restricted.
- East Gippsland Water had to treat water from the Mitchell River in February 2007, after the 2006/07 bushfires and subsequent flooding caused extremely high suspended sediment concentrations in the river.

The recent floods in parts of Victoria have shown the importance of continuing to maintain and strengthen emergency planning and responses, as well as ensuring that careful long-term land use planning is undertaken in flood-prone areas. In response to the floods across parts of Victoria in the summer of 2010/11, the Government began a review to examine aspects of flood response and recovery, emergency warnings and evacuations, led by Mr Neil Comrie AO APM. The review findings will help guide the Government's response and planning to ensure Victoria is better equipped to deal with similar severe flooding in future. In addition, the Department of Sustainability and Environment is reviewing and updating the Victorian Flood Management Strategy.

The climatic conditions experienced over the past 14 years highlight the need for water users to be able to adapt to changing water availability and use tools to help them respond effectively to prolonged dry conditions as well as wet periods. The actions and policies in this Strategy aim to achieve this.

2.2.2 Changes in climate over the longer term

The global climate system is warming, as is now evident from observations of increases in global average air and ocean temperatures, and rising global average sea level[7]. A range of recent reports taking into account published research since 2007[8] highlights that the observed changes appear to be at the more severe end of predictions made by the Intergovernmental Panel on Climate Change in 2007[7].

Global average surface temperature has risen by 0.74°C over the past century, and global ocean temperatures have risen by about 0.7°C over the past 120 years, rising by 0.10°C between 1961 and 2003 (to a depth of 700 metres). As water warms, it expands in volume. This thermal expansion of the ocean was the major cause of sea level rise in the 20th century. Globally, sea levels rose an average of 1.7 millimetres per year during the 20th century, and 3.4 millimetres per year from 1993 to 2007[9]. Erosion-prone areas along Gippsland's coast will be particularly susceptible to impacts from sea level rise, such as Corner Inlet and the Gippsland Lakes.

Increasing global average temperatures and subsequent sea level rise in response to increasing levels of greenhouse gases are likely to continue. Although it is difficult to predict how rainfall patterns may change at a particular location, climate scientists predict that over the long term the mid-latitudes (which include Victoria in the southern hemisphere) are likely to become drier[7].

Climate scenarios to inform long term planning in this Strategy

While our understanding of the potential impacts of climate change on future water availability will continue to improve over time, uncertainty about future rainfall means that we need to be prepared for a range of future climate conditions. This Strategy considers several possible future climate scenarios to better understand how its policies and actions can deal with this uncertainty (Table 2.1). This allows the risks to water supplies, under a range of possible future climates, to be considered in the long-term planning of Victoria's water resources.

The baseline scenario, which assumes that the long-term climate experienced to date will continue, provides a basis for comparison with the other scenarios. Scenarios A, B and C are based on a range of future climate projections derived using models of the global climate system. Scenario D is identified for risk management purposes, to help water users and environmental managers consider the risks associated with returning to drought conditions, similar to those experienced between 1997 and 2009.

Streamflow reductions in response to rainfall reductions are typically magnified by a factor of about 2.5 to 3.0 – for example, a 10 per cent reduction in rainfall would generally result in a reduction in the order of 25 to 30 per cent for streamflow. This is mainly because the vegetation in the catchment is still trying to use what water it needs, and it is only what is left over that drains to waterways. However, in the recent drought, the impacts were generally larger, reflecting the consistently below average annual rainfall and also changes in the seasonal distribution of rainfall.

The potential impact of each scenario on the streamflow of the region's river basins has been modelled (Table 2.2). The modelling indicates a reduction in long-term annual average streamflows compared with historic conditions. As well as changes in average streamflow, the intensity of storms may be greater under different climate scenarios and variability from year to year may increase.

Table 2.2 shows that the under the medium climate change scenario (Scenario B), reductions in streamflow throughout the region would range from about -15 to -26 per cent. Under the high climate change scenario (Scenario C), reductions in streamflow would be lowest (-35 to -37 per cent) for the Latrobe, Thomson, Macalister, Avon, Mitchell, and East Gippsland basins, with reductions of -40 to -42 per cent projected for the remaining basins.

Streamflows experienced during the 1997 to 2009 drought were substantially less than the modelled streamflows for the high impact climate scenario at 2060. During the drought, the Avon Basin experienced the largest average annual flow reduction (-55 per cent), with the lowest reduction for the East Gippsland Basin (-33 per cent).

Table 2.1 Future streamflow scenarios

Baseline	**Historic conditions**	Long-term average, based on the long term streamflow record. The length of record varies for each system according to available data.
Scenario A	**Potential low impact scenario**	Low end of predictions using CSIRO 2011 estimates – 'Wet' CSIRO 2011 projection
Scenario B	**Potential medium impact scenario**	Middle of the set of predictions using CSIRO 2011 estimates – 'Median' CSIRO 2011 projection
Scenario C	**Potential high impact scenario**	High end of predictions using CSIRO 2011 estimates – 'Dry' CSIRO 2011 projection
Scenario D	**1997 to 2009 drought conditions**	A return of the dry conditions of the 1997 to 2009 drought.

Although the potential impacts of climate scenarios on groundwater are difficult to predict, some general observations can be made about how groundwater systems might respond to rainfall scenarios:

- Groundwater systems most at risk are unconfined aquifers, particularly those with shallow water tables. These systems respond rapidly to droughts and floods, and are most likely to respond rapidly to changes in rainfall.
- Smaller groundwater systems with less water in storage are likely to be more vulnerable because they do not have a storage capacity to buffer changes in recharge.
- Large regional groundwater systems have sufficiently large volumes in storage to buffer the effects of the changes in recharge for some time.
- Confined systems will take longer to respond because of the longer time required for surface water to recharge these aquifers.

If there is a long-term reduction in rainfall, it will affect communities, industry, agriculture, and environmental values. Impacts would vary, and may be felt by some water users more than by others. For example, in surface water systems with large storages, spills from storages would be expected to reduce by a greater amount than would consumptive use from the storages. However, in catchments that do not have large storages, access to water for consumptive uses may reduce more due to a greater frequency of pumping bans during more frequent low-flow periods.

The Bureau of Meteorology provides short-term seasonal climate forecasts of climatic conditions over the coming three to six months. These forecasts can inform decisions on water availability over the short term, and can be found at: www.bom.gov.au/climate/ahead/.

In addition to climate risks, other risks to water availability presented in the following sections may place water supplies under additional pressure, and may potentially interact with the climate risks.

Table 2.2 Projected potential streamflow impacts for each river basin under four climate scenarios[a]

River Basin	A Low (%) 2060	B Medium (%) 2060	C High (%) 2060	D 1997 to 2009 drought[b] (%)
South Gippsland	-9	-23	-40	-41[c]
Latrobe	-8	-26	-37	-43
Thomson	-5	-23	-35	-43
Macalister	-5	-23	-35	-40
Avon	-5	-23	-35	-55
Mitchell	-3	-20	-36	-38
Tambo and Nicholson	5	-20	-42	-44
Snowy	21	-18	-40	-49[d]
East Gippsland	22	-15	-35	-33[e]

Notes:
a Scenarios A, B and C are relative to the long-term average (ie. the full historical record up to and including 2010). These scenarios are taken from projections provided to DSE by the CSIRO as part of the SEACI research program.
b Reduction of average annual inflows when comparing pre-July 1997 average inflows with inflows over the recent drought.
c Scenario D for Bass, Powlett, Tarwin, Agnes and Tarra systems only. Data sourced from resource allocation modelling.
d Scenario D calculated from gauged data at Jarrahmond (gauge 222200).
e Scenario D for Bemm, Betka and Cann rivers only (calculated from resource allocation modelling).

Understanding Victoria's key climate drivers

The Department of Sustainability and Environment is a participant in the South East Australian Climate Initiative (SEACI). The SEACI research program was established in 2006 to improve scientific understanding of the key drivers influencing the climate of south-eastern Australia over a range of timescales. Research for the SEACI research program is undertaken by scientists within the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Meteorology.

The SEACI research program has led to improved understanding of the behaviour of El Niño – Southern Oscillation (ENSO), the Indian Ocean Dipole (IOD) and the Southern Annular Mode (SAM) and their associated impacts on rainfall – both in isolation and in their various combinations. These drivers will continue to influence year-to-year variability in rainfall across south-eastern Australia. However, while these were responsible for the floods in 2010/11, SEACI research has found that these large-scale drivers of variability cannot explain the observed decline in rainfall during the recent drought.

Rather, SEACI research has found that the key factor influencing the recent rainfall decline in south-eastern Australia is a rise in atmospheric pressure across southern Australia associated with an intensification of the sub-tropical ridge (a belt of high pressure about 30 degrees south). This intensification of the ridge shifts south the cold fronts and low-pressure systems that used to bring reliable rainfall to south-eastern Australia. The intensification of the ridge has been found to account for about 80 per cent of the observed reduction in rainfall during the recent drought.

The intensification of the ridge has been shown to be linked to observed changes in the large-scale circulation of the atmosphere which effectively mean that the tropics are expanding. Research has shown that these changes in the global circulation (and hence the changes in the sub-tropical ridge), are linked to global warming. This means that global warming is likely to have contributed to the recent drought in south-eastern Australia. However, natural variability will also have been a contributing factor. SEACI research shows that these trends in the global circulation are expected to continue. As a result the sub-tropical ridge is expected to continue to intensify and move further south.

The observed changes in the hydroclimatic data during the recent drought may therefore indicate the beginnings of a shift in the climate for south-eastern Australia in terms of a reduction of our late autumn/winter rainfall. A similar shift in climate was experienced at the beginning of the 1970s in south-west Western Australia. This shift has been linked to global warming and a range of other factors.

The SEACI research has also:

- developed improved projections of climate change, which indicate an increasing risk of below average rainfall and run-off for south-eastern Australia over the longer term;
- shown that short-duration storms may become more intense across the region, especially over the inland plains; and
- developed improved seasonal forecasts of rainfall and streamflow.

Through SEACI, the Department of Sustainability and Environment is contributing to further research to better understand Victoria's climate drivers in the short and medium term. The ongoing research will be important in advancing our understanding of whether, and to what extent, further rainfall declines can be expected.

A synthesis report describing the first three and a half years of research under SEACI can be found at www.seaci.org, and more recent research results can be found on the same website in the 2009/10 Annual SEACI Program Report and in the fact sheets.

A diagram showing the key influences on Victoria's climate is presented in Appendix 4.

Different Draft Strategy submission views on climate risk and variability:

"Much of the Draft Strategy is based on the assumptions that climate change predictions will mean much less water will be available in Gippsland over the next 50 years. Many people in the community are having difficulty subscribing to this point of view in light of recent rain events…"
– Draft Strategy submission 017

"The [Strategy should] lay the groundwork to address the disproportionate impacts of climate change and low inflows on waterway health."
– Draft Strategy submission 079

"The whole document seems to deal with radical climate change scenarios… Over time various climate phases of both drier and wetter periods have been experienced and discussed. The wetter and drier periods have lasted from months to years. Therefore the document should deal more with climate cycle than climate change."
– Draft Strategy submission 023

2.3 Other pressures on water resources

In addition to climate risk and climate variability, Gippsland's water resources and river and wetland health are under pressure from factors including:

- population growth;
- changing industrial water needs;
- water to produce our future food and fibre needs;
- increasing domestic and stock water use;
- land use change;
- declining groundwater levels in the Latrobe Group aquifer;
- emerging groundwater and mining technologies;
- bushfires;
- point source pollution;
- agricultural run-off and streamside grazing;
- land salinisation;
- saltwater intrusion; and
- acid sulfate soils.

This Strategy considers these pressures and challenges to water availability. Actions and policies to respond to these pressures are presented throughout the remaining chapters of this document.

In addition to these direct pressures on water resources, external pressures will influence the future of Gippsland, for example, global commodity prices and energy prices.

2.3.1 Population growth

A growing population means that households and industry in the region's towns and cities will require more water. Gippsland's population of about 225,000 is expected to increase to about 310,000 by 2056[10]. Strong population growth is predicted in areas closer to Melbourne, most notably along the Bass Coast and around Warragul. Strong population growth is also predicted in Bairnsdale and tourist centres such as Lakes Entrance.

The challenge is to ensure sufficient water is available to supply the increasing population in a sustainable way. The urban water corporations are implementing actions to ensure that water supplies will continue to meet residential demand into the future, taking into account the predicted rate of population growth and the amount of water each person uses.

2.3.2 Changing industrial water needs

The Latrobe Valley is home to brown coal generators that provide about 90 per cent of Victoria's electricity supplies, and Australian Paper's Maryvale mill.

The five coal-fired power stations are the largest users of water in the Latrobe Valley. Most of this water is used as part of the cooling process where heat is a by-product of electricity generation.

The future water needs for power generation and other large industry in the Latrobe Valley are uncertain. A price on the emission of greenhouse gases may reduce the amount of electrical energy produced by coal power, leading to a reduction in the volume of water required by the power generators. However if, for example, carbon capture and storage technologies become commercially viable this could lead to increased demands for water associated with electricity generation from coal. Other new industry that could develop in the Latrobe Valley may also require significant volumes of water.

2.3.3 Future food and fibre needs

Future agricultural production in Gippsland will be influenced by a range of factors, including commodity prices and access to markets. Reliable and secure access to water will continue to be important for agricultural producers, particularly with increases in climate variability. Food and fibre production from the region will continue to be important, with future food security an issue for all levels of government.

Access to water is often dependent on location – for example, within the Macalister Irrigation District, the infrastructure allows for water to be traded and moved between irrigators. But in unregulated surface water catchments and groundwater systems, the lack of infrastructure reduces the locations between which water can be traded.

Although the amount of water available for irrigation and agricultural needs is limited, the region will need to be flexible to adapt to changes in the types of crops grown and where they are grown.

Opportunities to increase the value of primary production include investment in the efficiency of water delivery and use, and options to improve reliability through trade or investment in off-stream storages.

2.3.4 Increasing domestic and stock water use

Historically, the amount of water harvested for domestic and stock purposes from farm dams, waterways and groundwater bores was relatively low compared with the total amount of water available. However, the demand for this water can be significant at a local level, placing stress on local water resources and reducing availability for other users and the environment.

Growing populations, rural subdivisions and fluctuating water availability as a result of climate variability are increasing the demand for domestic and stock water. As rainfall and run-off decline, a greater proportion of available water is captured by farm dams.

Domestic and stock use is a significant water use that remains outside the allocation and licensing framework. Currently, a person has the right to take and use water flowing or occurring on their land if that water is not in a waterway and provided it is for domestic and stock use. A person also has a right to take and use water from a groundwater bore for the same purpose.

Windmill, Bruce Cumming

2.3.5 Land use change

Land use change has the potential to impact significantly on water resources. For example, a shift from pasture to plantations or crops, or the reintroduction of native vegetation can affect the water balance of a catchment by intercepting water that would otherwise become part of the surface water or groundwater resources.

Over the past five years progress has been made in quantifying the impacts of various land use changes on water resources across Victoria.

2.3.6 Declining groundwater levels in the Latrobe Group aquifer

Groundwater levels are generally stable across Gippsland. The main area where falling groundwater is an issue is in the Latrobe Group aquifer, which extends under parts of the Latrobe Valley and Bass Strait.

Falling groundwater levels in the Latrobe Valley

Groundwater is extracted by power stations in the Latrobe Valley to dewater mine pits to ensure safe operating conditions for coal mining, and for process water in mine operation and power generation. As a result, water levels have declined by up to 90 m along the valley. The groundwater declines are lower away from the mines.

Occasionally land subsidence can result from groundwater extraction. This occurs when the pressure in an aquifer reduces as a result of water extraction and the overlying earth compacts and sinks. Compaction of the coal beds and localised movement of ground has resulted in the ground level dropping by up to 2.4 m near the Latrobe Valley coal mines.

The mine operators must comply with groundwater extraction licence and mine licence conditions which include managing the impacts of draw-down and any associated land subsidence.

Falling groundwater levels in Latrobe Group aquifer

Falling groundwater levels in the Latrobe Group aquifer near the coast have been well documented. Declines have been observed in State Monitoring Bores of up to about one metre a year since the mid-1970s from south-west of Yarram to south-east of Bairnsdale. This has affected farmers in the Yarram area by reducing their access to groundwater and increasing the costs for bore construction, pumps and operating costs (such as power). Falling water levels may be due to several causes, including offshore oil and gas extraction, reductions in rainfall and irrigation use.

Studies undertaken by CSIRO in 2004[11] demonstrated that it is difficult to determine the exact cause of decline in any particular area. For example, in a basin-wide context, extraction of offshore oil and gas is the most significant volume of fluid removed from the aquifer. However, this extraction occurs between 15 to 100 km offshore, depending on the oil and gas field. Consequently, when assessing declines in the Yarram area, it is estimated that the offshore extraction could contribute as little as 30 per cent of observed drawdown or as much as 70 per cent (80 per cent where certain geological conditions may prevail). This demonstrates the complexity of the interaction between different uses of the aquifer, and the difficulty in separating these activities when considering long-term observed trends.

Since the 1990s, concerns have been raised that continuing groundwater declines in the Latrobe Group aquifer could cause the coastal area to subside. More recent studies suggest that the risk of coastal subsidence is low, relative to the greater risks from sea level rise and storm surge intensity[12]. To date, there has been no observable subsidence along coastal areas[13].

2.3.7 Emerging groundwater and mining technologies

Pressures on groundwater resources in Gippsland are increasing, in terms of water availability and aquifer condition. A range of emerging technologies and developing industries that may have significant implications for groundwater include extraction of methane and petroleum products from in-ground coal, carbon capture and storage, geothermal operations and further development of mine dewatering for coal-based initiatives.

2.3.8 Bushfires

Bushfires are a natural occurrence in the Australian landscape, and have an influence on both water quality and quantity. After bushfires, rain can directly affect water quality by washing solids (ash, charcoal and soil) and dissolved materials (nutrients and organic matter) into waterways and reservoirs. The impact of bushfires on water yield (quantity) depends on the type of vegetation involved, the intensity and extent of the fire, and the proportion of a catchment affected.

The potential water impacts of bushfires vary across Gippsland as a result of the different types of vegetation, climate and landscapes. Quantifying the future impact of bushfires is difficult given the unpredictable nature of bushfire events, although it is expected that the frequency and intensity of bushfires is likely to increase if our climate becomes warmer and drier (see Technical Paper 3).

Increases in run-off rates are generally experienced for several years after a fire, due to the reduction in vegetation cover and loss of organic matter in soils. In areas where bushfires result in widespread tree death, significant reductions in surface run-off and groundwater recharge can occur over the longer term (20 to 80 years) during the phase of rapid tree regrowth.

The impacts of bushfires on water quality are normally short term, but can be severe. For example, fish kills can result and town water supplies can be affected if water treatment facilities cannot cope with the additional pollutant loads after a bushfire in the catchment.

The recent bushfires in and around many water supply catchments have highlighted to water managers and the community the impacts and risks in these catchments. Water corporations in Gippsland have also recognised this threat and the increasing need to protect water resources.

2.3.9 Point source pollution

Surface water pollution has the potential to result from point sources such as industrial outfalls or ineffective septic tanks because many of Gippsland's small towns are still not connected to the reticulated waste water system. Groundwater pollution can result from point sources such as poorly constructed groundwater bores or leaking fuel tanks in service stations.

There have been few severe pollution events in Gippsland that have posed a risk to human health or environmental values. The risk reduction strategies adopted by water corporations and industry help to minimise the risk of point source pollution events. If a pollution incident were to occur, the appropriate responses to mitigate the risk to human health or the environment would depend on the nature of the pollution incident but could include actions such as releasing stored water to dilute and flush the system.

2.3.10 Agricultural run-off

Agricultural practices have normally included the application of pesticides and fertilisers. If this practice is undertaken incorrectly, it can have wide-ranging impacts on water resources. Heavy rain and irrigation can mobilise nutrients and wash them into waterways if preventive measures are not taken. Increased levels of phosphates and nutrients entering waterways can result in algal blooms. Algal blooms have undesirable impacts on environmental, social, recreational and economic values of all waterways, especially waterbodies such as the Gippsland Lakes.

Many programs have been introduced to manage agricultural run-off, such as best practice management plans, buffer zones (strips of vegetation along a waterway that intercept nutrients before they enter the waterway) and incentives for dryland farmers to reduce nutrient loads. Well managed reuse systems on irrigated land will intercept nutrients that leave paddocks during irrigation and heavy rain.

A guide for landholders on managing land in drinking water catchments is available at: www.health.vic.gov.au/environment/downloads/protect_waterhealth.pdf.

2.3.11 Streamside grazing along Crown frontages

Stock access to waterways increases erosion and reduces water quality. This is of most concern where stock have direct access to permanently flowing waterways that are used for human water supply or swimming. Removing stock from waterways is a priority to protect river health and drinking water supplies.

Livestock in riparian zones can also have significant detrimental effects on in-stream and bank-side ecology. Elevated nutrient (caused by cattle effluent) and sediment loads (due to stock tramping the river bank) can lead to prolific algal growth, reduced light penetration in the water column and suppression of in-stream processes. Habitats can be smothered by deposited fine sediments and disturbed by animals walking in-stream.

Landholders who want to manage their livestock in ways that minimise impacts on riparian zones and waterways have a range of options including:

- fencing off riparian areas to exclude stock;
- providing alternative stock watering points;
- providing waterway crossings; and
- grazing management.

These programs are facilitated through catchment management authorities' riparian management programs.

2.3.12 Land salinisation

Land salinisation has serious implications for waterway health, water consumption, land productivity, and infrastructure. The 2005 West Gippsland Salinity Management Plan found that about 11,000 ha of Gippsland's farmland is affected by irrigation-induced salinity and about 13,000 ha is affected by dryland salinity[14]. Although less severe than other parts of Victoria, salinisation in Gippsland has been caused by land clearing and inefficient irrigation, which leads to an elevated water table. Salinity has been an issue for the Macalister Irrigation District as well as low-lying areas with naturally high water tables near the coast and the Gippsland Lakes.

Salinity has been a recognised issue in Gippsland since the 1960s and comprehensive salinity management plans are in place[15]. In wet years with high groundwater levels, waterlogging and salinity in the MID is successfully managed by pumping with public and private groundwater pumps and improving surface drainage.

2.3.13 Saltwater intrusion

Excessive extraction of fresh groundwater from aquifers close to salty groundwater systems can reduce water pressure in the aquifer and draw in saltwater. This risk is most prevalent in coastal areas, where fresh groundwater levels decline to a point where seawater is able to infiltrate freshwater aquifers.

Saltwater intrusions can cause groundwater to become too salty for drinking, irrigation and other purposes, as well as degrading environmental values. It can also change the patterns of groundwater flow and discharge in coastal areas, altering the nutrient budgets and salinity of coastal groundwater dependent ecosystems.

Saltwater intrusion caused by groundwater extraction can be controlled by managing pumping rates to maintain groundwater levels and positive groundwater pressure. This includes implementing restrictions and providing buffer zones to maximise groundwater recharge. This approach is applied in the Clydebank area near Lake Wellington and the Yarram area near the coast.

Saltwater intrusion has also occurred as a result of the opening at Lakes Entrance in 1889 which has increased the salinity of the Gippsland Lakes. Salinity levels vary depending on freshwater inflows to the lakes, influencing the ecology of the system.

2.3.14 Acid sulfate soils

Acid sulfate soils contain sulfuric acid or have the potential to form sulfuric acid when exposed to oxygen (for example, through drying or disturbance). Acid sulfate soils have been found in inland areas of south-eastern Australia as the exceptionally dry conditions over the recent drought have exposed wetland sediments in some areas. However, little information exists about the extent of these soils in Gippsland. In a drier climate future, this may become an issue as some wetlands become increasingly dry, with limited options for rehabilitation.

The Department of Sustainability and Environment released the Victorian Coastal Acid Sulfate Soils Strategy in July 2009[16]. The area mapped as having potential effects was along the Gippsland coastline east of the Gippsland Lakes, as well as in Corner Inlet. The strategy aims to protect people, the environment and infrastructure from the harmful effects of disturbing coastal acid sulfate soils.

Actions and policies to address these pressures and threats can be found throughout the remaining chapters in this document.

This chapter presents the Strategy for protecting the future of Gippsland's water resources. The actions and policies within the chapter will help to ensure that the values the Gippsland community obtains from water – recreational, economic, cultural and environmental – can continue into the future.

Protecting Gippsland's water future

Guide to this chapter

3.1 Sharing water resources – finding the right balance

- Balancing consumptive water extraction and the protection of environmental values
- Sharing water between consumptive users
- Reviewing entitlements to account for any long-term changes in water availability
- Supplementary uses of Gippsland's large water storages

3.2 Providing increased certainty for all water users

- Clearly defined entitlement framework with secure rights
- More responsive local management for licensed water extractions
- Providing more security to Section 51 take and use licence-holders
- Improving our understanding of climate
- Building groundwater knowledge

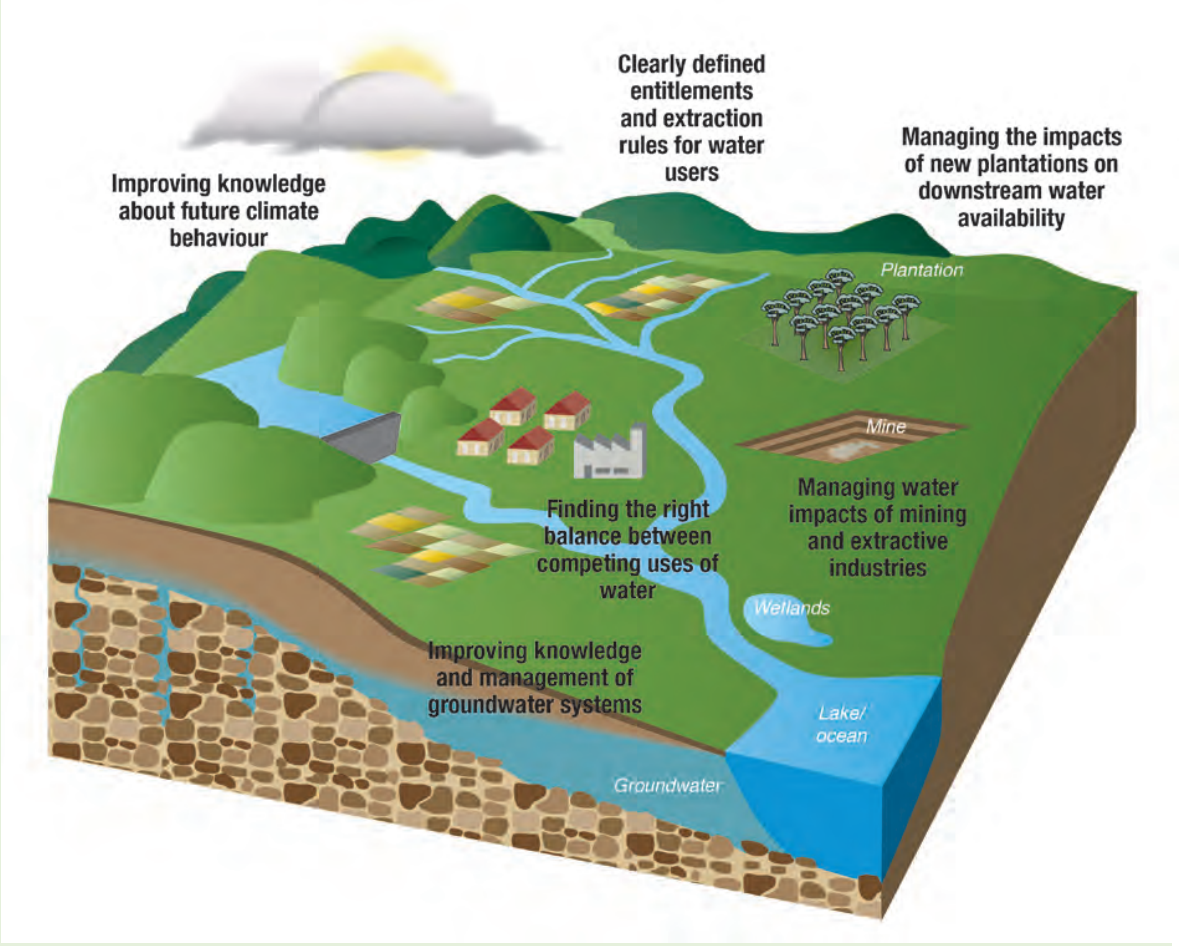
3.3 Strengthening the water entitlement framework

- Monitoring and managing adverse impacts of significant land use change on water availability
- Managing whole groundwater systems
- Managing extractive industries and the impacts of mining on other groundwater users
- Considering water impacts when undertaking planned burning on forested Crown land

Introduction

Actions and policies consider the whole of the water resource, and how water can best be shared between different uses. This includes decisions on how water is shared between consumptive users and the environment (see Figure 3.1).

Figure 3.1 Protecting the future of Gippsland's water resources



3.1 Sharing water resources – finding the right balance

One of the fundamental decisions to be made for the management of Gippsland's water resources is how much water is shared between different uses in the community. This section discusses the issues around sharing Gippsland's water resources, and outlines policies and actions to improve the way in which this is done. This includes policies that describe how new surface water and groundwater entitlements will be allocated.

3.1.1 Balancing consumptive water extraction and the protection of environmental values

Under the *Water Act 1989*, the role of sustainable water strategies is to identify ways to:

- improve and set priorities for improving the reliability of supply for existing and future consumptive users; and
- improve, protect and increase water for the environment.

Unlike most parts of the State where the water available for consumptive use is fully allocated, more water could be made available for consumptive use in some locations in Gippsland. Water that is not extracted for consumptive use provides environmental, recreational and cultural benefits to the community.

The sharing of water between consumptive use and the environment is a key issue for this Strategy. When deciding how to share water resources in Gippsland, we need to be sure that any new water allocations do not over-allocate the resource.

Approach to granting additional consumptive water entitlements

Many locations across Gippsland do not have additional water entitlements available – instead, water entitlements for new users need to be bought (traded) from an existing entitlement-holder.

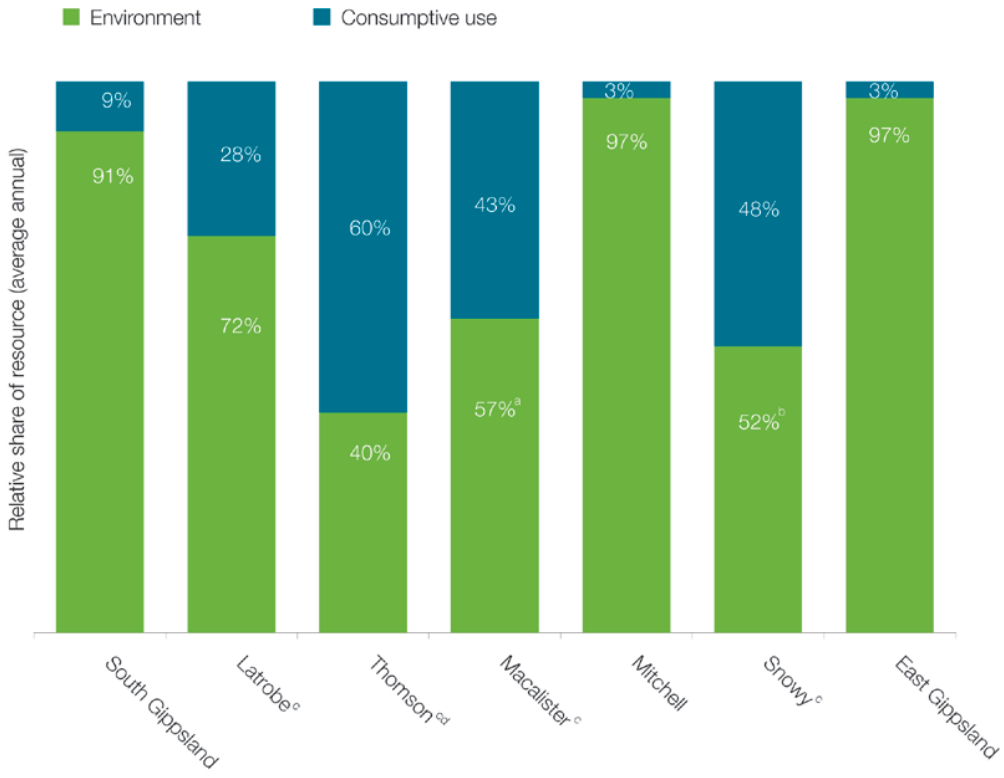
Locations in Gippsland where additional winter-fill entitlements may be available are:

- surface water (winter-fill) in South Gippsland, far East Gippsland (excluding the Snowy), and the Mitchell and Tambo catchments;
- groundwater licences in Moe, Leongatha, Tarwin and Wa De Lock groundwater management areas, with limited availability outside these areas; and
- from Blue Rock Reservoir (where the Government holds a 35.6 per cent share of inflows and storage).

The current balance between water available for consumptive use and for the environment for each river basin is presented in Figure 3.2. It shows that in some of the catchments with large storages in West Gippsland (the Thomson, Latrobe and Macalister), a significant share of the total available water resource is put to consumptive use. The other river basins in South and East Gippsland (except the Snowy) have a relatively small proportion of water extracted for consumptive use.

The percentages shown in Figure 3.2 are based on long-term average annual information, so do not reflect the variability experienced for individual years or seasons. The proportions are calculated for the whole of the catchment, and particular parts of the catchment will have a different proportion of water used for consumption compared with environmental use. For example, upstream of Lake Glenmaggie there is very little consumptive use in the Macalister River catchment.

Figure 3.2 Relative average annual shares of resource set aside for consumptive use, based on long-term climate



Notes:
a End of system flows, downstream of the MID.
b Diversions for consumptive use from the Snowy are primarily for the Snowy Mountains Hydro-electric Scheme.
c Systems with large onstream storages and sections of regulated flow.
d Diversions for consumptive use from the Thomson include diversions to Melbourne.

The numbers shown in Figure 3.2 raise two key questions that were considered as part of developing this Strategy, which were:

- Can more water be made available to the environment within some of the highly utilised western catchments (the Latrobe, Thomson and Macalister catchments)?
- Can more water be made available for consumptive use from some of the catchments in parts of South and East Gippsland, where the level of diversions is generally small?

For groundwater, the balance between water available for consumptive use and water remaining in the aquifer to protect environmental values is more difficult to quantify. This is because there is a need to understand the likely balance over the long term between the volume of recharge going into the aquifer and the volume being extracted to determine whether additional water can be made available. Monitoring groundwater levels within aquifer systems helps to determine whether use is sustainable (see Sections 2.1.1 and 3.2.5).

The average annual numbers shown in Figure 3.2 do not show the variability in streamflow and water availability. The water available at a point in time can vary within a wide range, and often demand for water is greatest when little water is available.

The cost to the community of over-allocating water entitlements can be substantial. Taking a balanced approach to making new allocations will reduce the risk of entitlement buybacks occurring in Gippsland.

A broad range of community submissions were received in response to the principles for allocating new entitlements that were presented in the Draft Strategy, with most submitters supporting the proposed approach to allocating new entitlements.

Chapters 5 to 7 present actions for how new water entitlements can be issued throughout Gippsland, based on Policy 3.1(see below).

The balanced approach will help protect the reliability of supply to existing users and environmental values. It will also enable new allocations to be made as knowledge of the resource improves over time. By applying the principles outlined on page 2, this Strategy provides the flexibility to adapt over time, with volumes to be evaluated again in 10 years as part of its review (see Action 3.1).

Chapters 5 to 7 describe how unallocated water will be made available for each aquifer and river system with unallocated resources, considering:

- an assessment of risks to existing users and the environment of making more water available and options for minimising those risks (for example, conditions on use);
- the magnitude of possible future water demands, and any limits on demand (for example, limits on the area of land available for irrigation); and
- the increased uncertainty about future climate.

Policy 3.1 A balanced approach to allocating new water entitlements

In Gippsland's catchments and aquifers that are not yet fully allocated, the balance between water for consumptive use and the environment will be set having regard to the:

- Environmental, economic and social values supported by the river basin and the costs associated with maintaining and improving those values.
- Existing and projected availability of water in the river basin.
- Need for a precautionary approach to promote intergenerational equity and sustainable water resource management.
- Need to protect the reliability of supply to existing water users and the health of the environment, taking into account:
  - seasonal needs of consumptive users and the environment;
  - availability of storage to manage these seasonal needs;
  - the need to protect existing high value areas or areas in good condition;
  - the economic benefit of allocating more water for the economic development in the area;
  - the ability to place conditions on how and when water is taken to minimise the impact on existing users and the environment;
  - the ability to meet environmental needs through other measures such as complementary river restoration works or integrated and adaptive management of environmental water and works; and
  - the ability to meet the needs of consumptive users through other measures such as alternative supplies.

In areas where groundwater is already available under the permissible consumptive volume (PVC) (see Reference Guide 2 (on page 12) and Appendix 3), groundwater will continue to be allocated on a case-by-case basis consistent with the *Water Act 1989*. The Act specifies the matters that must be considered before the water is allocated, including the impact on existing users and the environment. Consideration of these matters sometimes means water cannot be allocated even though it is available within the PCV.

For groundwater, the Government supports additional water being made available where a resource appraisal shows this can be done sustainably.

Before allocating more groundwater to new or existing users, assessments need to be made to ensure the groundwater system has the capacity to supply the additional water without impacting adversely on existing users or the environment (see Action 3.2). The capacity of the resource is assessed:

- on a case-by-case basis, and groundwater licence applicants may be asked to demonstrate that the groundwater system has the capacity to supply the water by commissioning a hydrogeological report from a suitably qualified expert; or
- periodically through a strategic groundwater resource assessment commissioned by the Department of Sustainability and Environment or Southern Rural Water.

The highest priority for undertaking a groundwater resource assessment in Gippsland is the Moe Groundwater Management Area.

Mitchell River estuary, DSE

Action 3.1 Balanced approach to allocating new water entitlements in unregulated catchment areas

Who: Department of Sustainability and Environment, Southern Rural Water, catchment management authorities

Timeframe: Precautionary caps – End 2012

The Government will:

- Impose precautionary caps on the issue of new winter-fill licences taking into account the likely demand for additional water, potential impact on existing users and the environment, and climate uncertainty.
- Review the precautionary caps taking into account an assessment of demand when this Strategy is reviewed in 10 years.

If demand exceeds a cap before this review, a change in the cap would be considered where detailed assessment of the resource demonstrates a low risk to existing users and the environment.

Action 3.2 Strategic groundwater resource assessments

Who: Department of Sustainability and Environment, Southern Rural Water

Timeframe: Progressive

The Victorian Government will support ongoing strategic assessments to determine the capacity of groundwater systems to supply additional water while protecting existing users and the environment.

How will the unallocated water be made available?

Major sources of unallocated water in the region will be released in stages based on the latest assessment of the sustainable yield of each system. As better understanding of each system develops, the potential for further allocations will be reconsidered (see Action 3.3).

Opportunities to increase the environment's share

In addition to taking a balanced approach to allocating any new entitlements, this Strategy also makes additional water available to the environment in the large regulated systems with major on-stream dams. The additional environmental entitlements are described in Chapter 6, and will be made available in the:

- Thomson Reservoir (8 GL) to reduce the impact of the dam and Melbourne diversions on the Thomson River.
- Macalister River (5.5 GL) by early 2012, with work continuing to secure further savings.
- Blue Rock Reservoir (10 GL) to benefit the lower Tanjil River, lower Latrobe River and Gippsland Lakes.
- Snowy River (311 GL) recovered as part of the existing Intergovernmental Agreement between Victoria, New South Wales and the Commonwealth.

The source of water for the increased environmental share in the Thomson Reservoir will come from Melbourne system augmentations together with continued water conservation and efficiency measures, to enable an additional 8 GL to be returned. The new environmental entitlement in Blue Rock Reservoir will be made available from the unallocated share of Blue Rock held by the Government.

In recent years most of Gippsland's rivers that have large water storages have had increases in the amount of water allocated to the environment. Water savings projects and water conservation measures have been undertaken to increase the share of water for the environment in the Thomson, Macalister and Snowy rivers (See Section 6.3.1, page 144, and Section 7.3.4, page 162).

3.1.2 Sharing water between consumptive users

Water is essential for human health, domestic use, food and fibre production and many industries. Given the value of water for consumptive uses, there are often conflicting demands for water between users and different user types.

Government and water licensing authorities need to set clear rules about how water will be shared, and establish mechanisms that allow water to move between different uses, as society's needs change. If no regulations existed to limit access and use of water resources, the ever-increasing levels of use would impact on water availability for existing users and the environment.

This Strategy contains policies and actions that aim to share water between users fairly and minimise conflict through:

Policy 3.3 Recognising existing rights to water p41

Policy 3.5 Establishing local management plans for unregulated surface water and groundwater systems p43

Action 3.15 Revising groundwater management units (GMU) p54

Policy 3.8 State-wide approach for managing water impacts of land use change p51

Policy 3.9 Managing the impact of new mining and earth resource projects on Gippsland's water resources p55

Action 4.2 Improving opportunities for water trading in groundwater and unregulated river systems. p65

Action 3.3 Staged release of unallocated water

Who: Southern Rural Water **Timeframe:** Progressive

Where unallocated water can be made available for consumptive use, within sustainable diversion limits for unregulated rivers and permissible consumptive volumes for groundwater systems, auctions and tenders will be used to ensure the price is based on the value of the resources.

Auctions or tenders between 2011 and 2013 will provide an estimate of the market value of water in different parts of the region.

Southern Rural Water will use the results of these auctions to inform the setting of a reserve price for unallocated water in areas where there is insufficient demand to hold an effective auction. However, the setting of a reserve price would be waived in circumstances where application fees and the costs of resource appraisals required to access the water already provide a strong signal about the value of the resource.

Any revenue raised through these auctions would be used by Southern Rural Water to cover the cost of the auctions and to undertake future resource appraisals.

3.1.3 Reviewing entitlements to account for any long-term changes in water availability

A key strength of Victoria's entitlement framework is that permanent changes cannot be arbitrarily made to existing entitlements.

Section 51 take and use licences, which are issued for a defined period, can be amended only:

- when a licence is renewed, however the Minister for Water must consider several matters and renew the licence unless there are good reasons not to do so;
- through the declaration of a water supply protection area (WSPA) and development of a statutory management plan (discussed on page 43); or
- following a 15-year review of water resources (discussed below).

Bulk entitlements, environmental entitlements and water shares, which are all permanent rather than renewable rights, can be amended only:

- at the request of the entitlement-holder, for example following the completion of water-saving projects; and/or
- following a 15-year review of water resources.

The fact that entitlements are not subject to arbitrary changes gives water users, water corporations and environmental managers' confidence to invest in their water future.

Under the *Water Act 1989*, the Minister for Water is required to undertake a 15-year review of water resources, with the first review due to be completed by 2019. The Act sets out the formal process for assessing the resource availability and if needed, rebalancing water for consumptive and environmental purposes.

Recent experience of the process to develop the Murray-Darling Basin Plan highlights the difficulties and potential uncertainty associated with undertaking centralised, periodic resource assessments across a huge region, with the expectation of rebalancing water for consumptive and environmental purposes (see Policy 3.2).

3.1.4 Supplementary uses of Gippsland's large water storages

The large water storages in Gippsland were built so that water is available for urban, agricultural and industrial use during dry times. In some cases, these storages can provide secondary benefits including recreational opportunities, hydroelectric power generation and some flood mitigation (see Table 3.1). These secondary benefits can conflict with the primary use of storing water for dry times.

Table 3.1 shows which major storages in Gippsland have some capacity for flood mitigation, which allow recreational use, and which have hydroelectric turbines.

Flood mitigation

To reduce the impact of downstream flooding, storages would need to be able to retain a significant volume of floodwater when flooding occurs. This would require storages to be kept partly empty. In Gippsland, there are very limited opportunities for storages to provide significant flood mitigation without also reducing the ability to supply water.

For example, Lake Glenmaggie has a limited capacity to mitigate major floods, due to the relatively small size of this storage compared to the large upstream catchment area. Lake Glenmaggie was not designed or built for flood mitigation, but has floodgates that can release water when the reservoir reaches 119 GL (about two-thirds full). For small or moderate floods it may be possible, depending on prevailing storage conditions, for it to provide some benefit in moderating downstream flows. Where possible, Southern Rural Water aims to operate Lake Glenmaggie to reduce the severity of floods, without reducing its ability to maximise water available to irrigators in the Macalister Irrigation District.

In comparison, the Thomson Reservoir has a catchment area about one-quarter the size of Lake Glenmaggie's, but a storage capacity five times larger. Because the Thomson Reservoir is not often full and rarely spills, it has a higher capability to store excess water during a flood. Unlike Lake Glenmaggie, Thomson Reservoir was not constructed with floodgates.

Policy 3.2 Reviewing entitlements

Through actions and policies developed in sustainable water strategies, the Victorian Government will promote more flexible and adaptive management arrangements which allow water managers to:

- work with the community to manage water resources sustainably;
- respond at a local level when problems arise; and
- potentially avoid the need for once-off, centralised rebalancing as part of the 15-year long-term review.

Similarly, Blue Rock Reservoir has a catchment about one-fifth the size of Lake Glenmaggie's and a slightly larger storage capacity. The reservoir does not have floodgates, however due to the limited size of the spillway and large storage volume, the reservoir can moderate flood flows even when above full capacity.

More information on flood mitigation in the storages managed by Southern Rural Water is available from the Southern Rural Water website at www.srw.com.au.

Hydroelectric power generation

Water storages can be used to generate electricity if the water released from the reservoir is passed through a hydroelectric power plant. Hydroelectric power generation can provide additional power to the grid during times when demand for electricity is high, however these times do not always align with the times when storages are spilling.

Drawing storages down for the purpose of generating electricity would mean that less water is stored for use in dry times and so the potential for the large storages in Gippsland to be used to produce electricity is limited. There are hydroelectric turbines at the outlets of the Thomson, Blue Rock and Glenmaggie reservoirs, which are used to generate electricity from reservoir releases.

Recreational use of storages

Some of Gippsland's major public storages can be used for recreational activities. These activities do not reduce the amount of water that can be stored, although in some cases there have been calls for storage operations to be altered so that more opportunities can be provided for recreation. In the case of Lake Narracan, some improved recreational opportunity can be provided for the community at a low risk to water harvesting opportunities (see Section 6.2.1, page 127).

Recreational activities pose a risk to water quality (for example, contamination from boat fuel or camping wastes). As a result of the water quality risk, some large public water supply storages in Gippsland place restrictions on recreational activities on the storages or within the catchments.

Lake Glenmaggie,SRW

Table 3.1 Potential for supplementary use of major storages

Storage	Main uses	Potential for actively managing flood flows	Recreational activities within the catchment	Recreational activities permitted on storage	Hydro-electric turbines
Thomson (1,068 GL)	Urban supply, some irrigation supply	None	Restricted[a]	None	Yes
Blue Rock (208 GL)	Urban and industry, some irrigation supply	None	Open catchment[b]	Limited	Yes
Glenmaggie (178 GL)	Irrigation	Minor	Open catchment	Most activities permitted	Yes
Narracan (7 GL)	Industry	None	Open catchment	Most activities permitted	No
Moondarra (30 GL)	Urban supply	None	Open catchment	None	No
Tarago[c] (37.5 GL)	Urban supply	None	Open catchment	None	No

Notes:
a Public access (such as walking tracks and camping) is limited and movement is restricted to particular areas to safeguard Melbourne's water supply.
b An open catchment is where the land within the catchment is privately managed over many land titles by the rural community.
c Tarago is in the Westernport catchment, which is outside the area covered in this Strategy.

3.2 Providing increased certainty for all water users

Before making decisions about how water should be managed, water users, water corporations and environmental managers need to be sure that their rights to water are secure. They need to know that the resource is being shared fairly – that no one is extracting more than they are entitled to – and that the processes and rules for sharing water between entitlement-holders in times of shortage or high flows are well defined and transparent.

They also need to be sure that while their supply may be subject to allocations, restrictions or bans in times of shortage, their rights to a certain volume will not be changed without evidence and consultation. Robust, statutory processes that respect individual rights must be followed to justify a change in entitlement-holders' access to defined volumes of water.

3.2.1 Clearly defined entitlement framework with secure rights

A secure entitlement has legal tenure that is certain and protected, with known arrangements for sharing available water during dry and drought years. Victoria's entitlement regime (see Reference Guide 1, page 10) ensures those rights can be changed only by clear and transparent processes (see Section 3.1.3).

The reliability of an entitlement is different to its security; it relates to the likelihood that the full entitlement volume will be available each year. Reliability may be reduced by dry conditions. However, the security, or right to a share of the available resource, will be protected. Water users have a right to a well defined share of the available water in any year or season (see Policy 3.3).

This Strategy recognises the rights of all existing licence-holders. This also applies to 'sleeper licences' on unregulated rivers and groundwater systems (see Policy 3.4). A sleeper licence is defined as an inactive Section 51 take and use licence (see Reference Guide 1, page 10).

> *"Security and high reliability of water rights are crucial for the agricultural industry to have confidence to invest and grow"*
> *– Draft Strategy submission 077*

This approach reinforces the security of water rights and avoids potential impacts from sleeper licences being activated to demonstrate use under a 'use it or lose it' policy.

Any impacts on the reliability of supply or the environment from increased utilisation of existing licences (including activation of sleeper licences) will be shared by all licence-holders through local management arrangements (see Section 3.2.2). All water users will be encouraged to make the most efficient use of their water.

3.2.2 More responsive local management for licensed water extractions

Water from groundwater systems and unregulated river systems (rivers with no large dams or weirs) is allocated by issuing individuals or urban water corporations with a licence under Section 51 of the *Water Act 1989* to take and use water. If water is available, it can be taken and used in accordance with the licence conditions. If there is not enough for all needs, licence conditions provide for water use to be restricted to:

- ensure available water is shared equitably between users; and
- protect the environment, and the long-term condition of the resource.

Under the *Water Act 1989*, the main mechanism for establishing management arrangements for unregulated surface water and groundwater systems is the process of declaring a water supply protection area (WSPA) and preparing a statutory management plan. This process, which was introduced in 1969, was originally used to tighten controls on licensed water use, such as caps on extractions, increased monitoring, the requirement to meter use and the ability to levy charges to recover management costs.

Since 1969, several reforms have improved management without the need to develop a statutory management plan including:

- The Minister for Water now has the ability to set permissible consumptive volumes (PCVs) to cap licensed water extractions.

Policy 3.3 Recognising existing rights to water

All existing rights and entitlements, including those of water users and the environment, will be recognised consistent with the *Water Act 1989*. This includes the security of entitlements and the right to a share of available water in a given year.

Policy 3.4 Sleeper licences

The rights of Section 51 take and use licence-holders will continue to be recognised, independent of their current water use and, if activated, will be subject to the same management rules applied to active licence-holders (for example, restrictions or bans in times of scarcity).

- Since 2004, Southern Rural Water has rolled out an extensive metering program, which has resulted in all surface water extraction of more than 10 ML and groundwater extraction more than 10 ML being metered in southern Victoria.
- Southern Rural Water now recovers the full cost of managing the licensing regime through charges approved by Victoria's independent economic regulator, the Essential Services Commission.

For some stressed systems, statutory management plans may not have the power to address the main causes of that stress, such as water use under a bulk entitlement, land use changes or the proliferation of domestic and stock farm dams. Also many of the original management actions that statutory management plans aimed to achieve are now in place. In addition, the process for developing a statutory plan is resource-intensive and time-consuming, and is most relevant in areas where licensed extraction is the main cause of flow stress.

This suggests that statutory management plans are not required for all systems and developing new statutory management plans is likely to be costly and time-consuming with limited additional benefits for users and the environment.

In the absence of a statutory management plan, Southern Rural Water will continue to use licence conditions to manage supplies in times of shortage. However, with the potential for more variable water supplies in the future, there is a greater need for water users and environmental managers to know how licence conditions will be applied to manage periodic changes in water availability.

While Southern Rural Water has developed local management rules on some systems to explain to users how the licence conditions will be invoked (for example, roster or restriction rules), the Government believes these rules should be formally documented in local management plans to improve transparency and provide greater certainty to users about the processes for reviewing and changing these rules over time.

Local management plans will be developed for all systems. They will lead to improved management by providing a more flexible, efficient and effective way to clarify water-sharing arrangements.

Local management plans will be responsive and adaptable to local conditions, and the characteristics of each groundwater or unregulated river system. They will specify rules applying and removing rosters or restrictions on water use that:

- closely match the characteristics of each system, with every opportunity explored to apply them in a way that best meets the needs of users and the environment; and
- are clearly documented and well understood by users, with any proposed changes to these rules subject to appropriate consultation with users and environmental managers.

State-wide guidelines for licensed water use

The Minister for Water delegates powers under the *Water Act 1989* to rural water corporations (including Southern Rural Water) to manage water use throughout the State. The Department of Sustainability and Environment prepares and updates Ministerial guidelines *(Policies for Managing Section 51 Take And Use Licences)* to reflect current government policy and best management practice to ensure rural water corporations have appropriate processes in place to make good licensing decisions, which protect downstream users and the environment.

In particular, the guidelines require a licensing authority, when issuing, renewing or approving the transfer of a licence, to consider the need to include conditions on the licence to protect the environment and other water users. This can include consultation with the relevant catchment management authority and the Department of Sustainability and Environment about the allocation and restriction arrangements.

These policies have been consolidated in recent years by updating and developing Ministerial guidelines for:

- Basic standards for section 51 take and use licences and how they can be issued and traded, including trading rules, caps on new licences, metering requirements, standard licensing conditions (such as pumping rates, passing flows and roster and ban arrangements), the use of the Victorian Water Register to record all licences in the State, and the implementation of new policies, such as the dairy shed transition program.
- Minimum standards for the construction, alteration, decommissioning or operation of works licensed under section 67, including groundwater bores, works on a waterway (such as a pump) and potentially hazardous dams.
- Rural water corporations assessing and recording domestic and stock dams in a rural residential area.
- Standards to permit underground disposal of drainage water and other waste, and also increasingly managed aquifer recharge projects (see Section 4.1.4).
- Licensing requirements to harvest stormwater under a Section 51 take and use licence from the works of an authority or from a waterway.

Local management plans will also document the water trading rules for each system, with appropriate links to the relevant State-wide water trading regulations and policies (see Policy 3.5).

Local management plans will conform to state-wide guidelines for managing licensed water use (see page 42). Further guidelines will be prepared to facilitate the development of these plans as a more efficient water planning process to address circumstances in specific areas. In some cases, existing rules will be documented in local management plans. Over time, other areas may require more detailed assessment and consultation (see Action 3.4, page 45).

Most unregulated surface water systems that have local management rules in place will be converted into local management plans by the end of 2012. The timetable for developing local management plans on each surface water system and groundwater management unit is presented in Tables 3.2 and 3.3 and in Chapters 5 to 7.

Water supply protection areas

Local management plans will provide adequate management for most unregulated rivers and groundwater systems. However in highly flow stressed systems, the water-sharing arrangements or the total volumes licensed for use may need to be revised to restore water for the environment or to address reliability problems. In these cases, a water supply protection area (WSPA) will be declared under Section 32 of the *Water Act 1989* and a statutory management plan prepared. This formal process allows competing demands to be negotiated and resolved. There are currently no water systems in Gippsland where the Government considers it necessary to declare a new WSPA (see Policy 3.6, page 45).

In areas where a WSPA has already been declared but the statutory management plan has not been finalised or is due to be reviewed or updated, consideration needs to be given whether a statutory management plan is still required. If not required, the rural water corporation will initiate the process for undeclaring the area and preparing a local management plan. Table 3.4 presents the areas where WSPAs have been declared for groundwater management purposes but there is no longer a need for the statutory management plan to be completed.

The development of a statutory management plan for a WSPA can take 18 months or longer. It requires the Minister for Water to appoint an overseeing consultative committee and extensive consultation with license-holders and the broader community. This process will be reviewed to ensure it operates as efficiently as possible to meet the needs of water users and the environment (see Action 3.5, page 45).

Policy 3.5 Establishing local management plans for unregulated surface water and groundwater systems

Local management plans will:

- document management objective for the system;
- explain to licence-holders (and the broader community) the specific management objectives and arrangements for their water resource and the rules that apply to them as users of that resource;
- clarify water-sharing arrangements for all users and the environment, including environmental flow requirements;
- consider the environmental values in regional river health strategies
- document any limits, including water use caps, permissible consumptive volumes or extraction limits that apply to the area/system;
- document rules for applying temporary qualifications;
- include trading zones and rules;
- be based on existing operational rules, recognising the rights of existing licence-holders;
- if applicable, document groundwater carryover provisions;
- document monitoring and reporting requirements;
- be periodically reviewed to incorporate new knowledge;
- be consistent with the *Policies for Managing Section 51 Take and Use Licences*; and
- be publicly available on water corporation websites.

Table 3.2 Local management plans for surface water[a]

Action	River basin	Unregulated river system	Timeframe
Areas where existing rules will be documented as local management plans	Latrobe	Moe river	End 2012
		Morwell River	
		Narracan Creek	
		Upper Latrobe	
	South Gippsland	Agnes River	
		Albert River	
		Bruthen Creek	
		Franklin River	
		Merrimans Creek	
		Tarra River	
		Tarwin River	
	East Gippsland	East Gippsland Basin	
		Snowy River	
	Tambo	Tambo River	
Areas where existing rules will be reviewed or improved[b]	Mitchell	Mitchell River	End 2012
	Avon	Avon River and Valencia Creek	2014

Notes:
a A local management plan will be developed for each unregulated river basin. Where needed, plans for specific unregulated rivers within each basin will be developed and attached as a schedule to the local management plan for the basin. Licensed water use in the regulated Thomson and Macalister rivers is managed through bulk entitlements.
b Existing rules will continue to apply in these areas until they are reviewed/revised and incorporated in a new local management plan.

Table 3.3 Local management plans for groundwater

Action	Management area	Timeframe
Areas where existing rules will be documented as local management plans	Gifford GMA	End 2012
	Leongatha GMA	
	Moe GMA	
	Orbost GMA	
	Rosedale/Stratford GMA	
	Tarwin GMA	
	Wa De Lock GMA in conjunction with Avon River local management plan	
	Unincorporated areas[a]	End 2012

Note:
a Areas that are not included within either a GMA or WSPA are called unincorporated areas.

Table 3.4 Water supply protection areas[a]

Action	Management area	Timeframe
Undeclare existing water supply protection areas (WSPA) and revise associated management plans	Denison WSPA (1997) – due to it being a self-regulating system Wy Yung WSPA (1997) – due to stable water levels Avon WSPA (2006) – no statutory management plan in place Tarra WSPA (2003) – no statutory management plan in place	End 2012
Further investigation needed before undeclaring WSPA	Sale WSPA (1997) – no management plan in place	End 2012
Retain existing WSPA and associated management plan	Yarram WSPA (2010) – a management plan is in place (2010)	N/A
Declare WSPA and develop associated management plan	There are no water systems in Gippsland where the Government considers it necessary to declare a new WSPA	N/A

Note:
a Technical Paper 8 (see page 193) provides further information on the areas proposed to be undeclared, information about the process that will be followed and how stakeholders can comment.

Action 3.4 Developing local management plans for unregulated surface water and groundwater systems

Who: Southern Rural Water, Department of Sustainability and Environment, catchment management authorities and local water users

Timeframe: Plans for all existing rules – end 2012

Southern Rural Water will develop local management plans in accordance with the Minister's *Policies for Managing Section 51 Take and Use Licences.* All existing operating arrangements for Gippsland's surface water and groundwater systems will be formalised as local management plans by:

- Converting existing rules into local management plans on systems where Southern Rural Water believes that the existing rules are sufficient, working effectively and there are no immediate concerns about the reliability of supply.
- Publishing a timetable and work schedule for developing local management plans on systems where Southern Rural Water believes that existing rules are not sufficient and need to be reviewed/revised.

Policy 3.6 Developing statutory management plans for water supply protection areas

In the event that new information identifies an unregulated surface water or groundwater system as highly stressed, the Minister for Water will declare water supply protection areas and Southern Rural Water will develop a statutory management plan if:

- licensed extraction is the primary cause of the stress on the system;
- there is a need to amend licence conditions before renewal of licences;
- permanent or ongoing restrictions on licensed extraction are required to protect consumptive licences, domestic and stock use or the environment; and/or
- the overall licensed volume needs to be reduced.

Action 3.5 Reviewing the process for declaring water supply protection areas and developing statutory management plans

Who: Minister For Water, Department of Sustainability and Environment, Southern Rural Water

Timeframe: End 2012

The process for declaring WSPAs and developing statutory management plans will be reviewed to identify options for improvements, such as developing the criteria against which WSPAs are declared and options to streamline the process.

Drip irrigation, Lindenow, SRW

3.2.3 Providing more security to section 51 take and use licence-holders

Holders of water shares on regulated river systems, such as in the Macalister Irrigation District, have a perpetual right to water.

Some submissions to the Draft Strategy argued that Section 51 take and use licence-holders should also be granted a perpetual right, noting that the ability to access the water in any given year would still be subject to water availability. They also noted that the volume and conditions of the licence could still be changed through the preparation of a statutory management plan in a WSPA or as part of a long-term resource assessment every 15 years.

> *"(The submitter) recommends issuing water licenses in perpetuity similar to other water entitlements and consistent with the agreed National Water Initiative." – Draft Strategy submission 077*

The *Water Act 1989* requires licences to be renewed unless there are good reasons not to do so. While this provides a relatively high degree of security and in practice most licences are renewed without any change to conditions, arguments for extending the licence term or making it perpetual include:

- *Providing greater confidence to invest* – for example, if only a few years were remaining on the licence, a farmer may not be confident that the water will be available to support a significant investment (for example, to construct a deep bore).
- *Potentially making section 51 take and use licences an asset that could be mortgaged* – if licences were perpetual with the same characteristics as a water share, this could make them an asset against which farmers might borrow against to finance future investments.
- *Longer licence terms may reduce the risk of government intervention* – as governments change and introduce new policies, short-term licences may be exposed to more frequent government intervention compared to longer-term licences or water shares.
- *Reducing costs associated with licence renewals* – as licences must be renewed unless there are good reasons not to do so, the administration and costs associated with renewing them are considered a burden with limited benefits that could be reduced/avoided if the term was increased or made perpetual.

Some of these arguments have merit, however, it is important to note that:

- Licence-holders can apply to have their licences renewed at any time, which means a licence-holder could apply and have the licence renewed up to 15 years before making an investment.
- Access to a Section 51 take and use licence is likely to be incorporated in the value of a farm, which can be mortgaged.
- On ephemeral/unreliable streams or unreliable groundwater systems, the reliability of the system rather than the length of the licence term is likely to drive investment decisions.
- If the system was unreliable but still supported high social, economic and environmental values, extending the licence terms may limit the ability to manage risks to those values by reviewing licence conditions more frequently (for example, every five years).

These points suggest that the costs and benefits of extending the licence term are likely to be system-specific. Where a system is highly variable or unreliable, the arguments for extending the licence term are weaker. Where a system is reliable, which can often be the case in groundwater systems with significant storage, the arguments for extending the licence term or potentially establishing water shares may be stronger.

The Government accepts that there may be benefits in enabling licence terms to be extended for up to 20 years. However, before extending licence terms on a specific system, rural water corporations, in consultation with licence-holders and the relevant catchment management authority, would need to review and update the relevant local management plan to ensure they adequately consider the potential benefits and risks associated with extending the licence term.

In groundwater systems where there is significant storage and the rate of recharge is good, greater certainty could be provided to users by establishing water shares for groundwater. Water shares for groundwater could be similar to unbundled water shares on regulated surface water systems, potentially providing the many benefits associated with the water share product, such as an asset that can be mortgaged, the ability to receive annual allocations and greater flexibility for trading of allocations, long-term leases and carryover.

At this stage, only a few systems are likely to have storage significant enough to establish water shares for groundwater. There needs to be strong evidence that the benefits of establishing permanent water shares are likely to outweigh the administrative costs, which from the experience of unbundling regulated water systems, can be high (see Action 3.6).

3.2.4 Improving our understanding of climate

Regional sustainable water strategies play a key role in providing water users, water managers and the community with the most up-to-date information about the threats to water availability. The latest information about the risks from climate variability (see Appendix 4) gives water users and managers an understanding of what the future might hold and how they may need to manage risks of water scarcity. As more research or modelling is completed, the findings will be made available to water users and water managers as soon as possible so their management decisions can be informed by the latest science (see Action 3.7).

Action 3.6 Providing more security to Section 51 Take and Use Licence-holders

Who: Minister for Water, Southern Rural Water, catchment management authorities

Timeframe: 2013

The Minister for Water will propose changes to the *Water Act 1989* to enable section 51 take and use licences to be issued for up to 20 years.

Rural water corporations may renew and/or issue a licence for a period of up to 20 years provided the proposed extension to the term of a licence on a particular system, including the potential benefits and risks associated with the proposed extension, has been discussed and determined as part of the process to prepare, review or amend a local management plan.

The Department of Sustainability and Environment, in consultation with rural water corporations and catchment management authorities, will investigate the potential to convert section 51 take and use licences into water shares for groundwater where:

- resource assessments and management have shown that the groundwater system has significant storage and the rate of recharge is good; and
- the benefits of establishing water shares for groundwater are likely to outweigh the administrative costs.

Action 3.7 Improving information sharing about climate variability and risks

Who: Department of Sustainability and Environment

Timeframe: 2011 and ongoing

The Department of Sustainability and Environment will:

- make available on its website links to the latest research on climate variability and climate change undertaken by the South Eastern Australian Climate Initiative (SEACI); and
- regularly review and update streamflow projections to incorporate the latest advances in government's understanding of climate change projections and scenarios.

3.2.5 Building groundwater knowledge

Long-term, viable and cost-effective groundwater monitoring

Adequate groundwater monitoring is critical for ensuring the effective management and beneficial use of Victoria's groundwater resources.

Groundwater levels in Victoria are monitored using the State Observation Bore Network. This network is a collection of about 2,500 bores managed by the Department of Sustainability and Environment, which spends about $1.3 million a year on quarterly bore monitoring ($900,000) and minor maintenance ($400,000).

Southern Rural Water contributes to the cost of monitoring bores where more frequent monitoring is required. From 2011/12, rural water corporations (including Southern Rural Water) will also contribute towards the management and minor maintenance of the bores they monitor monthly. They monitor 627 of the 2,500 bores rather than relying on the Government's quarterly readings. Rural water corporations in Victoria contribute $415,000 to $560,000 a year towards monitoring, management and minor maintenance on bores where they have an interest.

The contributions of rural water corporations will be maintained until at least 2013/14, when the state-wide monitoring contract will be reviewed and revised or extended for another two years. During this time, contributions from rural water corporations would increase only if a statutory management plan or local management plan identified the need for the corporation to increase the number of bores to be monitored monthly.

The network is adequate in some regions but deficient in others. While Government funding has been used to periodically upgrade the network, ongoing secure funding to maintain and refurbish it has been limited. This is partly due to a lack of clarity about who should pay for the cost of maintaining the network, with the National Water Initiative suggesting water users should pay an appropriate share.

The Victorian Government accepts that the State has an ongoing responsibility for monitoring the condition of the resource and recognises the need to further develop the bore network to ensure it provides adequate coverage and is in reasonable condition.

Once the network is upgraded, the cost of maintaining and renewing it should be shared between the State, water users and environmental managers on an equitable and 'beneficiary pays' basis.

The future cost-sharing arrangements recognise that domestic and stock groundwater users do not contribute towards the cost of monitoring the resources on which their businesses rely (see Policy 3.7 over page).

The Government's commitment to progressively upgrade and rationalise the network, combined with the maintenance of rural water corporations' current contributions until at least 2013/14, will provide time to transition to arrangements that ensure:

- groundwater monitoring is adequate across the State (see Action 3.8); and
- formal processes and equitable sharing of future costs provide secure, ongoing funding (see Action 3.9).

Based on this approach, the cost of the backlog program will be quarantined. This will enable the forward-looking costs of maintaining and renewing the upgraded network to be shared on an equitable and beneficiary pays basis.

The Minister for Water will be given the opportunity to review and comment on the forward works program before it is submitted for consideration in the process to set and allocate the environmental contribution levy[17]. The process will include mechanisms for resolving disputes in the event that the Department of Sustainability and Environment, Southern Rural Water and environmental managers do not agree on the works program and/or relative cost shares. This mechanism could include the ability to refer a dispute to the Essential Services Commission for resolution.

Policy 3.7 Clarifying responsibilities for groundwater monitoring

Groundwater monitoring in Victoria will be guided by the following principles:

- The Government is responsible for maintaining a baseline of continuous monitoring that provides sufficient information to identify changes in groundwater resource availability and condition over time.
- The Government will continue to cover the cost of monitoring groundwater resources on behalf of domestic and stock users.
- Southern Rural Water on behalf of licensed consumptive users is responsible for additional monitoring or investigations required to:
  - manage water availability for groundwater license-holders during the water year;
  - ensure extraction does not impact adversely on entitlement-holders and third parties, including the environment; and
  - assess and investigate, at the applicant's expense, applications for new groundwater allocations or transfers to ensure there are no third party impacts, including on the environment.
- The need for Southern Rural Water to perform additional monitoring in the future will be subject to consultation with groundwater users and environmental managers through the development of statutory management plans, or local management plans.
- Environmental managers are responsible for monitoring to support management actions outside the licensing regime and initiated by them to protect high value environmental assets.
- Groundwater monitoring should be as efficient as possible, with every opportunity to reduce the capital and operational costs explored.
- Monitoring undertaken by the State, water corporations or environmental managers should be coordinated and made publicly available.

Action 3.8 Upgrading and refining the groundwater monitoring network

Who: Department of Sustainability and Environment, Southern Rural Water, environmental managers **Timeframe:** June 2012

The Department will work with Southern Rural Water and environmental managers to identify a backlog program of works to upgrade and refine the monitoring network to ensure it provides adequate coverage and is in reasonable condition. This backlog program will identify:

- the number and location of new bores required to ensure adequate baseline monitoring across the State;
- the number and location of existing bores not required for the baseline level of monitoring and which should be capped, decommissioned or transferred to an interested party;
- the estimated cost of commissioning new bores or decommissioning obsolete bores; and
- how the commissioning or decommissioning of bores should be prioritised.

The Government will invest to deliver the program on a priority basis. The need for additional funding will be considered through the normal budgetary process.

Action 3.9 Establishing secure ongoing funding for future maintenance and renewal of the monitoring network

Who: Department of Sustainability and Environment, Southern Rural Water, environmental managers

Timeframe: Ongoing

The Government will establish a formal process for determining arrangements for the future operation, maintenance and any renewal of the network having regard to:

- The process for setting and allocating funding from the environmental contribution levy (currently every four years, with the next period beginning on 1 July 2012).
- Southern Rural Water's water planning and price setting process overseen by the Essential Services Commission (currently every five years, with the next pricing period beginning on 1 July 2013).

Each planning period, the Department of Sustainability and Environment, in consultation with Southern Rural Water and environmental managers, will develop the forward operation, maintenance and renewal program, which will:

- Identify the cost of operating (monitoring), maintaining and renewing the network over the planning period, taking into account a planning horizon that extends beyond the period.
- Propose cost-sharing arrangements between the State, Southern Rural Water and environmental managers on a 'beneficiary pays' basis having regard to:
  - the guiding principles in Policy 3.7;
  - consideration of the minimum level of monitoring the State would perform in the absence of consumptive extraction; and
  - the State's current commitment to continue to pay the share of monitoring costs attributable to domestic and stock users.

3.3 Strengthening the water entitlement framework

Entitlement-holders also need to be certain that potential risks to their water supply posed by water use that is currently outside the entitlement framework, such as domestic and stock water use or land use changes that intercept significant amounts of water, are being monitored and managed appropriately.

Victoria's water entitlement framework is designed to share water among users in an equitable and orderly way. It does this by setting out the rights to water for a range of consumptive water uses and users, including the environment.

The current entitlement framework has evolved. As more has been learned about the State's water resources and the competing demands on them, the entitlement framework has been updated to ensure water rights are clear and protected.

For example, *the Water (Irrigation Farm Dams) Act 2002* strengthened the water management framework by bringing all irrigation and commercial use of water under the licensing regime, irrespective of whether the water was being diverted directly from a waterway or taken from higher up in the catchment.

For the water entitlement framework to remain effective, all significant water uses must be recognised and managed. When uses of water are outside the water entitlement framework, their impact on the water resource cannot be measured well or controlled effectively. The consequences of water scarcity may not be shared equally, and existing rights to water could be undermined.

3.3.1 Monitoring and managing adverse impacts of significant land use change on water availability

Large-scale changes in land use can affect water availability for other water users and the environment by taking more water that would otherwise reach streams and/or extracting more water directly from shallow aquifers. These impacts are felt most keenly during dry years and in summer, and where the available water is already fully committed.

New forestry developments

During the development of the Western and Gippsland Sustainable Water Strategies, the community expressed concerns about land use change impacts on the reliability of supply for water users, especially in dry times. Concerns were greatest in Western Victoria, where rapid plantation forestry development has occurred in the past 10 to 20 years. The community also expressed support for a sound policy to protect water resources from the impact of rapid expansion of water-intensive land uses.

Forestry is the most water-intensive land use and has been identified by the National Water Initiative as a water interception activity that should be regulated in water-stressed areas. Other land use changes can affect water availability, particularly on a cumulative basis, but the costs to the community of regulating other forms of land use change is likely to far outweigh any benefit.

Protecting Gippsland's water future

A major driver for land use change in Gippsland could be the introduction of a price on the emission of greenhouse gases into the atmosphere. This could result in the development of a carbon credit scheme for afforestation activities and the development of markets for more sustainable energy products, such as biofuels.

A carbon credit scheme would be expected to increase the profitability of environmental planting activities and potentially forestry activities compared to other land uses, such as agriculture.

About one-quarter of Victoria's plantation estate is located in Gippsland, where plantations cover about 100,000 ha. Of this, about 60 per cent are softwood plantations and 40 per cent hardwood plantations. Most softwood plantations in Gippsland were established in the late 1960s to mid 1970s, whereas most hardwood plantations were established from the 1960s to date.

While many of the early plantations established in Gippsland replaced native forest (minimising any impact on the water balance), more recent plantations have replaced cleared grazing land. According to the National Plantation Inventory, there has been an increase of about 20 per cent in the total plantation area across Gippsland since 1994. However, more recently there has been very little plantation development in Gippsland, due in particular to the failure of Managed Investment Schemes combined with significant competition for land and unexpectedly low growth rates of hardwood plantations.

Enabling the Government to declare intensive management areas will allow targeted management, because controlling plantation forestry state-wide is inflexible and in many areas (including Gippsland) there has not been shown to be a need to control the water impacts of plantations.

At the current time the Government does not consider there to be a need to declare any intensive management areas in Gippsland. However, it is proposed that intensive management areas be declared for some locations in western Victoria, as described in the Western Region Sustainable Water Strategy. In locations where intensive management areas are declared:

- most landholders and government land managers will not be affected. They will be able to plant up to 10 per cent or 20 ha, whichever is greater, of their allotment to farm forestry or native revegetation without restriction; and
- the plantation industry will have certainty that the water use of their existing plantations is protected, and this will continue as plantations are rotated. This approach will protect plantation asset values and jobs in harvesting and hauling timber.

Once an area is declared:

- Existing water use will be recognised, including the right to replant existing plantations.
- New plantation forestry developments will be restricted. No expansion would be allowed without approval from Southern Rural Water. Approval would be granted only if the proponent can offset the water use (see Policy 3.8).

Intensive management areas will be identified:

- when a sustainable water strategy is reviewed every 10 years; or
- by the Minister for Water in response to a written request from a catchment management authority or Southern Rural Water, for a declaration to be considered.

Once an area has been identified for further consideration, the Minister for Water will appoint a regional committee to assess the need to declare the area. This committee would include community leaders and technical experts, supported by Southern Rural Water, who will consider:

- the potential for future land use changes to reduce aquifer recharge and streamflow, and the relative contribution of plantation forestry;
- water-dependent economic, social and environmental values that would be protected by active management; and
- the degree of stress on water resources and its causes, and the ability to cater for future impacts.

Hardwood plantation, DPI

The committee will provide advice back to the Minister about:

- the need to declare the area, and how declaring the area would align with other relevant plans and strategies;
- the appropriate boundaries of the area for declaration; and
- issues to be considered in managing the declared area.

Based on this advice, the Minister would make a decision to declare the area. The Minister would not be bound by the committee's recommendations. However, the Minister's decision to declare or not declare the area, and any reasons for not following the committee's recommendations, would be tabled in Parliament and subject to disallowance (see Action 3.10).

Recording of land use changes over time will allow for the rate of new plantation developments to be tracked. This will be done by the Department of Sustainability and Environment, but local and regional groups have a role to play due to their understanding of land and water resources at a local level. This information will help water and land managers cope with change and strike the right balance between future economic growth and protecting existing water users and the environment when making decisions about water licences, and introducing or reviewing caps on licensed water use (see Action 3.11).

For further information on the intensive management area approach for managing new plantation developments, see the state-wide policy paper on land use change at: www.water.vic.gov.au/programs/sws.

Policy 3.8 State-wide approach for managing water impacts of land use change

Throughout Victoria, the Government will manage the impacts of land use changes on other water users and the environment by:

- obtaining the best estimates of water use by vegetation and tracking changes over time;
- proposing changes to the *Water Act 1989* to enable the Minister for Water to declare and manage 'intensive management' areas where more active management is required to protect other water users and the environment; and
- recognising the rights to existing use in declared areas but controlling expansion of forestry developments covering at least 20 ha or more than 10 per cent of a property, whichever is greater.

Once an area is declared:

- New forestry developments replacing pasture or crops would be restricted if they are greater than a certain size:
  - the state-wide default area is at least 20 ha or more than 10 per cent, whichever is greater, of a property (excluding remnant native vegetation); and
  - regional committees will have scope to modify this condition for a given declared area.
- Plantation forestry includes timber, pulp, carbon and biofuel plantations, and large environmental and farm forestry plantings. A change from one type of plantation forestry to another would not be controlled.

If plantations in intensive management areas are replaced with another land use, proponents could offset new plantation development against the cleared area. Regional committees will have scope to recommend against this option for offsets being available, so they have a way of gradually reducing water stress if needed.

Action 3.10 Amend the *Water Act 1989* so that intensive management areas can be declared to control water intensive land use changes

Who: Department of Sustainability and Environment **Timeframe:** End 2013

The Department of Sustainability and Environment will propose amendments to the *Water Act 1989* to enable the Minister for Water to declare and manage an area according to the process outlined in this Strategy.

Action 3.11 State-wide recording of water use by land use changes

Who: Department of Sustainability and Environment **Timeframe:** End 2012

The Department will:

- produce state-wide whole-of-catchment estimates of water use by key land use category that will be included in wholesale water accounts; and
- establish a framework and guidance for how estimates will be updated.

These water uses will be reported in the Victorian Water Accounts.

Improving information about domestic and stock dams

The Strategy also emphasises the need to continue to monitoring water use outside the entitlement framework, such as growth in domestic and stock water use in rural residential areas, where regulations have been introduced to ensure all new or enlarged domestic and stock dams are registered and comply with guidelines for reasonable domestic and stock use (see below).

In addition to the requirement to register new or substantially enlarged domestic and stock farm dams in rural residential areas, land holders in these areas will be required to register their domestic and stock dams following a change of ownership (see Action 3.12). A rural residential area includes any property:

- located within the rural living zone, green wedge zones or any residential zone as defined by Victoria's Planning Schemes; or
- that is 8 ha (20 acres) or smaller.

This requirement is intended to capture peri-urban areas where farming is not the primary long-term activity. It will provide better information to track potential increases in water interception by farm dams in areas being developed more densely for peri-urban purposes, without placing unnecessary demands on farmers. It will help Southern Rural Water assess potential impacts from domestic and stock use on water supplies.

Registering domestic and stock dams in rural residential areas

Registering domestic and stock dams in rural residential areas

Domestic and stock water use continues to be an 'as of right' use if used for the purposes defined in the *Water Act 1989*.

However, in 2009, new state-wide policies were announced to improve the management of domestic and stock water use by:

- Requiring the registration with the local rural water corporation (Southern Rural Water) of all new or altered domestic and stock dams within rural residential areas.
- Promoting sustainable use in accordance with 'guidelines for reasonable domestic and stock use'.
- Committing to further review Victoria's approach to domestic and stock management after the release of the draft Murray-Darling Basin.

New regulations

All new household dams in rural-urban fringe areas in Victoria need to be registered with rural water corporations.

The regulations came into effect on 1 January 2011. They require property owners in rural residential areas to register with their rural water corporation any new aesthetic dam, domestic and stock dam, or plans to significantly alter existing dams before beginning any works.

However, while property owners were encouraged to register their dams, the Minister for Water announced a two-month grace period before the rural water corporations put in place formal registration programs.

A rural residential area is any property located within the rural living zone, green wedge zones or any residential zone as defined by Victoria's Planning Schemes, or any property that is 8 ha (20 acres) or smaller.

Under these policies, people with existing dams in rural residential areas do not need to register them unless they want to significantly enlarge them.

Property owners who live outside a rural residential area (with a property size greater than 8 hectares) do not need to register their new domestic and stock dams.

Defining 'reasonable' domestic and stock water use

The Department of Sustainability and Environment has prepared guidelines to promote the sustainable use of water for domestic and stock or aesthetic purposes.

The guidelines help determine reasonable domestic and stock use, and suitable dam sizes.

Further review of Victoria's domestic and stock management arrangements

The release of the draft Murray-Darling Basin Plan was delayed from late 2010 to late 2011. At this stage, it appears that Victoria's current domestic and stock management arrangements will adequately meet the needs of the Basin Plan. Therefore, the proposed review can be postponed until the next review of sustainable water strategies in 10 years.

However, if detailed consideration of the draft and final Murray-Darling Basin Plan reveal the need to refine Victoria's domestic and stock management arrangements, any potential changes will be the subject of extensive public consultation as part of the process to implement and comply with the Murray-Darling Basin Plan by 2019.

Further information on the new regulations and contact details of all rural water corporations can be obtained from:

http://www.water.vic.gov.au/resources/news_items/news_items_folder/new-regulations-domestic-stock-water-dams

Action 3.12 Improving information about domestic and stock dams

Who: Minister for Water, Department of Sustainability and Environment, Southern Rural Water

Timeframe: 2013

The Minister for Water will require property owners in rural residential areas to register existing domestic and stock dams when a property changes ownership.

Action 3.13 Requiring property owners to register new domestic and stock bores

Who: Minister for Water, Department of Sustainability and Environment, Southern Rural Water

Timeframe: End 2012

The Minister for Water will require property owners who construct a new bore to register the bore as being active by obtaining a section 67 operating licence once the bore has been sunk and is ready for use. This requirement will also apply to existing bores when a property changes ownership.

Registering new active domestic and stock bores

There is currently no practical way for the Government to know whether a domestic and stock bore is in operation or not. This gap in information about the location of active bores makes it difficult to:

- assess the potential for any adverse impact on existing users when approving a new licence or the transfer of an existing licence; and
- accurately estimate domestic and stock groundwater use.

A person who wants to extract groundwater, even for domestic and stock purposes, must obtain a licence to 'construct' a bore under section 67 of the *Water Act 1989*. If the water is for commercial use, the person must also obtain a licence to 'operate' the bore under section 67. This 'operating' licence confirms the bore is in operation and ensures the bore is operated and maintained in a way that protects the integrity of the aquifer, such as ensuring an appropriate pumping rate. It does not provide conditions on the volume of water that is taken.

A bore used solely for domestic and stock purposes is currently exempted from the requirement to obtain an operating licence. This means that while the location of the bore is generally known, current arrangements do not confirm that the bore is in operation.

To help monitor and keep track of the growth in active domestic and stock groundwater bores, the Government will introduce a requirement for domestic and stock users who construct a new bore to register the bore as being active by obtaining an operating licence, once the bore has been sunk and is ready for use (see Action 3.13).

This requirement will apply to any new bores constructed from 1 September 2012. Existing property owners will not be required to obtain an operating licence for their existing bores. However, when a property changes hands, the new property owner will be required to obtain an operating licence for all active domestic and stock bores on their land.

This requirement will provide better information about domestic and stock use over time. It will also help identify the number of domestic and stock bores constructed that are in use, which will help licensing authorities to assess the potential for bore interference when approving a new take and use water licence or transfer of an existing licence. Better information about the location of active domestic and stock bores will help ensure the potential impact on supplies to the owners of those bores is adequately considered by rural water corporations when making licensing decisions in the area. It will also help improve the understanding and management of groundwater resources and extraction in the area.

The operating licence for domestic and stock bores will be issued under section 67 of the *Water Act 1989* for 20 years with a condition to notify the rural water corporation and cancel the licence if the bore fails or is decommissioned during that period. This licence term will ensure that information is updated at least every 20 years while minimising the costs associated with renewing the operating licence too frequently. The operating licence would attract a moderate upfront administration fee associated with issuing and renewing the licence, similar to the fee charged by rural water corporations for registering domestic and stock dams in rural residential areas.

Monitoring water use outside the entitlement framework

The Victorian Government has recently received funding from the National Water Commission to undertake a project that aims to:

- estimate all significant water uses currently outside the water entitlement regime;
- record these estimates on the Victorian Water Register and Victorian Water Accounts; and
- track this use over time.

This project will consolidate the various tools available for estimating unaccounted water use to gain cost-effective, point in time estimates, and develop a framework for adopting emerging technologies to achieve more accurate estimates over time. These estimates will establish an information base from which more active management of unaccounted water use can evolve (see Action 3.14).

3.3.2 Managing whole groundwater systems

A key test for assessing whether the resource is being shared fairly is determining whether users extracting water from the same groundwater system are subject to the same management rules. As a legacy of where management boundaries were drawn, there are instances where users are subject to different management rules even though they are extracting water from the same groundwater system.

The current approach to groundwater management relies on managing groundwater use within defined management areas, which have been established where the resource is of reasonable quality and where there is considerable use. Areas with more use were declared water supply protection areas (WSPAs), while areas where groundwater resources are of a suitable quality but with less water were established as groundwater management areas (GMAs). In the remaining parts of the State, there is little groundwater water use, due mainly to poor groundwater quality, or deep groundwater systems that are expensive to access.

Recent investment in mapping groundwater systems, resource assessments and the completion of the first phase of redeveloping the observation bore network have greatly improved the Government's understanding of groundwater systems. This new information provides an opportunity to review the boundaries of the management areas to:

- ensure they cover all parts of the region, including currently unincorporated areas; and
- align them, as far as practical, with groundwater systems to ensure management decisions are better informed by the major influences on those systems.

The Government, through the Secure Allocation, Future Entitlements (SAFE) project, is developing new groundwater management boundaries based on groundwater systems. The project aims to:

- ensure all Victoria's groundwater is included in an appropriate management area;
- develop guidelines to ensure consistency in the way groundwater is managed throughout the State;
- develop guidelines for better determining the volume of groundwater available for use; and
- recommend how to transition from current to future management arrangements.

Defining management boundaries based on groundwater systems will provide state-wide coverage of management areas. The water balance and interconnectedness of aquifers within these systems will be better managed. Common management objectives for similar types of groundwater systems will be developed. This approach aims to ensure that the needs of water users and the environment throughout a groundwater system are supported by a consistent and efficient management framework. It should also provide greater scope for groundwater trade (see Action 3.15).

Southern Groundwater Futures

Southern Rural Water's Southern Groundwater Futures project provides detailed information about groundwater across the southern part of the State. A three-dimensional map was created, using information selected from about 7,900 bores, to help describe the shape and depth of aquifers. Together with information about land use, catchment features and the location of bores, it can improve our understanding about groundwater levels and where they may be altered by rainfall patterns and extraction rates. This information will be used by the SAFE project to better inform the management of groundwater across the State.

The maps can be viewed at: http://www.srw.com.au/Page/Page.asp?Page_Id=436&h=0

Action 3.14 Monitoring and tracking water use outside the entitlement framework

Who: Department of Sustainability and Environment **Timeframe:** Annually

The Department of Sustainability and Environment will monitor, track and report on water use outside the entitlement framework annually using:

- registrations of domestic and stock dams in peri-urban areas;
- records of construction licences for domestic and stock bores;
- estimates of domestic and stock water use reported on the Victorian Water Register and Victorian Water Accounts; and
- estimates of water intercepted by current land use throughout the State (see also Action 3.10 and 3.11).

This information will be used to inform the review of this Strategy in 10 years, which will assess the need for more active management of water use outside the entitlement framework.

Action 3.15 Revising groundwater management units (GMUs)

Who: Department of Sustainability and Environment **Timeframe:** March 2012

The Department of Sustainability and Environment will work with rural water corporations, catchment management authorities and groundwater users to revise the boundaries of groundwater management units (GMU) to align with groundwater systems.

The revised GMU boundaries will:

- Cover all parts of a groundwater system that share common characteristics and/or are interconnected.
- Be set at an operational and administrative scale appropriate for efficient management. Other boundaries, such as surface water catchments, administrative boundaries and existing groundwater management boundaries will be considered.
- Identify zones within management units to be used for specific management needs and variations.
- Where necessary, identify the need for transitional arrangements to avoid sudden changes in management arrangements for water users and processes for implementing future boundary changes.

3.3.3 Managing extractive industries and the impacts of mining on other groundwater users

This section considers actions and policies to manage activities which have an indirect and unintended impact on the quantity and quality of groundwater resources. Mining and other earth resource industries include oil and gas production, quarrying and underground coal gasification/liquification, as well as geothermal energy and carbon geosequestration projects.

By their nature, these projects involve the permanent extraction of materials from the ground. Activities with the greatest potential to impact groundwater resources in Gippsland are offshore oil and gas extraction in the Gippsland Basin and coal mining in the Latrobe Valley. Mining and other earth resource industries provide significant economic and social benefits to Gippsland, but can reduce groundwater availability for other users and environmental values.

Managing the impact of new mining and other earth resource projects

All new mining and other earth resource industry projects in Victoria require either a planning permit under the *Planning and Environment Act 1987*, or consideration under the *Environment Effects Act 1978*. Similarly, new offshore oil and gas production projects in Commonwealth waters require consideration under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*. These approval processes consider the environmental, social and economic impacts including the impacts on other water users or water-dependent environmental values.

Actions in this section will ensure that for any major new mining and earth resource projects the proponents are aware of the potential impacts on water resources and the environment, and that these impacts are addressed through approval processes (see Policy 3.9).

Where potential impacts are identified, project proponents should mitigate the impact by minimising the amount of water taken or by helping affected water users to source alternative supplies. In the event that mitigation options are not available, the project proponent could explore options to offset the impact of the project by investing in environmental programs to provide net benefits to the region or providing compensation to affected water users. The most appropriate form of any offsets will vary depending on the type of project and the location. Therefore offsets would need to be determined project by project, and subject to approval through the relevant approvals processes.

Where the water requirements of any major new earth resource projects cannot be met by obtaining a new or traded licence within the existing permissible consumptive volume (due to the size of the water demand), the project proponent will need to put in place appropriate measures to mitigate or offset this impact.

Where the impacts on the water resource cannot be adequately mitigated or offset, the project may not be given approval to proceed, based on consideration of other environmental and social and economic impacts.

Policy 3.9 Managing the impacts of new mining and earth resources projects on Gippsland's water resources

The Victorian Government's approval processes will continue to ensure that proponents of any new mining and earth resources projects in Gippsland and its Victorian coastal waters will:

- identify if the activity will impact adversely on Gippsland's water resources;
- identify mitigation strategies to, where possible, reduce impacts, or manage the impact to an acceptable level; and
- where necessary, provide offsets that will aim to ensure no net loss to existing water users and environmental values, where impacts cannot be mitigated to an acceptable level.

Offshore oil and gas

The offshore oil and gas fields in the Gippsland Basin provide Victoria's natural gas and supply about 20 per cent of Australia's crude oil. The basin contains 21 oil and gas fields currently in production, including Australia's largest oil discovery to date.

As described in Chapter 2 (page 20) fluids and gases are extracted from the aquifer as part of the offshore oil and gas production process in Bass Strait. The extraction of these fluids and gases reduce the pressure in parts of the Latrobe Group aquifer, and some of these pressure changes are transmitted through the aquifer to other locations. This can impact on access to groundwater for other aquifer users. The decline in pressures in the Latrobe Group aquifer is a particular issue in the Yarram area. A financial assistance package, funded by the State and Commonwealth governments has been established to assist irrigators to maintain access to the groundwater resource in the Yarram area.

Submissions to the Gippsland Region Sustainable Water Strategy Discussion Paper and Draft Strategy in relation to oil and gas production expressed concern about decreasing groundwater availability and called for more consideration of the impacts of oil and gas extraction on Gippsland's groundwater reserves.

Managing the impact of existing oil and gas activities

Victoria is responsible for oil and gas approvals in Victorian waters (within three nautical miles). Oil and gas production projects in Commonwealth waters (beyond the first three nautical miles) are managed by the Commonwealth Government's National Offshore Petroleum Safety Authority. From 1 January 2012, a new authority called the National Offshore Petroleum Safety and Environment Management Authority, will take over these responsibilities. Before these authorities were established, the oil and gas activities in Commonwealth waters were jointly administered by Victoria and the Commonwealth.

All new and existing oil and gas projects in both Victorian and Commonwealth waters will remain subject to environmental regulations under the federal *Offshore Petroleum and Greenhouse Gas Storage Act 2006*. These regulations aim to ensure that petroleum activities are carried out in a way that is consistent with the principles of ecologically sustainable development[18].

These regulations state that each project must have an approved environment plan demonstrating that the environmental risks of the activity have been considered and measures are in place to mitigate these risks. Any new environment plans will be considered by the Commonwealth Minister for Resources.

Tuna Platform, Bass Strait, DPI

Processes to consider the implications of offshore oil and gas extraction on Gippsland's water resources were not in place when many of the current oil and gas production projects began. However, environmental regulations require environment plans for existing projects be revised every five years, on the request of the authorities or when a significant new increased environmental impact or risk is identified.

The revision of an environment plan provides an opportunity to address the impacts identified and reduce any ongoing impacts. If any significant new increased environmental impact or risk is identified that is not included in the environment plan/s, Victoria will advocate to the Commonwealth Government for the risk to be addressed as part of a revision to the relevant environment plan/s (see Action 3.16).

All new onshore oil and gas production projects, and those in Victorian waters, are subject to the *Planning and Environment Act 1987* or the *Environmental Effects Act 1978.* These projects are also subject to the *Commonwealth Petroleum Act 1998* as well as the *Environment Protection and Biodiversity Conservation Act 1999*. Since 2000, all new oil and gas projects in the Gippsland Basin have been in Commonwealth waters.

The results of further exploration cannot be anticipated but development of any new discoveries would be subject to the existing approvals processes. This includes any new projects that eventuate from the five new onshore exploration areas made available in the Gippsland Basin in May 2010. These five new areas are between Yarram and Orbost, with two of the areas next to existing offshore oil and gas fields.

Action 3.16 Considering adverse impacts of existing oil and gas extractions

Who: Victorian Government **Timeframe:** Ongoing

If significant new risks associated with oil and gas projects are identified, including risks associated with the Latrobe Group aquifer, then the Victorian Government will advocate for the environment plans to be revised. Potential risks could include risks to the groundwater availability for users of the Latrobe Group aquifer and subsidence.

Mining and quarrying

Coal mining

The Gippsland Basin contains large reserves of brown coal, which provide about 90 per cent of the State's electricity. Three large open-cut coal mines are located in the Latrobe Valley.

Open-cut coal mining operations require the mines to be dewatered to allow access to the coal and for mine stability[19]. The water extracted is used in the mines for dust suppression and fire response. Each of the Latrobe Valley mines hold a groundwater licence. Historically they have pumped only about 60 to 70 per cent of their combined volume, lowering groundwater levels immediately around the mines to maintain batters.

It is possible that new coal mines could be developed in the Latrobe Valley. All new coal mining projects in Victoria first require an approved work plan under the *Mineral Resources (Sustainable Development) Act 1990*. Before any new mines are approved, the Victorian Government determines whether a planning permit or an Environment Effects Statement (EES) is required.

An EES identifies and assesses any adverse impacts the project may have on Gippsland's water resources and provides a response to how these impacts might be mitigated. If an EES is required then any groundwater licence granted would contain conditions set in accordance with the outcome of the EES.

If an EES is not required, the relevant water authority (Southern Rural Water) is given the opportunity to ensure water issues are adequately considered before the project's work plan is approved. Southern Rural Water would then assess whether or not a water licence is required for the proposed project.

The Department of Primary Industries has provided funding of $3.25 million over five years to establish the Geotechnical and Hydrogeological Engineering Group (GHERG) at Monash University Gippsland Campus. This is a world-class research and innovation unit, created to focus on coal geotechnical engineering and hydrogeology. The group's key focus is on understanding the environmental impacts of open-cut mining on groundwater and aquifer systems, understanding mine stability and the long-term failure risks, and establishing options for rehabilitation of mines.

Other mines and quarries

Other extraction activities in Gippsland include lime, sand, gravel and hard rock quarries and small gold mines. There is also potential for other types of mines. Quarries provide a local source of materials for construction activities, but can interact with surface water and groundwater by altering surface drainage, intercepting the water table, generating an off-site discharge or requiring a water supply for processing.

Dewatering has the potential to lower the water table locally, which in some cases may affect other groundwater users or water dependent ecosystems. There is also the potential for water quality to be affected by leaching of mining wastes into waterways.

When it is determined that a mine or quarry requires a water licence, they must make a separate application to Southern Rural Water for a new licence or to trade a licence from an existing user.

The Department of Primary Industries is reviewing the *Mineral Resources (Sustainable Development) Act 1990*, which among other things aims to improve processes for government approvals. The Department of Sustainability and Environment is also reviewing the licensing requirements for dewatering activities under the *Water Act 1989*. The outcomes of the review will clarify how dewatering activities are to be licensed (see Action 3.17).

Subsidence

Considerable research has been undertaken to assess the risk of broadscale subsidence of aquifer systems along the Gippsland coast occurring in response to the declines in groundwater levels and pressures due to offshore oil and gas production, mine dewatering or groundwater use.

The research, including work done by CSIRO, found that while subsidence along the coast is a possibility, no evidence exists that broad-scale subsidence has occurred. The realistic amounts of subsidence predicted by CSIRO[20] were 0.15 to 1.39 m over 50 years, with subsidence at each monitoring point along the coast dependent on the thickness of the underlying aquifer. The study concluded that the risk of future subsidence causing inundation at the coast was small compared with the risks posed by seawater inundation as a result of climate change.

Limited data is available to model the impact of continuing falls in groundwater levels offshore on the coastal region, due to the difficulty of obtaining suitable core samples at the necessary depth.

A four-year monitoring program completed by the Department of Primary Industries in 2007 did not detect any significant subsidence along the coast, within an error margin of +/-16mm.

The Department of Sustainability and Environment will undertake a pilot study into the use of radar satellite imagery to monitor subsidence along the Gippsland coast. The pilot study will determine whether satellite technology now available can monitor subsidence with greater accuracy and spatial coverage than has been possible in the past (see Action 3.18).

Chapter 6 (Section 6.2.2) considers the issues of local subsidence monitoring in the Latrobe Valley.

Action 3.17 Consistent groundwater licensing requirements for new quarries and mines

Who: Department of Sustainability and Environment **Timeframe:** End 2012

The Department of Sustainability and Environment will review the licensing requirements under the *Water Act 1989* for mines and quarries and take steps to ensure they are applied consistently across Victoria.

Action 3.18 Understanding and monitoring the risk of coastal subsidence

Who: Department of Sustainability and Environment **Timeframe:** End 2012

The Department of Sustainability and Environment will undertake a pilot study using satellite imagery for monitoring subsidence along the Gippsland coast. If successful the pilot study will be used to design a longer term monitoring program.

Emerging technologies

A range of emerging technologies, some of which are seen as part of the solution to reducing carbon emissions, may have significant implications for groundwater. These include: geothermal operations, carbon capture and storage, extraction of methane and petroleum products from in-ground coal, and further development of mine dewatering for coal-based initiatives. Each raises new challenges for the licensing and management regime that applies to groundwater under the *Water Act 1989*.

Geothermal energy

The Victorian Government has awarded five permits for geothermal exploration under the *Geothermal Energy Resource Act 2005* in areas across Gippsland. The Act applies only to resources at a depth greater than 1000 m. While it is less likely that the use of resources at these depths will impact on other users any approval regime applied for these projects must ensure overlying aquifers and the existing users are not adversely affected.

Carbon capture and storage

Carbon capture and storage involves capturing of carbon dioxide from industrial emissions and injecting it under pressure into rock formations where it can be securely held. Victoria's CarbonNet project is investigating the potential of capturing carbon dioxide from electricity generation and new coal-based industries in the Latrobe Valley, and moving it to offshore storage sites in Victoria's geological basins.

The potential for this technology to impact on aquifer pressures and quality is assessed through the *Greenhouse Gas Geological Sequestration Act 2008* (onshore) and the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (offshore).

Underground coal gasification/liquification

Underground coal gasification/liquification involves turning coal into hydrocarbons in the coal bed without the coal being extracted. This technology is under consideration in Victoria.

Deeper coal seams in the Gippsland Basin that cannot be commercially mined are potential targets for these technologies. These coal seams could be part of, or occur above or below aquifers used for water resources. Unless well regulated, underground coal gasification/liquification could impact aquifers in Gippsland through additional demand for water, or the creation of by-products that could pollute groundwater resources.

Coal seam methane

Coal seam methane is the extraction of methane gas from deeper coal seams. The process of extracting coal seam methane involves extraction of water and gases from the coal seam. The extraction of groundwater could affect water levels but is required to be licensed as any other water user under the *Water Act 1989*. If coal seams needed to be hydraulically fractured to enhance permeability then this could affect water quality if inadequately planned and monitored.

There is as yet untested potential for the commercial development of coal seam methane in Gippsland. While there has been no coal seam methane extraction in Victoria, intermittent exploration for coal seam methane has occurred near Longford in the Yarram WSPA since 2005. As it stands in September 2011, while there is known brown coal in the area, further exploration is required to test the viability of this coal to produce coal seam methane.

Coal to liquids technology

A range of primary commodities derivatives can be derived from coal including methanol, ammonia and oil (from coal to liquids technology). The extraction of coal for the production of these products has the potential to impact on groundwater systems.

For example, EPA Victoria approved the development of the HRL dual gas project, a proposed 300 MW power station that will use new gasification technology in Morwell. If the plant is constructed it is expected to primarily run on synthetic gas derived from coal and use natural gas as a start-up fuel.

Managing potential impacts from emerging technologies and industries

As new technologies and industries, such as geothermal energy or carbon capture and storage, emerge over time, their potential impact on the availability of groundwater must be considered.

The particular licensing issues presented by these new technologies were not able to be contemplated when the *Water Act 1989* was prepared. However, legislation can always be amended or redrafted to ensure appropriate protections are provided. Over the life of this Strategy, licensing requirements will be reviewed to ensure that the water use by new technologies and industries does not impact on other users or the environment.

The Department of Sustainability and Environment and the Department of Primary Industries are working together to determine licensing and management issues for emerging technologies to clarify responsibilities and to give greater direction to the resource development industry about approval requirements (see Action 3.19).

3.3.4 Considering water impacts when undertaking planned burning on forested Crown land

> *"The consideration of increased planned burning and the outcomes of the implementation of the recommendations of the recent 2009 Victorian Bushfires Royal Commission must be considered and incorporated into the Gippsland Region Sustainable Water Strategy"*
> *– Draft Strategy submission 046*

As discussed in Chapter 2 and Technical Paper 3, bushfires can impact on water quality in the short term, and have the potential to reduce run-off in the long term.

The Victorian Government undertakes planned burning aimed at reducing the intensity and size of bushfires when they do occur.

The 2009 Victorian Royal Commission recommended that the Department of Sustainability and Environment amend the *Code of Practice for Fire Management on Public Land*. The Government adopted this recommendation and is reviewing the Code of Practice to provide a revised framework for planned burning activities.

Each year, the Department of Sustainability and Environment prepares fire operations plans for public land in Victoria. The three-year plans describe the proposed fuel management and other fire protection works for public land managed by the Department and Parks Victoria, including planned burns.

Each fire operations plan is developed in accordance with the *Code of Practice for Fire Management on Public Land*, in consultation with communities, Parks Victoria, local government, Country Fire Authority, technical specialists within the Department and other stakeholders as identified. In developing the plans, consideration is given to priorities that have different weightings, with asset protection, which includes the protection of human life, the highest priority.

Planned burning can help to protect the quality and quantity of water flowing out of catchments by reducing the size, intensity and subsequent impact of future fires. These positive impacts need to be weighed against the relatively minor impacts of planned burning on water quality and yield (see Action 3.20).

Planned burning, DSE

Action 3.19 Emerging technologies

Who: Department of Sustainability and Environment and Department of Primary Industries

Timeframe: End 2012

The Department of Sustainability and Environment and the Department of Primary Industries will work together to ensure that approvals and licensing decisions under the *Water Act 1989* for new and emerging technologies consider the potential impacts on groundwater, including:

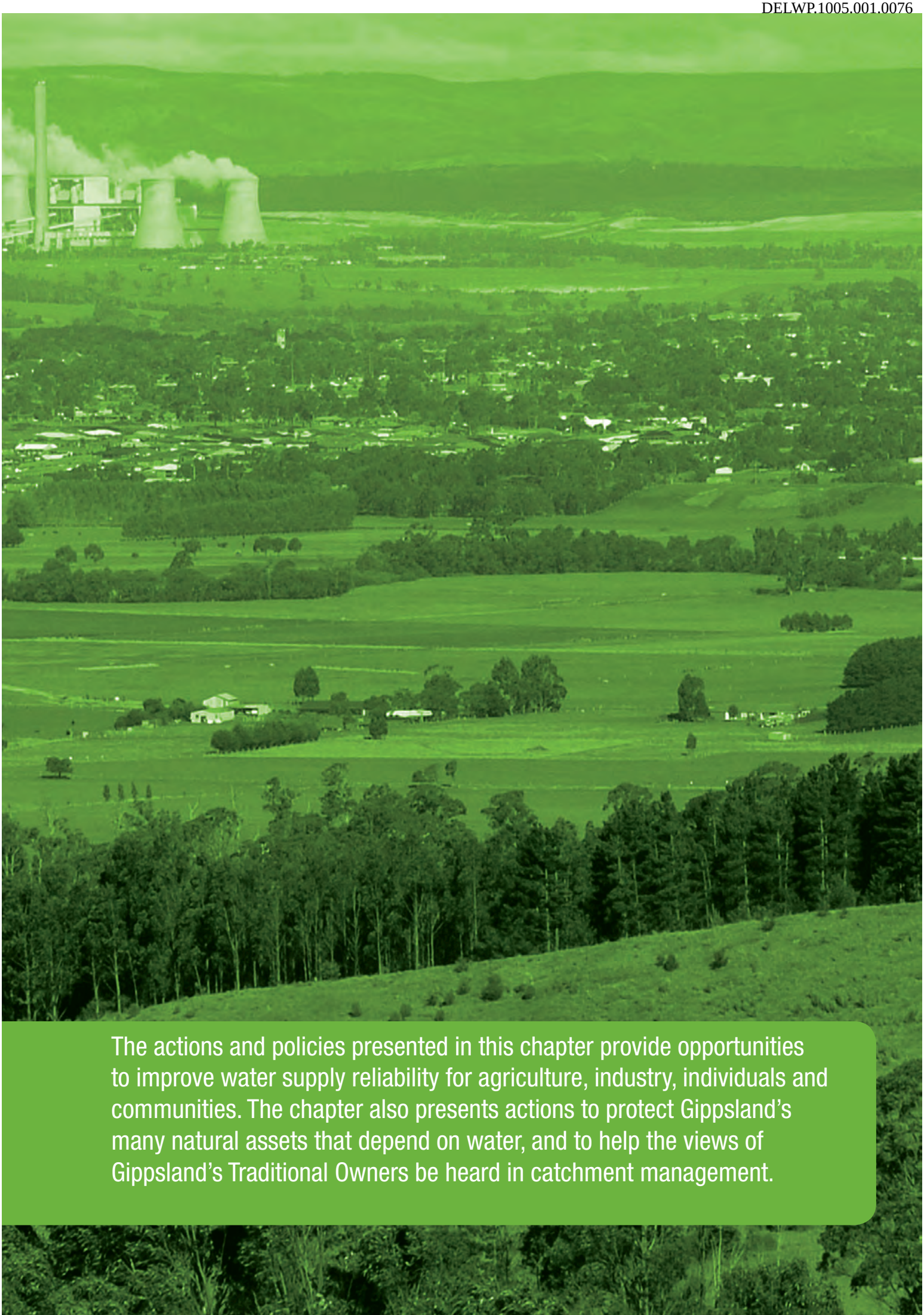
- water quality (consistent with its beneficial uses);
- environmental, social and economic impacts; and
- other water users.

Action 3.20 Considering water impacts when undertaking planned burning and other bushfire control measures

Who: Department of Sustainability and Environment

Timeframe: Ongoing

When developing Fire Operations Plans, the Department of Sustainability and Environment will consider how the proposed works can benefit downstream water quality and quantity responses to bushfire. This will take into account the relative importance of other priorities for forest management, as well as the relatively high level of uncertainty around the management action and the catchment response.



The actions and policies presented in this chapter provide opportunities to improve water supply reliability for agriculture, industry, individuals and communities. The chapter also presents actions to protect Gippsland's many natural assets that depend on water, and to help the views of Gippsland's Traditional Owners be heard in catchment management.

Promoting sustainable use of water

Guide to this chapter

4.1 Promoting the sustainable development of water resources

- Promoting water conservation and efficiency
- Trade and carryover
- Sustainable use of surface water resources – harvesting and storage
- Sustainable use of groundwater resources – storage and carryover
- Promoting the use of alternative supplies such as recycled water and stormwater
- Extending water supply systems to improve reliability

4.2 Future consumptive water needs of industry, agriculture and communities

- Improving the reliability of supply for agricultural and rural water users
- Improving the reliability of supply for urban and industrial water users

4.3 Considering the views of Gippsland's Traditional Owners when managing catchments

- Connection to Country
- Traditional Owner involvement in catchment management

4.4 Protecting Gippsland's waterways, aquifers, wetlands and estuaries

- Environmental water
- Complementary river restoration works and measures
- Adaptive and integrated management for a changing environment
- Managing groundwater dependent ecosystems

Promoting sustainable use of water

Introduction

The past 14 years have been severe – the drought from 1997 until early last year, followed by a return to average conditions across much of Gippsland, but with some areas experiencing well above average rainfall and damaging floods. This highlights the need for water users to be able to adapt to changing water availability in order to manage the uncertainty of prolonged dry periods and floods.

This Strategy draws on the experience of the past 14 years to identify policies and actions to provide water users and water corporations with the information and tools required to meet their future water needs.

Actions and policies presented in this chapter look to improve the reliability of water supplies and consider the future water needs of industry, agriculture and communities. It also presents actions to help the views of Gippsland's Traditional Owners be heard in catchment management, and to protect Gippsland's many natural assets that depend on water.

4.1 Promoting the sustainable development of water resources

The Strategy aims to make the best use of existing supplies by:

- continuing to promote water conservation and efficiency, and alternative water sources;
- exploring opportunities to improve storage capacity by, for example, using off-stream storages or aquifers, or extending the supply network; and
- encouraging water users to trade water with other users or carryover water from year to year.

4.1.1 Promoting water conservation and efficiency

Recent drought conditions have highlighted the important role water efficiency and demand management measures can play in ensuring reliable supplies.

The community embraced the extensive water efficiency and demand management campaigns throughout the State during the past 14 years. Homes and businesses changed their habits and actively sought to reduce the amount of water they used. Large-scale water efficiency projects, such as the Gippsland Water Factory (see Section 6.2.2, page 130), have also reduced the demand on the region's rivers.

The Government will continue to support urban water corporations pursuing water efficiency initiatives as part of their strategies for balancing supply and demand. Chapters 5 to 7 discuss water efficiency initiatives urban water corporations have put in place or are developing as part of their water supply-demand strategies, which are due to be reviewed and updated by March 2012.

In July 2011, the Government announced it would extend the water efficiency rebate program to include all Victorian households and small businesses and to encourage them to invest in water-efficient appliances.

Action 4.1 Promoting water conservation and efficiency

Who: Department of Sustainability and Environment, Southern Rural Water, urban water corporations, and individuals

Timeframe: Ongoing

The Government will promote water conservation and efficiency by:

- requiring urban water corporations to evaluate cost-effective water conservation and efficiency options as part of their water supply-demand strategies (see Action 4.8);
- continuing to support its rebate program for water-efficient appliances for homes and small business;
- continuing to encourage water efficient practices in homes and businesses;
- reviewing permanent water saving rules as part of a broader evaluation of the Victorian Uniform Drought Water Restriction Guidelines (see Action 4.9);
- requiring best practice *Irrigation Development Guidelines* to be applied for new irrigation developments and encourage the use of these guidelines when sleeper licences are activated;
- continuing to support whole-of-farm planning through the Sustainable Irrigation Program, helping irrigators plan for and manage their water needs efficiently; and
- promoting efficient domestic and stock water use through the *Guidelines for Reasonable Domestic and Stock Use* and dryland sustainable water management program (see Action 4.7).

The Government is continuing to encourage water efficiency in homes and businesses. Urban water corporations are working with communities and business customers to help them implement water-efficient practices.

To help promote efficient water use, the Government is reviewing permanent water saving rules to ensure that the rules reflect community expectations about environmentally, socially and economically responsible water use. This review is part of a broader evaluation of the *Victorian Uniform Drought Water Restriction Guidelines* (see Section 4.2.2, page 79).

In rural areas, the Government will continue to promote efficient use of water for irrigation and domestic and stock purposes. Best practice *Irrigation Development Guidelines* will continue to be applied in areas where new section 51 take and use licences are issued and irrigation is developing.

The *Guidelines for Reasonable Domestic and Stock Use* will be promoted to help domestic and stock users plan for and meet their water needs. The Government will also promote efficient use of domestic and stock water as part of an initiative to encourage sustainable water management on dryland farms (see Section 4.2.1).

Whole-of-farm planning supported through the Sustainable Irrigation Program will continue to help irrigators plan for and manage their water needs as efficiently as possible to minimise irrigation side-effects such as nutrient run-off or salinity.

Another key water efficiency issue will be to ensure that water use stemming from the activation of sleeper licences is as efficient as possible. About 30 per cent of unregulated surface water licences in Gippsland are sleeper licences, and about 40 per cent of groundwater licences are sleeper licences. When sleeper licences are activated, users will be encouraged to comply with best practice *Irrigation Development Guidelines.*

Actions to promote these water conservation and efficiency measure are contained in Action 4.1.

4.1.2 Trade and carryover

Where appropriate, water trading and the ability to carry over unused water entitlements can let water users manage the risk of changing water availability to meet their individual needs.

Improving opportunities for water trading

In parts of the region, water resources are fully allocated or close to full allocation. The only way to obtain more water is to buy it from another water user or find alternative sources.

When they work effectively, water markets promote productive water use. They allow water to move from lower value to higher value uses as demands change over time, boosting the regional economic returns that can be made from available water. Additionally, trading can help new water-dependent developments become established.

> *"…the current trading rules limit the use of trade as a means for consumptive users to access new or increased entitlement."*
> *– Draft Strategy submission 044*

What is needed for a water market to work well?

Water markets can work effectively when:

- the amount of water available is capped and fully allocated, so those wanting water will look to the water market to buy it;
- the ownership rights to that water are secure and clear, for example through a register of entitlements;
- there are many potential buyers and sellers, and simple and effective ways for them to find each other;
- buyers and sellers are connected to the same surface or groundwater system so that water can be transferred between them;
- potential buyers and sellers are well informed and there is clear, readily available information about the available water so they can make their own business decisions about the value of water and possible sales or purchases;
- any limitations for water trading are made clear in trading rules that are understood by potential buyers and sellers; and
- there is a good understanding of the trading process, for example the volumes traded, the prices paid and the time required to sell or buy water.

Promoting sustainable use of water

Types of water trading

Temporary trade

Water users with a water entitlement, or a tradeable water allowance, can trade part of that entitlement in a given year (known as a temporary trade), and still keep the entitlement. They will have their full entitlement the following year, unless they decide to sell some of it again.

Limited-term transfers or leases

Water users also have the ability to trade or 'lease' water for a multi-year period. However, the option of leasing water is available only for:

- up to 20 years on regulated systems; and
- up to five years if
  - permanent transfers have been banned for more than 12 months due to the declaration of a water supply protection area; or
  - the water corporation, after consultation with the Department of Sustainability and Environment, believes other circumstances warrant a temporary transfer for a period longer than one season.

Permanent trade

Water users may want to sell all or part of their water entitlement or tradeable water allowance permanently. They may have less need for water because of more efficient operations or because they have reduced the water-using parts of their business.

Water trade in Victoria

A water market has existed in Victoria since the early 1990s. In areas where new water entitlements are not available, water trading is the main way for individuals to access additional supplies. It enables rural water users, industries, urban water corporations and environmental managers to buy and sell water shares, seasonal allocations and section 51 take and use licences. Trading can encourage more efficient use of water resources, without increasing water entitlements in an area.

The water market is a fair and effective way to reallocate water to meet changing needs of individuals and the community in the short and long term. In times of water scarcity, it is a voluntary way to move water between uses. Without trade, irrigators could not buy additional water when allocations are too low to support their crops. Likewise, other irrigators could not sell their allocations to generate revenue.

If the market did not exist, other compulsory and more bureaucratic methods would need to be found to reallocate water. This type of government intervention would reduce water users' confidence in their entitlement and make it more difficult for them to plan. It is important to maintain the integrity of Victoria's entitlement system, so that the community has confidence to invest.

Potential water markets in the region

Water markets are well developed in regulated supply systems such as the Macalister Irrigation District. However, water markets are not nearly as well developed in Gippsland's unregulated surface water and groundwater systems. Generally, this is because there are not enough active buyers and sellers drawing on one waterway or aquifer to create the market. However, opportunities exist to develop water markets where trade is already occurring and to facilitate trade in areas where there has been limited or no trade to date.

The Minister for Water's *Policies for Managing Section 51 Take and Use Licences* (see box on page 42) specify the trading rules for unregulated surface water systems.

Under current arrangements, trade is permitted to downstream areas and to upstream areas if the all-year licence is changed to a winter-fill licences. In special circumstances, a licensing authority can apply to the Secretary of the Department of Sustainability and Environment to allow upstream trade to summer direct pumping licences if there is sufficient summer flow and there are no alternative supplies. The assessment of such applications is based on a precautionary approach to protect exiting water users and the environment.

In addition, Victoria's sustainable diversion limits (see Reference Guide 2, page 12) are used to assess the capacity to trade or transfer winter-fill licences between unregulated sub-catchments. Under the current trading rules, if the sub-catchment to where the water is being traded has licensed volumes greater than the sustainable diversion limit, the trade would not be approved without a detailed assessment of the potential risks to existing users and the environment.

The *Policies for Managing Section 51 Take and Use Licences* do not specify trading rules for groundwater systems. This means that rural water corporations generally assess applications to trade groundwater on a case-by-case basis in accordance with Section 40 of the *Water Act 1989*, which requires several matters to be considered, such as the impact on other users and the environment, before approving the trade. In some instances, rural water corporations have developed and documented trading rules for particular groundwater systems in statutory management plans or local management rules.

Action 4.2 aims to encourage and potentially free up water trading in Gippsland while maintaining the benefits of the 'black and white' approach described in the box. The *Policies for Managing Section 51 Take and Use Licences* will continue to specify generic, 'black and white' rules for water trading.

Specific trading rules may be developed in local management plans. In these cases, the local trading rules need to be consistent with the principles in the box and reviewed and approved by the Secretary of the Department of Sustainability and Environment on behalf of the Minister for Water to ensure they adequately manage the potential risks to existing users and the environment (see Action 4.2 and Table 4.1, over page).

Principles to guide development of trading rules

The trading rules for unregulated surface water and certain groundwater systems have been developed to be 'black and white' to:

- minimise risks to neighbouring existing licence-holders and the environment;
- provide certainty to prospective traders;
- avoid the need for expensive assessment processes to ensure trades are affordable;
- ensure rules are clear, minimising the need for interpretation by licensing authorities that could be subject to lobbying, public, dispute or legal challenge; and
- manage the risk of the tyranny of small decisions (for example, where approving one trade of 10 ML may not have an adverse impact but approving 20 trades of 10 ML would).

Action 4.2 Improving opportunities for water trading in groundwater and unregulated river systems

Who: Department of Sustainability and Environment, Southern Rural Water, Department of Primary Industries, catchment management authorities

Timeframe: End 2012

Trading opportunities and flexibility in groundwater and unregulated river systems in the region will be improved for entitlement-holders while minimising third-party impacts. See Table 4.1 for the specific actions to be taken.

Potato crop, Thorpdale, VFF

Table 4.1 Improving water trading opportunities

Issue and context	Action	Who	Timeframe
Better information about water markets and trading • Government and water corporations can assist development of water markets by providing information to help potential participants understand how trading works and value their water entitlements each year.	**Action 4.2 (a):** A market development and education program will be implemented to inform water users and the wider community about trade, its benefits and how it works, including: • more detailed market information on the Victorian Water Register (www.waterregister.vic.gov.au); • information about trade concepts, rules, processes and applications, and sources for trade data; • requiring trading applications to disclose market prices; • information from other areas where trade occurs to allow people to infer market prices; • how potential buyers and sellers can use the Victorian Water Register to search for and view water licences held in an area; and • how to go about and complete a groundwater transfer.	Department of Sustainability and Environment, Southern Rural Water	Dec 2012
Increasing the potential for trade in unregulated surface water and groundwater systems • In some systems, the current trading rules or approval processes may limit trade despite the risks to existing users and the environment being low. It may be possible to develop system-specific trading rules that increase the potential for trade while ensuring the risks to existing users and the environment are low.	**Action 4.2 (b):** In developing or amending a local management plan, rural water corporations may develop system-specific trading rules that provide greater potential for trade while risks to existing users and the environment minimising. For example: • establishing trading zones to allow upstream and downstream trades in reaches of larger waterways; • providing exemptions to Victoria's sustainable diversion limits in sub-catchments where the risks to third parties are low; • establishing rules or arrangements that facilitate trades of small volumes where the risks are low; • identifying areas where trades could proceed without the need for a detailed, technical assessment of the potential risks to third parties; and • identifying buffer zones where trades could not proceed without a detailed, technical assessment of risks. Any system-specific water trading rules in a local management plan must be reviewed and approved by the Secretary of the Department of Sustainability and Environment (on behalf of the Minister for Water) before being implemented. *The Policies for Managing Section 51 Take and Use Licences* with be amended to include this requirement.	Department of Sustainability and Environment, Southern Rural Water	As needed

Table 4.1 Improving water trading opportunities

Issue and context	Action	Who	Timeframe
Risk-based approach to approving water trades • Applications to trade water are assessed to identify potential impacts of the trade on third parties. However, the time and cost of these assessments can preclude the trade of small volumes such as for dairy wash down. The costs can be significant for groundwater trading, which must be supported by a hydrogeological assessment.	**Action 4.2 (c):** In applying Section 40 of the *Water Act 1989*, rural water corporations will use a risk-based approach to determine the level of assessment required before approving a trade. Low risk trade applications could include those with low transfer volumes and low likelihood of impacts. Trades with little likelihood of affecting third parties might require only a desktop assessment. The Department of Sustainability and Environment will work with rural water corporations and catchment management authorities to identify best practice in using a risk-based approach to assess transfer applications. Temporary groundwater transfers of 20 ML or less will not require advertising or a detailed groundwater assessment unless there is likely to be a third party impact. These transfers will still be subject to trading rules for each management area or trading zone.	Department of Sustainability and Environment, Southern Rural Water	End 2012
Facilitating limited term-transfers or leases in unregulated surface water and groundwater systems • Under the *Policies for Managing Section 51 Take and Use Licences*, limited-term transfers or leases are currently permitted for up to five years in certain circumstances (see box on page 42). Comments on the Draft Strategy suggested that providing greater ability for limited-term transfers or leases could help stimulate trading of section 51 take and use licences.	**Action 4.2 (d):** The *Policies for Managing Section 51 Take and Use Licences* will be amended to allow limited-term transfers or leases of section 51 take and use licences for: • a period of up to five years if the water corporation believes the risks to third parties are low; or • the licence term if the rural water corporation, as part of the process of developing a local management plan, has demonstrated that the benefits of enabling leases for the term of a licence outweigh the potential costs and risks to third parties.	Department of Sustainability and Environment in consultation with Southern Rural Water	Mid 2012

4.1.3 Sustainable use of surface water resources – harvesting and storage

Harvesting high flows

The prospect of a more variable climate, with extended dry periods and floods, requires water harvesting rules to make the best use of storages while protecting the interests of all water users and the environment. The challenge is to find the right balance between providing flexible management options to entitlement-holders without adversely impacting on the needs of the environment and downstream users.

Most water entitlements provide for storages (on and off-stream) to be filled only from 1 July to 31 October. Winter-fill rules were established to minimise the impact on the environment by filling storages in winter and reducing diversions over the summer months, where inflows have historically been low.

During the recent drought (1997-2009), there was a noticeable shift in rainfall seasonality, with a clear reduction in Victoria's autumn/winter rainfall. The reduction in spring/summer rainfall was less significant and was coupled with an increase in the number and intensity of 'summer storms'.

It is not certain which weather patterns will influence Victoria's climate in the future. However, opportunities exist to amend the licensing framework to make it more flexible under a range of rainfall and climate patterns by allowing diverters to access high flows outside the winter-fill period.

Natural freshes and floods are vital for the health of a river system, by improving water quality, regenerating floodplains and wetlands, including agricultural soil and replenishing river channels (see box to right). Allowing diverters to access high flows outside the winter-fill period could reduce freshes or floods and harm the environment. Therefore, measures would need to be taken to ensure harvesting of high flows does not reduce the benefits of freshes and floods (see Action 4.3). These measures include setting triggers for allowing harvesting based on a river height or flow capacity that will not erode the environmental benefits of high flow events.

Harvesting of high flows may deliver some benefits to reliability, but these should not be overstated. High flow diversions linked to floods will be opportunistic and should not be seen as the panacea to extended dry periods, or the basis for significant new investment.

Controlled access to high flows will add to the options available to adaptively manage water-sharing arrangements for Victorian waterways. A decision to access high flows in a given waterway system will be made locally and will consider allowing access on river systems where:

- high flows are more likely to be sustained over a number of days;
- flow capacity may be considerably higher than total licensed demand;
- the proportion of water harvested is small compared to the streamflow; and
- customers are willing to pay additional administrative costs of managing access to high flows.

The importance of summer and spring flows for the environment

Unregulated streams can receive short bursts of higher flows in the drier late spring and summer months. These pulses of water often come from local rainfall and usually last only a few days. They are greater than the usual low summer flows, and bring important ecological benefits to the stream by:

- providing biological triggers;
- increasing the release and distribution of food by creating short-term connections between the main channel and terraces along the river bank;
- helping to maintain a range of habitats by watering stream-side vegetation; and
- sustaining populations of some plants and animals.

Action 4.3 Harvesting high flows

Who: Department of Sustainability and Environment, Southern Rural Water, catchment management authorities

Timeframe: End 2012

The Department of Sustainability and Environment in consultation with Southern Rural Water and catchment management authorities will investigate the option of providing access to high flows (outside the winter-fill period) based on the following principles:

- the total volume of entitlements for a given system is not increased, although the reliability of entitlements may consequently increase;
- harvesting high flows will be available only in river systems and for flow events where the risk of adverse impacts to downstream users, and the immediate and downstream environments, is low;
- appropriate constraints/rules on extraction, such as limiting individual pumps and pumping rates, are in place to ensure equitable access to any high flow events; and
- the licensee meets administration costs of managing and monitoring the harvesting of high flows.

The *Policies for Managing Section 51 Take and Use Licences* will be amended to formalise agreed principles for licensing access to high flows and processes to be followed to determine implementation arrangements locally.

Water corporations would need to consider granting access to high flows as part of a system-specific planning process to assess relevant local issues, consult with stakeholders and be guided by the principles in Action 4.3. In some instances, it may be better to promote trade to provide the increase in management flexibility and/or reliability needed (see Action 4.2).

Exploring opportunities to improve storage capacity

In some areas, the region's existing water could be put to better use if it could be stored and used in dry periods without adversely affecting existing users and the environment.

There have been suggestions, including in some submissions on the Draft Strategy, for the construction of a large public storage on the Macalister River or the Mitchell River. The Government does not support constructing new storages on rivers or major tributaries within the Macalister or Mitchell river catchments (see Chapter 6, pages 137 and 145).

Private storages

Off-stream storages can be used by individual licence-holders to capture water from rivers during wet periods for use in drier months. Although more expensive than direct pumping and use of water, these storages reduce the impact of water extraction on the river by taking water when environmental stress is low, generally in winter. This can reduce demand in dry periods when environmental stress is highest. The total amount of water able to be taken over the year is unchanged.

This option may need flexibility to allow increased pumping rates during wet periods, for example by revising local conditions or local management plans. It would be allowed only where there is a demonstrable need and where there are no unacceptable impacts on other consumptive users in the system and the environment.

Southern Rural Water approves the construction of off-stream storages by issuing section 67 construction licences. The process of obtaining a section 67 licence can be time-consuming because it often requires a determination to be made that the storage is not on a waterway before the application is referred to the relevant catchment management authority, which may require the applicant to commission a study to assess potential risks to the environment. The scope of these studies may vary in different parts of the State because of limited guidance provided for catchment management authorities on how to assess environmental needs, including how to consider the potential benefits of converting an all-year licence to a winter-fill licence.

In some instances, it may not be possible to construct a storage off-stream and the applicant may seek approval to build a storage on a waterway. Before this can occur, Southern Rural Water must be satisfied that:

- the applicant has thoroughly investigated alternative sites for the storage and alternative sources of water supply;
- an environmental assessment report commissioned by the applicant demonstrates that the proposed works will not have an unacceptable impact on downstream ecological or riparian values at or near the site; and
- the section 67 construction licence includes appropriate environmental conditions, such as requirements to provide passing flows or appropriate fish passage.

Satisfying these requirements can also be time-consuming because of limited information and guidance on how to identify waterways of high ecological value and how to determine appropriate environmental requirements.

Applicants need guidance to help understand the risks to third parties and the environment associated with constructing water storages and the process they need to follow to obtain the relevant approvals (see Action 4.4).

Action 4.4 Streamlining the approval of section 67 licences to construct storages

Who: Minister for Water, Department of Sustainability and Environment, Southern Rural Water, catchment management authorities

Timeframe: End 2012

The Department of Sustainability and Environment, in consultation with Southern Rural Water and catchment management authorities, will develop Ministerial guidance for assessing applications for section 67 licences to construct private storages, which will include guidance on:

- determining appropriate timelines for the application process;
- identifying waterways of high ecological value;
- assessing the needs of the environment, including how to assess the potential net environmental benefits of converting all-year licences to winter-fill licences; and
- determining appropriate environmental requirements and licence conditions.

Large public storages

In the right situations, large public on-stream storages may be the best option to provide water when it is needed.

However, on-stream dams have major impacts on aquatic environments by changing the seasonal pattern of flow and obstructing the movement of fish and other animals that need to migrate along the waterway.

The assessment of any future large public storages should be based on a thorough investigation of the economic, environmental and social benefits and costs of each proposal. It should consider the cumulative environmental impact on a basin-wide scale of large public storages, the risks of long-term climate variability and be consistent with State and Commonwealth legislation.

Proposals for new large public storages will be considered on a case-by-case basis through existing water planning processes such as the urban water corporations' water supply-demand strategies.

Options to improve winter-fill storage within the Mitchell River catchment are being considered as part of the Lindenow Valley Water Security Project (see Section 6.2.3, page 140).

In the Macalister system, water saving projects rather than construction of additional storage provide more potential to be cost-effective. In consultation with Southern Rural Water, the Government is considering the costs and potential benefits of additional water saving options within the Macalister Irrigation District, including from the proposed MID2030 Strategy (see Section 6.2.3, page 136).

4.1.4 Sustainable use of groundwater resources – storage and carryover

Using aquifers to store additional water

In the right situations, managed aquifer recharge (MAR), could be used to store raw water, recycled water and treated stormwater for later reuse. In simple terms, water is stored underground rather than in a dam.

For example, water could be stored in an aquifer over winter and extracted in summer to improve supply reliability and ease pressure on other water users or the environment in summer. The use of MAR could potentially remove the need to build more expensive off-stream storages.

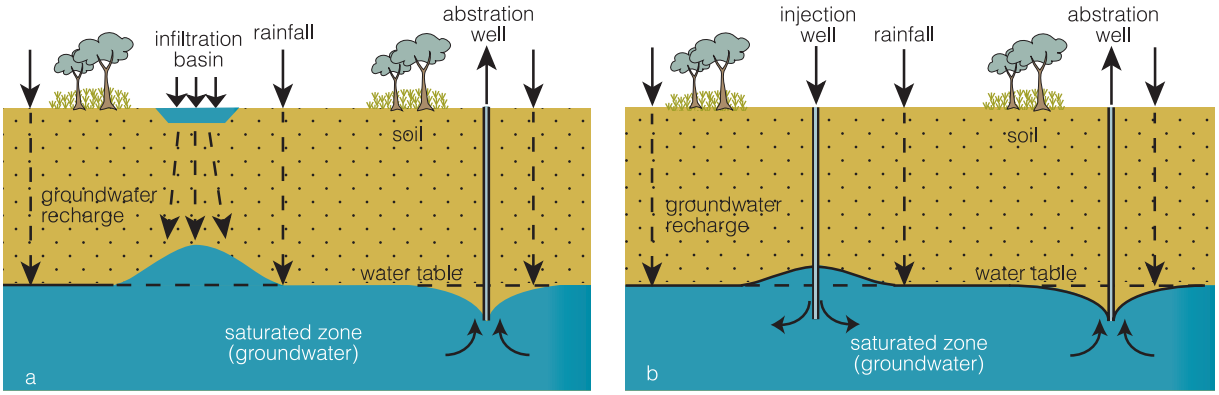
Water can be put into the aquifer by:

- 'infiltration' – a passive process using a recharge basin (Figure 4.1a); or
- 'injection' – an active process of pumping water into a bore for deeper or confined aquifers (Figure 4.1b).

The implementation of MAR has been slow in Victoria, because:

- there is a lack of operational knowledge of MAR in Victoria, together with the need to adapt technologies to suit aquifer conditions;
- there are potential environmental and water quality risks associated with injecting recycled water and/or stormwater into aquifers;
- there is a need for further education and working examples to develop social acceptance and community confidence in this technology;
- there are economic risks associated with all new projects;
- there are untested regulatory provisions and processes; and
- investment is restricted by the need to investigate local aquifer properties without the certainty the aquifer will be suitable.

Figure 4.1 Managed aquifer recharge



A MAR project is being progressed in East Gippsland, where East Gippsland Water has found that injecting water from the Mitchell River into the Latrobe Group aquifer over the winter months and extracting the water over summer is a viable cost-effective option compared to building more off-stream storages, in terms of cost and environmental impacts. East Gippsland Water recently obtained approval to store and recover up to 500 ML of water using MAR, under a number of conditions.

The Government is supporting a further investigation into whether MAR could be a viable storage option to increase the reliability of supply for irrigators on the Mitchell River (see Section 6.2.2 and Section 6.2.3). The Lindenow Valley Water Security Project, which will build on East Gippsland Water's experience in progressing its MAR project, is due to be completed by the end of 2012. Additional opportunities to extract water over high flow periods from the Mitchell River and store this water in the deeper aquifer system will be investigated as part of this project.

Any use of MAR schemes must be done in a way that protects groundwater resources, other groundwater users and the environment. This includes ensuring water quality in the aquifer is not compromised (for example, from injecting stormwater or recycled water) and there are no unacceptable third party impacts (for example, injection causing unacceptably high groundwater levels).

Carryover of groundwater entitlements

Carryover allows individuals to keep their unused water allocation for use in the following season. This lets them manage their own reserves – and their own risks.

Carryover is possible only when water can be stored until it is needed, such as in large surface water storages or in some large aquifers. Managed aquifer recharge also provides opportunities to carry over groundwater entitlements.

Consultation on the Draft Strategy raised several concerns about the proposed introduction of groundwater carryover including:

- demand would be limited so it is not needed;
- it could lead to overuse in some instances;
- we do not know enough about each groundwater system to determine whether carryover might impact adversely on third parties or the environment; and
- establishing billing and register systems would be costly.

In considering these concerns, the Consultative Committee noted that carryover is not possible or necessary on all groundwater systems. As such, the Government considers that groundwater carryover should only be implemented due to the desire and support of existing users, to ensure that unnecessary cost burdens are not placed on existing users.

In Gippsland opportunities are limited for surface water carryover for irrigators, because the only irrigation system with large storage capacity is the Macalister Irrigation District. Most of the water supplied for the MID is from Lake Glenmaggie, which is a relatively small storage on a large river, meaning that there is no spare storage space to carry over water from one year to the next. Thomson Reservoir can carry water from one year to the next, however Southern Rural Water's share of Thomson Reservoir is needed to support reliability of the whole MID during dry years.

Policies for Managed Aquifer Recharge

In September 2010, the former Minister for Water issued policies to guide Southern Rural Water in assessing and licensing MAR projects, including:

- licences and approvals required under the *Water Act 1989;*
- a proponent's entitlements to water;
- the rights to carryover water from year to year;
- the rights to trade water;
- the standards required to protect human health and the environment; and
- information required to accompany an application.

Key aspects of the policies are:

- Storing water in an aquifer must not be detrimental to an aquifer, a bore, or other groundwater users (including the environment) as specified in the *State Environment Protection Policies (Groundwaters of Victoria)*.
- An entitlement to take groundwater will be linked to the volume of water recharged to an aquifer.
- An entitlement of up to 80 per cent of the volume of water recharged to an aquifer will be permitted for an unconfined aquifer and up to 100 per cent for a confined aquifer.
- Transfers and carryover are permitted, but may need to be managed to minimise interference with other groundwater users (including the environment).

The policies also clarify other approvals that may be required for some MAR projects (for example from EPA Victoria for an associated treatment process for recycled water).

4.1.5 Promoting the use of alternative supplies such as recycled water and stormwater

Alternative sources of water can replace potable water use. If implemented well, these sources can reduce pressure on existing stressed supply systems and the environment, and improve local amenity for communities. Alternative supply options can also be developed to be 'fit-for-purpose' (that is, of a quality appropriate for its intended use).

Some examples of alternative supplies:

- *Urban stormwater* is the extra run-off created by the large areas of pavement and other hard, impervious surfaces in towns and cities. With planning, particularly at the start of new developments, stormwater can be captured to supplement water supply.
- *Rainwater* (water run-off from rooftops) is used in Gippsland to capture and store on-site in rainwater tanks for domestic use.
- *Recycled water* (treated wastewater from sewage treatment plants) is used in fit-for-purpose applications.
- Individuals used *greywater* (recycled water from showers, baths and hand basins in the home) to maintain their gardens during the recent prolonged dry period. To protect public health, permanent greywater treatment and reuse systems must be approved by EPA Victoria and a permit obtained from the relevant council.
- *Desalination* of brackish groundwater could provide greater reliability of supply for higher value uses in dry conditions.

Alternative supply options for urban uses will be considered through each urban water corporation's water supply-demand strategy where they provide net community benefit. This includes reduction of demand on potable supply systems, deferral of major supply augmentation, and environmental, amenity and energy consumption benefits.

The Government will continue to promote the use of alternative sources to meet future water needs (see Action 4.5 and Table 4.2). It recently established a Ministerial Advisory Council to, among other things, provide advice on how Melbourne can make better use of alternative supplies. The Ministerial Advisory Council has developed a Roadmap (see Section 4.2.2, page 77). This identifies priority reform areas to improve urban water management, including the need to optimise use of all available water sources, including fit-for-purpose alternative water supplies. The Ministerial Advisory Council will also produce an implementation plan for these reforms. The Government's response, expected to be released in early 2012, will consider the relevance of the council's advice to regional Victoria and highlight opportunities to facilitate increased use of alternative supplies.

Milk processing plant, Bruce Cumming

Action 4.5 Encouraging fit-for-purpose use of alternative water supplies

Who: Department of Sustainability and Environment, urban and rural water corporations

Timeframe: End 2012

Increased fit-for-purpose use of alternative water sources will be encouraged, in accordance with State and National guidelines, where there are overall benefits to the community (see Table 4.2 for the specific actions to be taken).

Table 4.2 Encouraging efficient and fit-for-purpose use of alternative water supplies

Issue	Action	Who	Timeframe
Encouraging urban water corporations to use alternative supplies	**Action 4.5 (a)** **Identifying alternative supply options in urban water corporations' water supply-demand strategies** Requiring urban water corporations to identify and evaluate potential alternative supply options as part of their water supply-demand strategies, including preparing a Water Atlas[21] of alternative supplies in their operating area (see Action 4.8)	Department of Sustainability and Environment, urban water corporations	End 2012
Urban stormwater	**Action 4.5 (b)** **Allocating stormwater** Southern Rural Water will continue to issue licences to harvest stormwater in accordance with Section 51 take and use policies. The Department of Sustainability and Environment will also continue to work with local councils and Southern Rural Water to consider establishing mechanisms for licensing stormwater from council works and infrastructure to ensure stormwater is allocated efficiently with due consideration of downstream users and the environment.	Department of Sustainability and Environment, water corporations and local councils	End 2012
Managing groundwater desalination systems • *In-situ* systems leave salt in or around the bore. This may lead to localised salinity increases.	**Action 4.5(c)** **Guidelines for local desalination systems** Guidelines and licensing arrangements will be developed and applied for desalination systems, including disposal of brine in accordance with the *Environment Protection Act 1970* and *State Environment Protection Policy (Groundwaters of Victoria).*	Department of Sustainability and Environment, EPA Victoria, Southern Rural Water	End 2012

4.1.6 Extending water supply systems to improve reliability

Extending the water supply network may be a useful and cost-effective way of making the best use of existing supplies in some situations and areas. It spreads the risks from dry conditions and can give greater supply flexibility. The benefits of this option need to be weighed against significant construction and operation costs.

A recent example of an interconnection of town supply systems is in East Gippsland, where during the past 10 years East Gippsland Water has connected more of its towns to the Mitchell River supply system. This has improved the quality of water supplied to customers while reducing restrictions and total expenditure over the longer term. Gippsland Water has also connected the Neerim South and Noojee town supplies, and there are plans to connect the Coalition Creek and Little Bass systems to the Lance Creek system in South Gippsland.

The Government will continue to support water users and urban water corporations exploring the potential to extend the supply network to provide sustainable water supplies to existing and new users (see Action 4.6).

Action 4.6 Extending the reticulated supply network

Who: Department of Sustainability and Environment, urban water corporations

Timeframe: End 2012

The Government will encourage water users and urban water corporations to explore the potential for extending reticulated supply systems to provide sustainable water services to users near existing pipelines. The potential benefits of extending the network will be weighed against significant construction and operation costs.

A consistent approach will be developed to manage the expansion of reticulated supply systems, considering:

- cost-effectiveness and risk management;
- who will provide the service (an urban water corporation or Southern Rural Water or community cooperative);
- whether the service is required for one customer or a group of customers;
- required level of service (for example, timing of supply and water quality needs);
- proximity to existing supply systems;
- terms and conditions for customers and how to determine a fair and reasonable price; and
- protection of existing and prospective customer interests.

Pricing arrangements will need to be consistent with the Essential Service Commission's existing pricing principles and any future principles developed as part of a State-based third party access regime.

4.2 Future consumptive water needs of industry, agriculture and communities

4.2.1 Improving the reliability of supply for agricultural and rural water users

Irrigation and agricultural water licences

Major irrigation supplying dairy and horticultural industries occurs in the Macalister Irrigation District, on the Lindenow Flats on the Mitchell River, on parts of the Avon, Latrobe and Thomson river systems, and in the Yarram and Sale groundwater management units.

A study (see Technical Papers 4 and 5) undertaken as part of developing this Strategy found that over the next 10 years, the water demand of some agricultural industries across Gippsland is expected to grow[22,23].

In many of these areas no new water licences are available, so water licences for new businesses can be obtained only by trading the licence from an existing user, which for winter-fill licences generally means also constructing an off-stream storage to store the water.

The study estimated that the cost of constructing off-stream storages can be $400 per ML per year, which makes it too expensive for all but the higher value rural industries such as horticulture, intensive animal husbandry and dairy stock watering and wash down. Accessing deeper groundwater sources can also be expensive, with pumping costs unaffordable for many agricultural industries.

Other findings of the study include:

- a range of factors will influence what and where new water demands will occur, including commodity prices, the cost of land, access to markets, and reliability of water supplies;
- demand growth is likely to come from the predominant industry that already exists in each area; and
- there may be some new water demands as industries relocate (for example, intensive animal industries, horticulture development in the MID).

The study also found that improving the ability to buy winter-fill entitlements will help meet the future needs of agricultural industries, but for some industries there is not enough profit to allow for investment in infrastructure to capture and store winter-fill streamflows.

Both existing and new agricultural industries also face challenges from Gippsland's variable climate, with future droughts resulting in low allocations on regulated systems or more frequent rosters and bans on unregulated rivers and groundwater systems.

Some general conclusions can be drawn from the findings of the water demand study. These conclusions, which have been considered when developing this Strategy, include:

- The costs of constructing off-stream storages or deep groundwater bores are likely to limit the demand for significant irrigated agriculture in the region.
- There is likely to be demand for smaller volumes, such as water for dairy washdown, to support growth in largely rain-fed industries with the ability to substitute feed for grass.
- There is likely to be demand for smaller volumes to support high value industries such as intensive animal industries.
- Facilitating access to smaller volumes through new allocations or trade will be critical to support economic growth.
- All-year licences and shallower, reliable groundwater supplies, are the lowest cost options for rural and agricultural users – the ability to trade these options where possible could help move water to its highest value use.
- Because only smaller volumes are likely to be sought, there is the potential for agricultural growth without significant adverse impact or risks to the health of the region's waterways.

Continued investment in on-farm efficiency programs and potential large scale modernisation (see page 136 for discussion on the MID2030 project) also presents opportunities to increase production without also increasing the demand for water.

The Government provides advice to irrigators to increase their water use efficiency by improving their irrigation management or upgrading their irrigation system. The West Gippsland Catchment Management Authority (WGCMA) has provided incentives to irrigators for whole-of-farm planning and farm works such as reuse systems and conversion to spray irrigation.

WGCMA and Southern Rural Water are also implementing the Gippsland *Irrigation Development Guidelines*. These guidelines are a means to determine the conditions of water use licences and section 51 take and use licences for new and redeveloped irrigated land to meet best practice standards. The outcome is to avoid or minimise off-site impacts of water use and irrigation on third parties, and on key environmental assets such as the Gippsland Lakes.

Avon River, DSE

Promoting sustainable use of water

Investments in water savings through the Sustainable Irrigation Program in the Macalister Irrigation District over the past five years has delivered an estimated 12 GL of water savings for return to productive use on farms, alongside other benefits such as salinity management and nutrient reduction. Salinity management plans are in place in the MID to mitigate the effects of land salinisation that can occur in wet years. High groundwater levels and water logging is managed by public and private groundwater pumping and surface drainage.

On unregulated waterways, irrigators may need to explore the potential for building off-stream storages to take more water in winter for use over the low-flow periods in summer. The development of managed aquifer recharge (MAR), where water is injected and stored in aquifers for future use, might also present opportunities to maintain reliable supplies (see page 70).

Most of Gippsland was not as badly affected by the recent drought as some of the irrigation districts in northern Victoria, Werribee and Bacchus Marsh. The relatively high reliability of irrigation supplies in Gippsland makes the region attractive to agricultural businesses.

Other related opportunities for agricultural and rural users in this Strategy

Action 3.1 A balanced approach to allocating new entitlements in unregulated catchment area p37

Policy 3.5 Establishing local management plans for unregulated surface water and groundwater systems p43

Action 4.2 Improving opportunities for water trading in groundwater and unregulated river systems p65

Action 4.4 Streamlining the approval of section 67 licences to construct storages p69

Policies for managed aquifer recharge p71

Action 4.7 Promoting sustainable water management on dryland farms p77

"Sustainable food production and food security should also be a major consideration of the Government when planning water use."
– Draft Strategy submission 056

East Gippsland Food Cluster

Regional Development Victoria manages the Clusters Program to support the growth and development of sustainable, new and existing food clusters that increase productivity and innovation and provide a competitive advantage in regional and rural Victoria.

The Victorian Government and East Gippsland Shire Council funded the East Gippsland Food Cluster Incorporated (EGFCI), established in 2008, to consider the opportunities to improve the food production and manufacturing sectors in East Gippsland.

A further $140,000 in State Government funding, announced in January 2011, has been allocated to the EGFCI, to further develop innovation in the food growing and manufacturing sectors of East Gippsland.

The Food Cluster is expected to create opportunities for East Gippsland's food production and manufacturing sectors to:

- develop new opportunities in domestic and export markets for product made in East Gippsland;
- increase productivity through innovation in food processing;
- improve retention of skilled labour;
- reduce seasonal labour supply variation; and
- increase employment opportunities.

Domestic and stock water users

Domestic and stock water users are situated throughout Gippsland. Reliable domestic and stock water supplies are critical for maintaining supplies to rural homes, for bushfire protection, and supporting a wide range of livestock industries including the region's high value dryland grazing industries.

Gippsland's domestic and stock supplies are likely to be more resilient than other parts of the State, but they are still at risk during drought and from over-extraction by other water users.

In dry periods, domestic and stock dams can run dry, waterway diversions may be less reliable and shallow groundwater aquifers, with close links to surface water, cannot receive adequate recharge. In such times, rural landowners look to increase their domestic and stock supply sources. They might build more domestic and stock dams or seek approval to construct more bores in different locations. Individual rural landowners pay the costs of building and maintaining their domestic and stock water supplies.

Key policies and actions in this Strategy that help manage or protect domestic and stock supplies

Action 3.1 Balanced approach to allocating new entitlements in unregulated catchment areas p37

Action 3.7 Improving information sharing about climate variability and risks p47

Policy 3.7 Clarifying responsibilities for groundwater monitoring p48

Policy 3.8 State-wide approach for managing water impacts of land use change p51

Action 3.12 Improving information about domestic and stock dams p53

Action 3.13 Requiring property owners to register new domestic and stock bores p53

Action 4.1 Promoting water conservation and efficiency p62

Action 4.2 Improving opportunities for water trading in groundwater and unregulated river systems p65

Action 4.5 Encouraging fit-for-purpose use of alternative water supplies p73

Action 4.15 Managing riparian land p89

In addition to these general opportunities, the Government supports improving the level of information available to dryland farmers about sustainable water management in a variable climate. Because dryland farmers manage their own water needs, less information has historically been provided to them than to irrigators about the efficient and sustainable use of water.

The Department of Primary Industries provides general farm extension services and advice on the water needs of dryland farmers, but in the event of less or more variable water supplies, there may be a need to provide more advice to dryland farmers about how to sustainably manage their future water needs (for example, the latest climate research or opportunities diversify supply sources) (see Action 4.7).

4.2.2 Improving the reliability of supply for urban and industrial water users

A secure water supply is critical to the future prosperity of Gippsland's towns and regional centres. Growing populations along the coast will also increase household and industry demands.

Water supply-demand strategies

The region is well placed to meet its urban supply needs through the development and implementation of each urban water corporation's water supply-demand strategy (see Appendix 5 and Chapters 5 to 7). First prepared in 2007, these strategies set out actions to ensure water supplies are sufficient to meet the needs of cities and towns without taking water from other water users or the environment. As part of an adaptive management framework, these strategies must be reviewed and updated every five years so that decisions about managing the supply-demand balance are based on up-to-date information and benefit from recent experience. Each water corporation must review and update its water supply-demand strategy by 2012.

As noted earlier, as part of the Government's *Living Melbourne, Living Victoria* initiative, the Minister for Water established a Ministerial Advisory Council to develop a roadmap and implementation plan for identifying and progressing priority areas in urban water reform (see page 78). The roadmap and implementation plan will deal specifically with Melbourne, but its recommendations will guide reform across Victoria's cities and towns.

The roadmap emphasises the importance of a water planning framework that considers all options – water efficiency, centralised and decentralised approaches – with a particular focus on encouraging fit-for-purpose use of all available water sources. While the Government's formal response to the Ministerial Advisory Council's Roadmap and implementation plan is not expected to be released until early 2012, the Government will encourage urban water corporations to develop their water supply-demand strategies having regard to the Ministerial Advisory Council's high level objectives and directions.

The Department of Sustainability and Environment has prepared and issued guidelines that will help water corporations prepare, update and implement water supply-demand strategies consistent with the objectives of the *Living Melbourne, Living Victoria* initiative.

Action 4.7 Promoting sustainable water management on dryland farms

Who: Department of Sustainability and Environment, Department of Primary Industries

Timeframe: Ongoing

Drawing on experience from delivering the Sustainable Irrigation Program, the Department of Sustainability and Environment and the Department of Primary Industries will work together to promote sustainable water management on dryland farms, including advising farmers on the best options for managing the risks associated with low or more variable water supplies.

Promoting sustainable use of water

These guidelines confirm the responsibilities of water corporations in balancing water supply and demand. They aim to ensure that water supply-demand strategies are developed on a consistent basis across the State, adopting best practice in urban water planning.

Best practice planning involves consulting with the community and customers to ensure they understand and comment on the expected level of service provided by their water corporation, and the actions required to maintain or improve that level of service over time. In this regard, the guidelines require water corporations to consult their customers and community to set:

- agreed service levels that reflect community expectations about the environmentally, socially and economically responsible use of water; and
- minimum service levels that reflect community expectations about the appropriate use of water in times of drought or other water shortage.

The guidelines introduce a new requirement for water corporations to prepare an Alternative Water Atlas that provides information on specific opportunities for increasing the supply of alternative water supplies within their service areas. This will enable water corporations to assess the cost-effectiveness of these options compared to more traditional supply and demand measures.

The guidelines also introduce a requirement for water corporations to prepare an annual Water Suppy Outlook, which will present projections each year, on a scenario basis, to help identify and prioritise when particular actions need to be implemented to ensure

Developing state-wide policies for urban water

Objectives and directions from the Ministerial Advisory Council

The process of improving urban water supply reliability will be guided by the Government's Living Victoria roadmap which outlines priority reform areas for Victoria's cities and towns. The roadmap recommends eight key directions:

- An agreed vision for the contribution of water to urban liveability, through protection from flooding, improving the health of urban waterways and supporting green landscapes.
- Greater customer choice and innovation in water products on offer, the water charges they pay and their level of service.
- Improved integration of urban and water planning through planning and building regulations that facilitate integrated water cycle management.
- Optimised use of all available water sources, including fit-for-purpose alternative water supplies.
- Improved environmental and public health outcomes supported by clear regulations to ensure customers and the environment are protected.
- A common approach to the economic evaluation of water projects to ensure broader benefits, such as downstream water quality and reduced risk of flooding, are recognised.
- Approaches to pricing that recognise the value of water and reward customers for conserving water.
- Strengthened institutional and governance arrangements to hold service providers to account for their performance.

The roadmap was released on 11 March 2011 and is available on the Department of Sustainability's water website: http://www.water.vic.gov.au.

Action 4.8 Updating water supply-demand strategies

Who: Urban water corporations, Department of Sustainability and Environment

Timeframe: by March 2012

Water corporations, in consultation with their customers and communities, will review and update their water supply-demand strategy based on guidelines issued by the Department of Sustainability and Environment that include new requirements to:

- Set agreed standard and minimum service levels that reflect community expectations about the environmentally, socially and economically responsible use of water.
- Prepare an Alternative Water Atlas that provides information on specific opportunities for increasing the supply of alternative water supplies within their service areas.
- Prepare an annual Water Suppy Outlook, which will present projections each year, on a scenario basis, to help identify and prioritise when particular actions need to be implemented to ensure water security.

water security. This annual outlook will improve local communities' understanding of the likely risks to their water supply in forthcoming years and the actions being taken by water corporations to manage those risks (see Action 4.8).

Drought response plans

Urban water corporations develop drought response plans to manage temporary water shortages due to prolonged periods of below average rainfall or other causes such as water quality issues. As required after any period of drought, urban water corporations throughout the State update their plans to take account of lessons from recent experience. These updates are undertaken in parallel with the review of the water supply-demand strategies.

Drought response plans outline a staged approach with measures to progressively reduce demand and/or augment supplies, which may include imposing water restrictions. The prolonged dry period from 1997 to 2009 resulted in a greater frequency of water restrictions than planned in many areas of the State because conditions were worse than those previously assumed for planning. The experience in many cities and towns during this time also showed the impact of moving from Stage 3 to Stage 4 restrictions was significant, with unreasonable impacts on public facilities, open space and urban amenity.

Urban water corporations will remain responsible for deciding if and when to impose water restrictions as part of their drought response plans. However, to build on the lessons from imposing restrictions in recent years, the Minister for Water initiated a review of the water restriction framework to ensure:

- permanent water saving rules reflect community expectations about the environmentally, socially and economically responsible use of water; and
- consistency in the rules under each of the four stages of water restrictions throughout the State in times of drought or water shortage (see Action 4.9).

Integrating urban land use planning and water planning

Integrated water management creates incentives for adaptive, innovative and productive water management and puts under-utilised stormwater and recycled water resources to better use. This can contribute to a more resilient and adaptable water supply system, as well as more liveable, sustainable and productive urban environments (see Action 4.10).

The most effective way to achieve this is to integrate the urban land use planning process of local government and the water planning processes of urban water corporations, and using planning and building regulations that boost integrated water cycle management. Better environmental and water supply-demand outcomes for new developments can be achieved by:

- integrating more water-efficient measures into new residential, commercial and industrial developments;
- reducing the impact of stormwater discharges on local waterways;
- allowing for infrastructure to cost-effectively capture, treat and store stormwater for later use as an alternative water source, where this generates a net community benefit; and
- designing sports fields, parks and other open spaces that have access to fit-for-purpose water sources such that they remain viable community assets.

Action 4.9 Review of the Victorian Uniform Drought Water Restriction Guidelines and permanent water saving rules

Who: VicWater, Department of Sustainability and Environment **Timeframe:** End 2011

The Department of Sustainability and Environment, in conjunction with VicWater, the Victorian water industry and the community, will review the *Victorian Uniform Drought Water Restriction Guidelines* and permanent water saving rules in the light of recent experience and determine an appropriate process for implementing permanent water saving rules and a revised restriction schedule, if appropriate.

Action 4.10 Facilitating integrated water planning

Who: Local council, urban water corporations, Department of Sustainability and Environment and Department of Planning and Community Development. **Timeframe:** Ongoing

Local councils and urban water corporations will be encouraged to work together to ensure that cost-effective opportunities for more efficient water supply and demand options are considered in the urban planning process as early as possible.

Findings from the Ministerial Advisory Council (MAC) roadmap and implementation plan will be considered by Government to help facilitate and guide better integrated water management.

The Department of Planning and Community Development will continue to develop regional growth plans for eight regions over the next four years. Strategic direction for growth and planning will be facilitated through the development of these plans.

Promoting sustainable use of water

Managing threats to the quality of urban supplies

The quality of urban water supplies can be affected by severe weather resulting in floods and bushfires, and agricultural run-off and streamside grazing.

Urban water corporations have powers to manage the impact of new development on water quality in Declared Special Water Areas (Water Supply Catchments), which officially recognise designated catchments for water supply purposes. However, these powers do not cover impacts of existing agricultural run-off or streamside grazing.

Good land management practices that minimise agricultural run-off and prevent stock access to natural waterways in drinking water catchments help protect waterways and drinking water supplies. In Victoria, many stream frontages are on Crown land (particularly along larger, permanently flowing streams), with grazing of the frontage taking place under licence. In these public areas, there is potential to progressively manage or reduce stock access to waterways for public benefit.

Longer-term water needs for coal-fired power generation

Large industrial users that rely primarily on water sourced from outside the urban water supply systems include the Longford gas plant near Sale and power generators in the Latrobe Valley. The Longford gas plant extracts groundwater and the power generators in the Latrobe Valley source water from the Latrobe catchment and the Latrobe aquifer, in addition to some supply from Gippsland Water.

Power generators in the Latrobe Valley, particularly those most vulnerable to drought, are working to improve their water use efficiency to reduce the risk from water shortages. In total, the power stations have reduced water use by 5 per cent over the past few years.

The power generators also face challenges associated with the introduction of a price on carbon, which would most likely result in a reduction in output from the existing brown coal power stations in the Latrobe Valley, reducing the amount of water used. However, commercialisation of carbon capture and storage technologies could lead to increased demands for water for power generation.

The future water needs for power generation and other large industry in the Latrobe Valley are uncertain. A price on carbon would over time be likely to substantially reduce the amount of electrical energy produced by coal power, leading to a reduction in the volume of water required by the power generators. However if, for example, carbon capture and storage technologies become commercially viable, this could lead to increased demands for water associated with electricity generation from coal. Other forms of new industry could also develop in the Latrobe Valley that require significant volumes of water.

Future changes are likely in the mix of industrial users in Gippsland, and water trading is likely to become an important tool for moving available water between industrial users as they expand or contract their enterprises or new industries move into the region.

If large new water demands in the Latrobe Valley cannot be met by existing sources of supply or by trading between existing water users, augmentation options may need to be considered. Appropriate augmentation options will depend on a range of factors, including the nature of the proposed activity, and the relative cost of options. Future options could include new water users obtaining water entitlements from existing users through funding additional efficiency savings, or investing in recycled water projects locally or outside the region.

Mining and extractive industries

The largest extractions from groundwater systems for mining operations occur at the coal mines in the Latrobe Valley, and by oil and gas operations in Bass Strait. In addition, there are numerous smaller extractions for other mining operations and quarries throughout Gippsland.

In future, it is possible that there could be large new water demands, for example new mining operations could require water as part of the mining process. Where unallocated groundwater exists, it may be possible to source a new entitlement for the mining operation. In other areas, licences may be able to be sourced via trade from an existing groundwater user.

If any calls are made for large water extractions in addition to the existing groundwater caps, a change in the caps would be considered only if studies of the possible impacts on other users and environmental values demonstrates that there is a low risk to environmental values and consumptive users. Large projects generally require an Environmental Effects Statement to be prepared under the *Environment Effects Act 1978*, which would include consideration of the water impacts.

Policy 3.9 in Chapter 3 describes that where it is not possible to obtain a licence through trade or from a groundwater system that is not yet fully allocated, the Victorian Government's approval processes will require proponents to:

- identify mitigation strategies to, where possible, reduce impacts, or manage the impact to an acceptable level; and
- where necessary, provide offsets that will aim to ensure no net loss to existing water users and environmental values, where impacts cannot be mitigated to an acceptable level.

The most appropriate form of any offsets will vary depending on the type of project and the location. Offsets would need to be determined project by project, and subject to the relevant approval processes.

The Commonwealth Government is responsible for the approval of all oil and gas production projects in Commonwealth waters (beyond the first three nautical miles).

Other key opportunities for urban and industrial users in this Strategy

Action 3.1 A balanced approach to allocating new water entitlements in unregulated catchment areas p37

Action 4.1 Promoting water conservation and efficiency p62

Action 4.2 Improving opportunities for water trading in groundwater and unregulated river systems p65

Action 6.3 Establishing a drought reserve in Blue Rock Reservoir p126

4.3 Considering the views of Gippsland's Traditional Owners when managing catchments

Indigenous people in Victoria have for many hundreds of generations managed the land, coast and sea. Their management conserved biodiversity and created a rich cultural heritage. European settlement had a dramatic impact on the land and profoundly affected Indigenous people. While much of their generational knowledge and cultural heritage was lost, substantial and valuable information has been retained or is retrievable.

As part of the development of this Strategy, Traditional Owner groups were widely consulted. This process will continue through the Strategy's implementation. During consultations, a wide range of views were expressed. Some themes were common to all the Traditional Owner groups, such as core values of respect for Country, culture and the environment; however there were also issues specific to individual groups. This reflects the broad range of Traditional Owner groups, responsibility to certain areas and also different water-related aspirations. Technical Paper 1 presents the views expressed by three Traditional Owner groups, an outline of the consultation process, as well as key findings and recommendations.

Views expressed by Traditional Owner groups

"Our once healthy and stable people have been disconnected from the management of our land and culture, and many of our people struggle in the modern society to gain a fair share of the region's wealth and to have their voices heard. They are hampered by the legacy of a past steeped in dispossession and entrenched disadvantage." (GunaiKurnai Land and Water Corporation)

"Water is still important for our people today because it connects us to a past where we owned and managed the land, and it links us to time when we lived happily and in harmony with the natural environment. Today these connections are maintained through visits to the sacred and important cultural sites which are located along the region's watercourses." (Bidwell-Maap Aboriginal Corporation)

"Our people have long occupied the rainforests and coastal inlets, rivers and streams: our custom, art, language, beliefs, practices, values and oral tradition are interwoven into the landscape. Water is part of this complex cultural connection and cannot be separated or viewed as a single component." (Nindi Ngujarn Ngarigo Monero Aboriginal Corporation)

4.3.1 Connection to Country

Connection to Country is diminished when Aboriginal people cannot access significant and sacred sites. A key aspiration for Aboriginal people is to have access to waterways in their Country.

Connection to Country is important for the health of communities and for strengthening connection to culture and language. Removing impediment such as black berries from some areas can make it possible for Indigenous people to regain access to important cultural sites. The important link between culture, language and connection to Country was strongly emphasised throughout the engagement with Traditional Owners in the Gippsland region (see Action 4.11).

Action 4.11 Identifying water dependent sites of cultural importance

Who: Catchment management authorities, Parks Victoria and Traditional Owners.

Timeframe: Ongoing from 2012

Catchment Management Authorities and Parks Victoria to work with Traditional Owners to identify sites of cultural importance, while also identifying issues that restrict access and taking steps to remove impediments.

Promoting sustainable use of water

Access to water for traditional purposes

Section 85 of the *Traditional Owner Settlement Act 2010* allows for members of a traditional owner group with a natural resource agreement (under Section 80 of the Act) to take and use water from a waterway or bore for traditional (non-commercial) purposes. These rights are comparable to the private rights allowed by Section 8(1) of the *Water Act 1989*, which includes domestic and stock water rights.

Enhancing Indigenous capacity

Indigenous people in Gippsland want to be more involved in water resource decisions and processes (see Technical Paper 1). Traditional Owners identified the need for greater professional and skills development within their communities, especially for their younger generations. Providing traineeships and scholarships relating to water management, as well as increasing employment of Indigenous people in water management agencies, can help to increase capacity within communities.

Traineeships, such as the highly successful Lake Tyers land management traineeship project (see page 83), can be an important first step in transitioning trainees into positions in water management agencies. This project established an effective model that provided practical experience, mentoring and work ethic development while providing for baseline qualifications (Certificate 2 and 3 in Conservation and Land Management). Partnership organisations provided input into building trainee competencies, which helped the trainees' transition and better match individuals to positions. Strong commitment by water management agencies is required to support Indigenous staff (see Action 4.12).

Scar tree, Knob Reserve, DSE

Action 4.12 Indigenous involvement in water management

Who: Department of Sustainability and Environment,catchment management authorities, rural and urban water corporations

Timeframe: Ongoing from 2012

Education, training and capacity building for Indigenous people will be improved by inviting Traditional Owners to nominate young leaders to be involved in:

- A scholarship for the biennial Graduate Certificate of River Health offered by Melbourne University.
- A scholarship for the Graduate Diploma of Natural and Cultural Resource Management offered by the Institute of Koorie Education, Deakin University.
- An annual cadet position with the Department of Sustainability and Environment, catchment management authorities or rural/urban water corporations.
- Catchment management authorities and rural/urban water corporations, in consultation with Traditional Owners, will investigate providing traineeships to build participant capacity and confidence. This will help to enable equitable access to sustainable employment in water management.

Indigenous Partnership Framework

In 2007, the Department of Sustainability and Environment developed an Indigenous Partnership Framework to provide an opportunity to empower Traditional Owners and Indigenous Victorians to participate and share their knowledge of natural resource management for the benefit of all Victorians.

The actions in this section have been evaluated against the guiding principles within the Indigenous Partnership Framework, which are:

Principle 1 – respect and recognition

The Department's approach to Indigenous issues will be with an understanding that Victoria's Traditional Owners and Indigenous Victorians have a continuous connection to Country, and they:

- have a valuable contribution to make in land, water and natural resource management; and
- can fulfil a uniquely integrated role in land, water and resource management practices.

Principle 2 – caring for Country

The Department will develop and support opportunities for Victoria's Traditional Owners and Indigenous people to connect and care for Country.

Principle 3 – partnership and capacity building

The development of all future Department policy will specifically:

- include an Indigenous consultation component that reflects a meaningful engagement process; and
- Identify opportunities for Indigenous people to gain the skills required to be better placed as partners.

The framework is being reviewed to consider if any improvements can be made.

Lake Tyers Indigenous land management traineeship project (2007/08)

This 18-month project at Lake Tyers was developed after extensive consultation with the Lake Tyers Aboriginal Trust Community, and focused on restoring and protecting Gippsland's parks and public land. East Gippsland TAFE's Forestech provided the formal training component of the program, which led to trainees successfully completing Certificates 2 and 3 in Conservation and Land Management. Projects were coordinated across several land management agencies and included: measuring and assessing tree health for a University of Melbourne/ DPI study; erosion control and tree planting works at the Paynesville Silt Jetties for the Department of Sustainability and Environment and Parks Victoria; and an environmental audit and construction of foreshore fencing for EPA Victoria. Trainees also helped restore rainforest gullies for the non-government organisation Trust for Nature and helped VicRoads improve rest areas and bus stops. The project achieved a 100 per cent retention rate, and all participants moved into employment.

Artwork by Roderick (Rocky) Harrison – Participant DSE's Lake Tyers Management Traineeship (2007-2008)

Gaining experience in water management with East Gippsland Water

East Gippsland Water has developed an excellent relationship with the local Clontarf Academy at Bairnsdale Secondary College, which has resulted in capacity building and employment opportunities for the young indigenous men involved.

The academy aims to improve the education, discipline, life skills and employment prospects of young Aboriginal men. Initially, students aged 14 to 18 years were involved in a project to transform the exterior of East Gippsland Water's sewer pump station at Bruthen with a vibrant storyboard about Tiddalik the Frog.

Feedback from the academy was extremely positive, emphasising the heightened self-esteem and confidence this generated among those involved and the desire to further develop the relationship with East Gippsland Water to boost students' employment opportunities.

As a result, East Gippsland Water and Clontarf assisted students on the Victorian Certificate of Applied Learning program, providing practical work-related experience and helping to build life skills. One student on the program is gaining invaluable experience with East Gippsland Water in customer service one day a week, while another is beginning work experience with the operations and maintenance team in the field.

Both organisations want to continue developing this relationship and progress to a traineeship program in 2012, with an ongoing commitment for job opportunities into the future.

4.3.2 Traditional owner involvement in catchment management

All water management agencies have processes to engage and consult with local Indigenous organisations and leaders. Catchment management authorities are a key link for Indigenous groups to become more involved in water resource planning. The *Victorian Strategy for Healthy Rivers, Estuaries and Wetlands* (currently under development) will include a requirement that Indigenous consultation be undertaken when developing regional river health strategies.

When reviewing regional river health strategies, catchment management authorities and their communities will document values associated with the region's rivers, floodplains and wetlands. By recognising and communicating the social, cultural, economic and environmental values, they can provide input into further decisions on water recovery targets and annual watering plans.

Guidelines for the development of the regional river health strategies are being drafted and will include an Indigenous component, including advice on how to include Indigenous heritage in each strategy, and minimum standards on engaging with Traditional Owners and other Indigenous communities. Consultation with Traditional Owners is a requirement of all river health plans.

Traditional Owners and land management

Victoria is charting a new partnership with Traditional Owners in land management. A cornerstone is the joint management of mutually significant areas. This approach is a shift away from State control and management of public land to a joint management arrangement between the State and Traditional Owners.

The *Traditional Owner Settlement Act 2010* came into force on 23 September 2010. The Act provides a framework to settle native title claims out of court through agreements between the Victorian Government and Traditional Owner groups to recognise Traditional Owners and their rights in Crown land.

On 22 October 2010, the State and the Gunai/Kurnai signed a settlement agreement, which includes the establishment of a Traditional Owner Land Management Board over 10 parks and reserves in Gippsland, including Gippsland Lakes Coastal Park, the Lakes National Park, Mitchell River National Park and the Knob Reserve. The Department of Sustainability and Environment started working to establish the board in 2011.

Dja Dja Wurrung and North Central CMA Partnership Project

The Dja Dja Wurrung Clans Aboriginal Corporation is the corporate representative body for the Dja Dja Wurrung Traditional Owners of the Bendigo region.

The corporation successfully received funding through the Victorian Aboriginal Economic Development Strategy to establish a commercially viable Natural Resource and Cultural Heritage Management business.

The project is being implemented through a co-hosting arrangement with the North Central Catchment Management Authority, as the principal employer and host agency for the project, for two years beginning in January 2011. The project is a first of its kind in Victoria between a catchment management authority and an Aboriginal corporation.

The Gunai/Kurnai Land and Water Corporation are in early discussions with Parks Victoria to set up a similar project in Gippsland.

Coordinating regional reference groups

East and West Gippsland catchment management authorities have Indigenous Reference Groups, as do the Department of Sustainability and Environment and Parks Victoria. The purpose of these reference groups is to provide meaningful Indigenous community input, advice and direction regarding issues affecting the Indigenous community in the Gippsland region, and specific Indigenous ecological knowledge. The practice of having Traditional Owner-natural resource management agency reference groups as forums for liaison and information sharing on matters of mutual interest is encouraged.

Coordination of these groups may help to share information, reduce repetition, and help time management for Traditional Owners (see Action 4.13).

Action 4.13 Better coordination of regional Indigenous reference groups

Who: Catchment management authorities, Department of Sustainability and Environment and Parks Victoria

Timeframe: Ongoing from 2012

Given the number of Traditional Owner groups and natural resource management agencies in Gippsland that convene reference groups (or may wish to in the future), opportunities to rationalise these forums over time should be considered, provided this occurs with Traditional Owner involvement.

4.4 Protecting Gippsland's waterways, aquifers, wetlands and estuaries

Communities in the region rely on healthy rivers, floodplains, wetlands and estuaries to support a high value, efficient agricultural industry; provide safe drinking water; maintain cultural, social and heritage assets; and for tourism and recreational opportunities. Gippsland derives considerable economic benefit from its waterways and wetlands. The capture and use of water has affected the health of many rivers. When the health of a river declines, so does its capacity to provide the services we value.

For many people, waterways and wetlands are deeply associated with a 'sense of place' and 'belonging'. This is particularly true for Indigenous groups, for whom the health of waterways and the adjoining land are central to their cultural identity and aspirations.

A sustainable water strategy is required under the *Water Act 1989* to identify ways to improve, protect and increase water available to the environment. The environmental water reserve (the water set aside by law to protect environmental values) can include:

- formal environmental entitlements (such as a volume of water held in storage);
- conditions on other water users' entitlements, licences and permits (such as passing flows below a storage); and
- limits on diversions such as permissible consumptive volumes and sustainable diversion limits (see Reference Guide 2, page 12).

Aquatic ecosystems in Gippsland suffered during the exceptionally dry conditions from 1997 to 2009. Even though the 2010 and 2011 rainfall patterns rejuvenated these ecosystems, they may have to cope with prolonged dry periods in future.

Drought and climate variability mean that a stronger approach is required for managing rivers, wetlands and estuaries. This Strategy aims to do this by:

- increasing and protecting the environment's share of water;
- making the best use of environmental water;
- undertaking complementary river restoration works and measures to improve the condition of waterways and wetlands;
- adapting and integrating environmental water and river health works to manage a changing environment; and
- protecting groundwater dependent ecosystems.

Pristine river East Gippsland, DSE

4.4.1 Environmental water

Increasing and protecting the environment's share of water

As discussed in Section 3.1.1, a key strategic issue is whether or not the right balance has been struck between water for consumptive use and water for the environment.

Chapters 5 to 7 discuss this balance in more detail and identify existing or new proposals to protect or increase the environment's share of water. In addition to proposing precautionary caps on unregulated rivers in the south and east, the Strategy also makes a permanent allocation to the environment on the Latrobe and Thomson river systems (see Section 6.3.1, page 142).

Some of the key actions and policies in this Strategy to increase and protect the environment's share of water

This Strategy promotes improved documentation of rules for managing section 51 take and use licences through the development of local management plans. These plans will provide greater transparency and understanding of the rules in place to protect existing users and the environment in times of low flows.

Action 3.1 A balanced approach to allocating new entitlements in unregulated catchment areas p37

Action 5.2 Revised cap on the amount of unallocated surface water available for winter-fill (July to October) diversions in South Gippsland's catchments p104

Action 5.4 Protecting and improving the condition of South Gippsland inlets and estuaries through a continued focus on catchment management p110

Action 6.2 Revised cap on the amount of unallocated surface water available for winter-fill (July to October) diversions in the Mitchell and Tambo River catchments p123

Action 6.15 Additional 10 GL environmental share for the Latrobe River system (as part of establishing the Blue Rock drought reserve) p143

Action 6.18 Additional 8 GL share for the Thomson River p144

Action 6.19 More flexible environmental releases from the Thomson Reservoir p144

Action 6.21 Providing water to the fringing wetlands of the lower Latrobe River p149

Action 7.2 Revised cap on the amount of unallocated surface water available for winter-fill (July to October) diversions in Far East Gippsland p156

Action 7.6 Environmental flows for the Victorian reaches of the Snowy River, estuary and wetlands p167

Chapters 5 to 7 discuss where local management plans will be developed, and the priority areas.

The Strategy also aims to improve the way groundwater dependent ecosystems are considered in licensing decisions (see Section 4.4.5) and includes actions to protect the rights of existing users and the environment, such as actions to manage adverse impacts of significant land use change on water availability (see Section 3.3.1).

Most rivers in the region are unregulated, so applying precautionary caps on consumptive use is the preferred approach to managing the environment's needs.

The precautionary caps, passing flows, and other environmental measures, such as complementary river health works, are the main tools for protecting river health in most parts of Gippsland. In most unregulated catchments in Gippsland, there is a relatively low level of water use, which means that in these systems there is little need to recover water for the environment.

A Victorian strategy for healthy rivers, estuaries and wetlands

The Government is developing a *Victorian Strategy for Healthy Rivers, Estuaries and Wetlands* (VSHREW) for release in 2012. This Strategy will replace the *Victorian River Health Strategy (2002)* and present the Government's overarching policy framework for managing Victoria's rivers.

In the ten years since the *Victorian River Health Strategy* was released, a more integrated approach to planning has developed to consider the broader landscape and climate variability. VSHREW will integrate the management of rivers, estuaries and wetlands and incorporate the directions of recent Government legislation amendments and new policies, including those developed through successive sustainable water strategies.

The current regional river health strategies (see Appendix 6) will be replaced by the regional *Strategies for Healthy Rivers and Wetlands* (SHRWs) by late 2013. The regional SHRWs will use a priority setting process to identify the waterways of highest community value and outline a holistic program of management actions (including management of environmental water, riparian areas, in-stream habitat and water quality, bed and bank erosion control and provision of fish passage).

The *Regional Catchment Strategies* (RCSs), are an important link between waterway management and the broader catchment management. They are the primary framework for managing land, water and biodiversity in each catchment. The long-term waterway objectives and priorities for action in the updated RCSs will be reflected in the regional SHRWs.

Over time, other opportunities may arise to provide greater flows to the region's waterways. Recycled water, if treated to an appropriate standard, can contribute to environmental flows on some systems.

Making the best use of environmental water

In many ways, managers of environmental water are just like any other water user. They want to ensure that water provided to the environment – by way of entitlements, conditions on entitlements or minimum passing flows – is used as efficiently as possible.

Structural works to deliver environmental water

In some instances, structural works, such as pumps and flow control regulators, can be used to deliver environmental water and achieve environmental outcomes with much less water. This is particularly true for wetland and floodplain anabranches, which have become disconnected from the main river channel or where overbank flow frequency is inadequate to meet environmental flow objectives. Targeted structural works give greater environmental benefits for a given amount of water (see Policy 4.1).

Victorian Environmental Water Holder

The Victorian Environmental Water Holder (VEWH) was established in July 2011 as an independent statutory body to hold and manage environmental water entitlements and allocations throughout the State. It decides the best use of that water, including trade and carryover, to achieve the highest environmental value.

VEWH will make transparent, accountable and timely decisions about where and when environmental water is delivered. It will do this by drawing on the priorities identified by catchment management authorities, in consultation with local communities, to identify state-wide priorities.

The VEWH will make decisions independently from, but accountable to, the Government in accordance with high-level rules established by the Minister for Environment. It must have regard for catchment management authority seasonal watering proposals.

The VEWH makes decisions on the parts of the environment's water that can be actively managed (the formal environmental water entitlements), with discretion over when and how water is released or diverted. Within Gippsland, there are environmental water entitlements on the Latrobe, Thomson and Macalister systems. The VEWH also holds environmental entitlements in trust for the Snowy water recovery program, and manages the administrative requirements of these entitlements to ensure water is provided to the Snowy River but has no management role in the delivery of the water (see Section 7.3.4).

Policy 4.1 Structural works to maximise the benefits of environmental watering

The use of structural works to maximise the benefits of environmental watering will be explored, with each option being assessed on its potential benefits, feasibility and cost-effectiveness to meet environmental objectives.

Thurra River, Alison Pouliot

Carryover of environmental water

Where there are formal environmental entitlements that have access to storage space in regulated systems, such as the Thomson, the Victorian Environmental Water Holder (VEWH) can carry over any unused entitlement from one year to the next. This can be used to build up water in storage and selectively deliver higher flows, providing more flexibility for achieving environmental benefits.

Using consumptive water *en route*

An innovative way to achieve environmental or social benefits on regulated rivers without requiring additional water is to make use of consumptive water on its way to being delivered to water users. However, this is only possible where it can be done without impacting adversely on the reliability of supply to primary entitlement-holders.

The release of water from storages can be timed to meet ecological objectives and broader public benefits, provided that this does not impact on other users. Natural water carriers such as waterways, creeks and wetlands are sometimes used to deliver consumptive water from storages to water users, with significant environmental benefits. The extent of the benefit will depend on how well the release meets the timing, duration and frequency of flows needed for priority ecological outcomes (see Action 4.14).

Management of environmental water downstream of consumptive users

In river systems where there are no downstream consumptive users (such as the very downstream end of the lower Latrobe River) there may be opportunities to use some water in the river to improve the condition of adjacent wetlands, depending on the priority of environmental objectives at the time. Enshrining these unregulated flows in environmental water entitlements would give more flexibility to achieve environmental benefits, while still ensuring no impact to existing users (see Policy 4.2).

4.4.2 Complementary river restoration works and measures

Environmental flows are not the only factor in a healthy river, wetland or floodplain. Equally important are complementary restoration measures that protect other aspects, including water quality, riparian land and in-stream habitat. It is important that complementary measures and environmental watering are integrated and targeted to achieve the best possible environmental outcomes.

Complementary management actions to improve river health in Gippsland include:

- revegetation of waterways to provide habitat and prevent erosion;
- streamside fencing to protect habitat from livestock damage and allow regeneration;
- provision of fish passage to allow breeding and recolonisation; and
- better management of river banks to maintain and improve water quality.

Adverse impacts on river health can be caused by pressures not related to flow, such as agricultural run-off or disturbance. As well, options to provide additional environmental flows can be limited. In these cases, investment in complementary works and catchment management programs are critical to achieve improved environmental outcomes and can maximise the benefits from the available environmental water.

While not a substitute for adequate environmental flows in stressed systems, targeted works help to ensure environmental flows achieve the maximum environmental benefit possible (see Policy 4.3).

Action 4.14 Using consumptive water *en route*

Who: Department of Sustainability and Environment, Southern Rural Water, catchment management authorities

Timeframe: Ongoing

The Department of Sustainability and Environment, Southern Rural Water and catchment management authorities will work together to explore opportunities to use water *en route* for environmental and social benefits. Use of consumptive water *en route* will only be permitted if the rights of entitlement-holders are protected. Potential opportunities will be identified through existing planning processes.

Policy 4.2 Environmental decisions downstream of all consumptive uses

Entitlements will be created where unregulated water is available for environmental benefit at the end of the system, provided there is no impact on consumptive users. In areas where this is applicable, the waterway managers and Victorian Environmental Water Holder will work together to decide between:

- diverting a portion of the river water for use in watering floodplain wetlands; and
- the water needs of the downstream estuary and any other receiving waterbodies.

The waterway manager and Victorian Environmental Water Holder will be required to report on any water that is used.

Policy 4.3 Complementary river restoration works and measures

The Government will continue to invest in complementary river restoration works and measures based on priorities identified in catchment management authorities' updated regional strategies for healthy rivers, estuaries and wetlands.

Action 4.15 Managing riparian land

Who: Catchment management authorities, Department of Sustainability and Environment

Timeframe: Ongoing

Programs will continue to be identified and implemented to assist landholders (and other riparian land managers) to protect, improve and better maintain high priority riparian land.

This will include contributing towards the cost of fencing, revegetation, vegetation enhancement and the provision of off-stream stock watering infrastructure.

Water for stock will be provided consistent with the *Policies for Managing Section 51 Take and Use Licences*. These policies will be amended so licences to access stock water will be issued for up to the maximum licence period to minimise ongoing fees associated with renewing the licence. The Government will investigate options to minimise or avoid costs to landholders fencing Crown land frontages.

Protecting riparian land

Riparian land with intact vegetation is vitally important to waterway health and water quality, but its benefits can be damaged by uncontrolled stock grazing.

The policies for managing 'take and use' (Section 51) water licences have been amended to help farmers fence Crown land frontages along waterways. The changes allow landholders to fence stock out of these riparian areas and still access water for their stock. A licence can be issued in capped systems without the landholder needing to buy an entitlement on the water market. However, licence fees and conditions currently apply.

These changes will encourage improved riparian management and prevent degradation of riparian areas by continuous stock grazing and trampling, while providing water access to adjacent landholders for their stock. If needed, periodic or seasonal grazing may be allowed in fenced riparian areas to manage weeds.

In addition to these licensing arrangements, the Department of Sustainability and Environment and catchment management authorities are working towards improving the management and administration of Crown and freehold riparian land in Victoria. This includes financial incentives for activities such as fencing, revegetation, weed management and off-stream stock watering infrastructure. As part of this work, the $4.4 million Securing Priority Riparian Areas project will hasten management improvements for up to 1,000 frontages throughout Victoria, and improve recording of riparian management agreements (See Action 4.15 and box to right).

East Gippsland CMA – Landholder Partnerships

The East Gippsland Catchment Management Authority undertakes on-ground works on waterways in partnership with individual landholders and other agencies.

As part of these on-ground works, the East Gippsland (CMA) offers several incentives to deliver riparian management objectives, encouraging land holders to fence off riparian land including:

- providing grants to eligible landholders for fencing off riparian areas;
- providing off-stream watering grants of up to $4,000 to help cover the costs of buying equipment such as pumps and troughs;
- carrying out two thorough weed treatments of any fenced off frontage area, within two years of the agreement; and
- supporting the landholder to re-establish any fencing that may be damaged in floods.

This project provides benefits to landholders such as reduced risk of erosion, improved stock management and a healthy section of river.

4.4.3 Adaptive and integrated management for a changing environment

Integrated management focuses on achieving environmental outcomes through an appropriate mix of environmental water, structural works to deliver water and complementary (non-flow related) measures. Each of these aspects is discussed in this section.

Adaptive management involves learning from management actions to improve the next stage of management. Climate uncertainty means that environmental water managers need to have a more flexible way of dealing with short-term climatic variability. This will mean:

- adapting watering decisions to prevailing climatic conditions each year, taking into account variations in seasonal water availability; and
- identifying a clear and transparent process to change environmental objectives if current objectives are no longer feasible under climate change.

Seasonally adaptive approach

The seasonally adaptive approach involves adapting environmental watering decisions to prevailing climate conditions in any year. It provides the greatest protection to the most important parts of the environment through drought and dry years, and builds ecological resilience in wetter years (see Table 4.3).

This will be most effective in regulated river systems, where water can be stored and released when needed. Nonetheless, the guiding principles are the same for any management decisions for unregulated rivers.

In any given year, the approach identifies priorities for environmental watering, works and complementary measures, depending on the amount of water available. It is a flexible way to deal with short-term climatic variability. In dry years, the focus is to avoid catastrophic events, such as major fish kills, and to protect drought refuges. In wet years, the focus is to provide high flows and floods to build resilience and enable recruitment and dispersal of key aquatic animals and plants. The seasonally adaptive approach is similar to the way urban water corporations introduce restrictions during droughts.

Reviewing environmental water management objectives

The review of this Strategy and the statutory long-term review of water resources (see Reference Guide 2, page 12) will allow the Government and the community to consider if less water is available and, if so, what impacts this has had on water users and the environment. These reviews will lead to appropriate action, which could include:

- increasing the environmental water reserve;
- changing the balance between water for consumptive use and the environment through management plans; and
- formally reviewing waterway and wetland management objectives.

If the future is drier, the community may need to make difficult decisions that will affect the environment, consumptive users and regional communities. For the environment, this may mean we need to recover additional water to support priority environmental values. Alternatively, the community may decide that the cost of additional water recovery is too high for our agricultural and regional communities, and environmental objectives can no longer be met.

These are serious steps to take. As noted above, every effort should be made to manage the region's resources adaptively to ensure they continue to meet the needs of consumptive users and the environment. The region's water and environmental managers should aim to use the tools developed through sustainable water strategies to respond locally when problems arise and ideally avoid the need for once-off, centralised changing of environmental objectives or rebalancing in the future (see Action 4.16).

Action 4.16 Changing environmental management objectives

Who: Catchment management authorities, Department of Sustainability and Environment

Timeframe: 2019

Should it become apparent with defensible scientific evidence that environmental objectives can no longer be met as a result of long-term changes in climate and water availability, amendment of the objectives will be formally considered as part of the development of regional Strategies for Healthy Rivers and Wetlands in consultation with the community.

The review of management objectives through the 2013 and 2019 regional Strategies for Healthy Rivers and Wetlands will inform the 15-year statutory review of water resources in 2019.

Table 4.3 Seasonally adaptive approach to guide management decisions

Objectives	Drought	Dry	Average	Wet to very wet
Short-term ecological	• Priority sites avoid irreversible losses and have capacity for recovery	• Priority river reaches and wetlands maintain their basic functions	• Maintain or improve the ecological health of priority river reaches and wetlands	• Improve the health and resilience of priority river reaches and wetlands
Annual management	• Avoid critical loss • Maintain key refuges • Avoid catastrophic events	• Maintain river functioning with reduced reproductive capacity • Maintain key functions of high priority wetlands • Manage within dry-spell tolerances	• Improve ecological health and resilience	• Maximise recruitment opportunities for key river and wetland species • Minimise impacts of flooding on people • Restore key floodplain linkages

Gippsland water dragon, Ken Judd

4.4.4 Managing groundwater dependent ecosystems

The Strategy aims to establish management arrangements that make the best use of groundwater resources while protecting the environment.

The environment's reliance on groundwater is generally understood, but in most areas it is not understood in any detail at a local scale. In some aquifers, there is a risk that excessive groundwater extraction could damage environmental assets. However, a limited knowledge about the interaction and dependence between groundwater and the environment makes it difficult to assess this risk. In addition, it is difficult to isolate the influence of groundwater extraction on the environment from the impact of other pressures such as reduced rainfall/recharge, land use change, evaporation or management of surface water drainage.

The challenge is to determine how to assess the degree of risk to the environmental assets in the face of imperfect knowledge and develop appropriate management actions that strike the right balance between meeting the needs of consumptive users and the environment.

Promoting sustainable use of water

What are groundwater dependent ecosystems?

Groundwater dependent ecosystems (GDEs) are ecosystems such as wetlands, streams, estuaries or vegetation that rely totally or in part on groundwater (see Figure 4.2).

Just as surface water provides a source of water to rivers and wetlands, groundwater that discharges to the surface can help support ecosystems such as springs, wetlands, streams and estuaries. For example, waterways that flow permanently during summer can be sustained by groundwater inflows, known as baseflows. These baseflows supply water to the river throughout the year and are particularly important in low-flow periods or times of drought, where they can help sustain drought refuges and recolonise waterways. However, in some areas, baseflows may be salty.

Terrestrial vegetation with roots that tap into groundwater can also be dependent on groundwater.

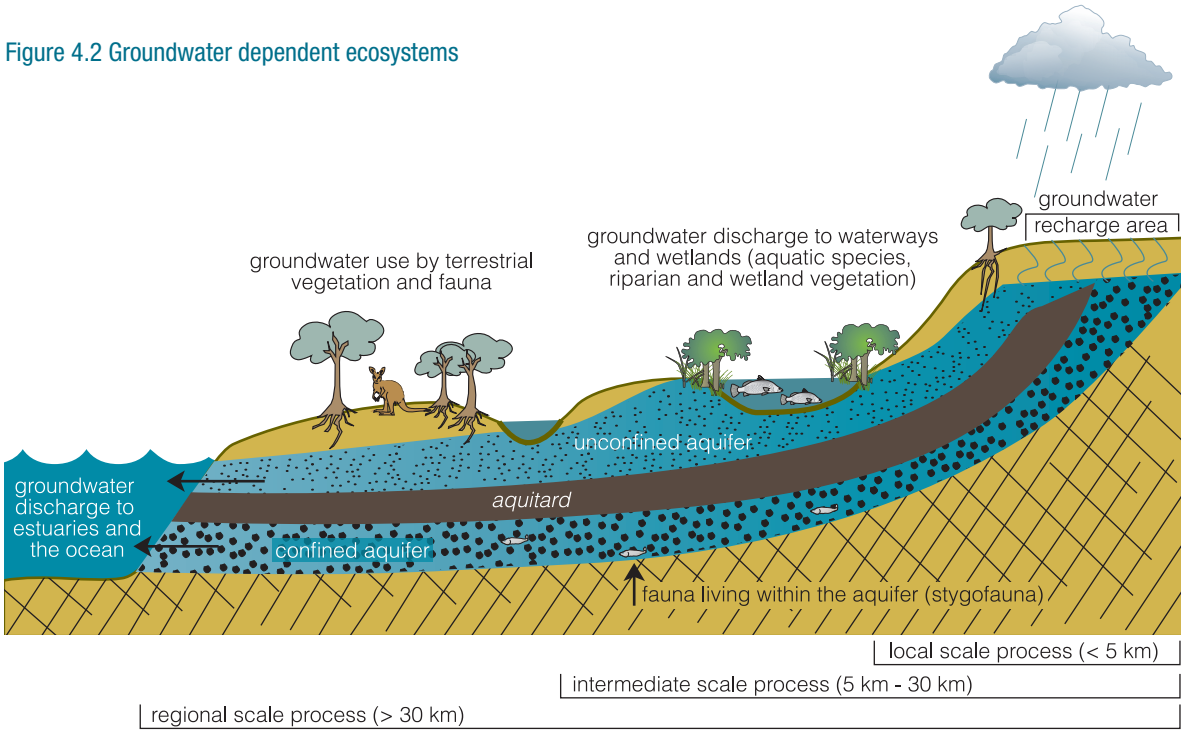
Current understanding of GDEs

Information about GDEs, such as identifying how they connect to groundwater and how sensitive they are to changes in water levels and chemistry is limited but is growing through a range of national and state-funded projects.

Different types of GDEs have different levels of dependence on groundwater. The characteristics of a groundwater system will influence how interconnected groundwater is with the surface and the likelihood that groundwater is supporting a particular type of GDE. For example, unconfined aquifers are more likely than deeper confined aquifers to have direct interconnection with the surface. So unconfined aquifers are more likely to provide water to support wetlands and streams, and supply groundwater users. Therefore these GDEs will most likely be the focus of management actions outlined in this Strategy.

The scale of a groundwater system can also be used to indicate the size and significance of the ecosystems they may support. Regional flow systems (less than 30 km long) are less likely to support large ecosystems compared with regional flow systems (more than 30 km).

Figure 4.2 Groundwater dependent ecosystems



There are three types of groundwater dependent ecosystems (GDEs):

- surface ecosystems that depend on groundwater flowing (discharging) to the surface, for example river baseflows, springs and some wetlands and estuaries;
- ecosystems that tap into groundwater, for example terrestrial vegetation using groundwater directly from shallow aquifers; and
- ecosystems within aquifers, for example in caves and in the cracks and pores in aquifers themselves.

GDEs can have different levels of dependence on groundwater

- An ecosystem is entirely dependent if it would be lost with only a slight change in key groundwater characteristics.
- Some ecosystems may be highly dependent on groundwater, and even moderate changes in groundwater discharge would cause substantial change to the ecosystem.
- Some wetlands rely on groundwater and surface and/or soil moisture. They would be substantially changed if they stopped receiving groundwater or if groundwater inflows were reduced moderately at certain times.
- Some ecosystems have limited or opportunistic use of groundwater, for example at the end of a dry season or during extreme drought. These include coastal floodplain swamp forests, Banksia woodlands and lignum shrublands along inland river systems. This water source may be critical to the survival of some ecosystems. For example, river baseflows may maintain drought refuges during low flow periods.
- Some ecosystems may appear to be groundwater dependent, but are entirely supported by rain or surface flows.

How should GDEs be considered in future management decisions?

Without a clear understanding of the potential impact on the environment, licensing and other authorities could adopt an unnecessarily conservative approach to allocating more groundwater, and/or require detailed and sometimes costly environmental assessments when licensing or making management decisions.

However, a lack of perfect information should not stop decisions from being made. Management decisions should use the best available information to consider the potential risks, make fair and reasonable decisions at a point in time, and establish appropriate measures to manage any residual risks, for example through monitoring, reporting or licence conditions.

This Strategy aims to provide more certainty about how the needs of the environment will be considered by outlining a risk-based approach to guide licensing authorities' decisions (see Policy 4.4 and Action 4.17) to:

- allocate groundwater available under PCVs;
- approve a temporary or permanent transfer of an existing licence;
- consider whether the location of a new bore or increased extraction from an existing bore could impact on the environment ; and
- document trading rules in local management plans to protect GDEs.

Policy 4.4 Risk-based approach to managing groundwater dependent ecosystems (GDEs)

The following principles will apply when risk to groundwater dependent ecosystems is being considered:

- the protection of high value GDEs will be considered when setting or adjusting permissible consumptive volumes;
- GDEs with high environmental values, and a high risk of being affected by changes in groundwater levels, will be given the highest level of protection;
- GDEs with high environmental values that rely on regional and intermediate scale groundwater systems will be included in groundwater management planning; and
- GDEs with high environmental values that rely on the surface expression of local scale groundwater systems will be assessed site by site in the licensing regime.

Action 4.17 Develop Ministerial guidelines for groundwater dependent ecosystems

Who: Catchment management authorities, Department of Sustainability and Environment

Timeframe: End 2012

The Department of Sustainability and Environment, in consultation with rural water corporations and catchment management authorities, will develop Ministerial guidelines to help licensing authorities consider the risk to groundwater dependent ecosystems.

Promoting sustainable use of water

How will high environmental values be determined?

To help Southern Rural Water identify GDEs where groundwater is likely to interact with the surface and/or where there are high environmental values, the following should be considered:

- The latest technical information identifying recharge zones, areas where groundwater is likely to interact with the surface or where terrestrial vegetation relies on groundwater.
- Lists of threatened species or protected environmental assets: for example, Ramsar-listed wetlands, rivers listed in the *Heritage Rivers Act 1992*, species listed under the *Flora and Fauna Guarantee Act 1988* or *the Environment Protection and Biodiversity Conservation Act 1999.*
- Regional river health strategies.

The Department of Primary Industries has recently conducted research identifying terrestrial vegetation across Victoria. This research uses satellite imagery to identify vegetation across the State where water levels are less than five metres from the surface. At this depth, the vegetation is more likely to be reliant on groundwater.

For more information on the Department of Primary Industries research, identifying potential terrestrial GDEs throughout the State, see the reports available online at http://www.dpi.vic.gov.au/ and follow the links to GDE research.

While this research has some limitations and relies on several assumptions to extrapolate information from a local to regional scale, when combined with information about areas with high environmental values, it is possible to identify potential high value GDEs that could be at risk from groundwater extraction.

How will the risk-based approach work in practice?

Southern Rural Water will apply the principles when making licensing decisions, developing statutory or local management plans. The Ministerial guidelines will help Southern Rural Water:

- identify where groundwater extraction may impact on high value GDEs;
- guide the level of assessment or risk mitigation measures required for management decisions; and
- ensure the latest available information is used to assess the potential risks and determine the need for risk mitigation measures.

For example, if Southern Rural Water received an application for a new licence or transfer of an existing licence, it would:

1. Consider whether any rules relating to protecting GDEs existed in a statutory or local management plan.
2. Consider whether there were any high environmental values at the location of the proposed bore or associated with the aquifer system from which the water would be extracted.
3. Consider the scale of the aquifer system to form a view on the size and significance of the ecosystems it may support.
4. Based on 1, 2 and 3, determine the level of assessment or mitigation measures required to satisfy Section 40 of the *Water Act 1989*, which requires the impact on existing users and the environment to be considered before a licence can be granted or transferred.
5. Consider whether or which conditions should be placed on licences to mitigate risks of future groundwater extractions adversely affecting the environment. For example, issuing a temporary licence and requiring monitoring over a certain period to demonstrate there are no adverse impacts before allocating or approving the permanent trade.

While the permissible consumptive volumes set by the Minister established to protect water users' reliability and to maintain groundwater levels also help manage environmental needs, Southern Rural Water can use a variety of additional management tools to protect high value GDEs. These can be applied in statutory or local management plans or included as conditions on licences and include:

- creating buffer zones or setting trigger levels to protect recharge areas, streams, wetlands or other assets;
- developing restriction rules;
- creating trading zones;
- creating buffer zones for water trading to ensure trades to areas outside these zones can be approved in most cases, without the need for detailed environmental assessments;
- establishing monitoring requirements; and
- allowing a temporary transfer to enable additional information to be compiled to support consideration of a permanent transfer.

In developing a statutory or local management plan, Southern Rural Water may choose to identify buffer zones for water trading to ensure trades to areas outside the buffer zones could be approved in most cases, without the need for detailed environmental assessments.

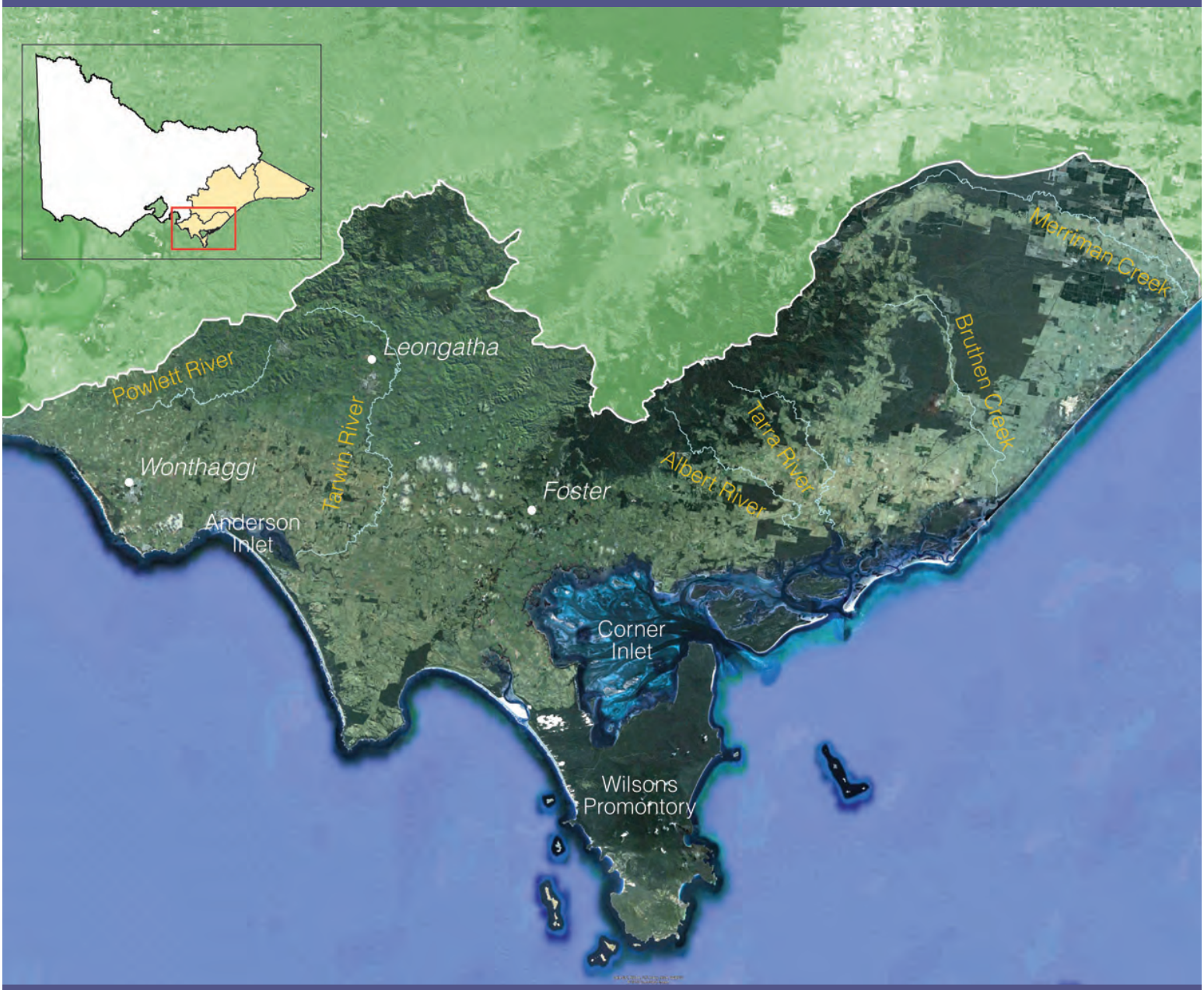
While the guidelines will provide advice and checklists to help Southern Rural Water consider the needs of GDEs when making management decisions, and the latest research will help guide those decisions, Southern Rural Water is ultimately responsible for considering the matters in Section 40 of the *Water Act 1989* before approving a new allocation or trade.

What else can be done to protect environmental values that rely on groundwater?

Other risks to environmental values may require complementary actions to protect or improve those values. For example, a wetland that relies on groundwater may also be affected by drainage schemes diverting water from it or excessive nutrients running off farms.

The *Victorian Strategy for Healthy Rivers, Estuaries and Wetlands* will clarify responsibilities for protecting and maintaining the health of rivers, estuaries and wetlands now and into the future. It will also identify complementary actions, beyond licensing decisions, that could be taken to protect or improve the health of the State's high value GDEs.

Macalister wetland, Maffra, Alison Pouliot



This chapter contains actions specific to South Gippsland.
The chapter also describes how some of the actions and policies presented in chapters 3 and 4 will apply in South Gippsland.

South Gippsland

Guide to this chapter

5.1 Water availability and use

- Surface water availability and use
- Groundwater availability and use
- Environmental and cultural values
- Pressures on future water availability

5.2 Promoting sustainable use of water

- Providing certainty and improved flexibility for water users
- Improving reliability of supply for urban and industrial water users
- Improving reliability of supply for agriculture and rural water users
- Managing other pressures on future water availability

5.3 Protecting waterways, aquifers, wetlands and estuaries

- Complementary works and programs
- Protecting the environment's share
- Adapting to a changing environment
- Risk-based approach to managing groundwater dependent ecosystems

South Gippsland

Introduction

The actions and policies presented in this chapter aim to meet the specific water needs of South Gippsland. They focus on protecting the reliability of supply for existing and future consumptive water users and improving the environmental values. Together with region-wide actions, this Strategy aims to provide a flexible framework that is able to respond to existing and potential pressures within South Gippsland. This chapter presents information on how these actions will be delivered, the responsible organisation(s), timelines for completion and the benefit of each action.

In this Strategy, South Gippsland includes the catchments south-west of the Latrobe catchment including the Powlett catchment in the west, and the Merrimans Creek catchment in the east. Towns include Inverloch, Korumburra, Leongatha, Wonthaggi, Mirboo North, Foster and Yarram.

South Gippsland contains many rivers and extensive estuarine systems that support significant environmental and heritage values. It includes the Tarra Bulga National Park, Wilsons Promontory Marine and National Park, Corner Inlet Marine Park, Bunurong Marine Park and Cape Liptrap Coastal Park. There are also aquifer systems beneath parts of South Gippsland, including the Latrobe Group and Balook aquifers in the Yarram area.

The major sources of water supplies for urban and industrial users are Lance Creek (Wonthaggi, Cape Patterson and Inverloch), Ruby Creek (Leongatha, Koonwarra), Coalition Creek (Korumburra), Little Bass River (Loch, Poowong and Nyora), Tarwin River (Meeniyan and Dumbalk), Agnes River (Toora and Port Welshpool), Tarra River (Yarram and Port Albert) and Deep Creek (Foster). These water supplies are managed by South Gippsland Water.

5.1 Water availability and use

Average annual rainfall varies across South Gippsland but is relatively high compared with the rest of Victoria. The annual average rainfall in some eastern areas is less than 600 mm, while in other areas it is more than 1,100 mm.

Across South Gippsland, average annual rainfall during the recent drought from 1997 to 2009 was 41 per cent less than the long-term annual average. This was the longest drought on record.

While our understanding of the potential impacts of climate change on future water availability will continue to improve over time, the uncertainty about future rainfall means that we need to be prepared for a range of future climate conditions.

5.1.1 Surface water availability and use

The historical average surface water availability in South Gippsland catchments is 911,500 ML per year (including distribution losses in supply systems), but this varies greatly from year to year. Figure 5.1 shows on average the water that is available for different uses in South Gippsland, including water protected for environmental use. Figure 5.1 presents average annual information based on the long-term climate record, however during dry years and dry months the proportion of water available for environmental uses can be much less than the long-term average.

The recent drought saw the biggest decreases in rainfall occurring in autumn, followed by spring and winter. The reduction in autumn rainfall meant that the catchments tended to be drier at the beginning of winter, which resulted in less runoff from winter and spring rainfall.

Even though climate scenarios predict decreases in rainfall over the long term, there may be an increase in the intensity of rainfall within these scenarios.

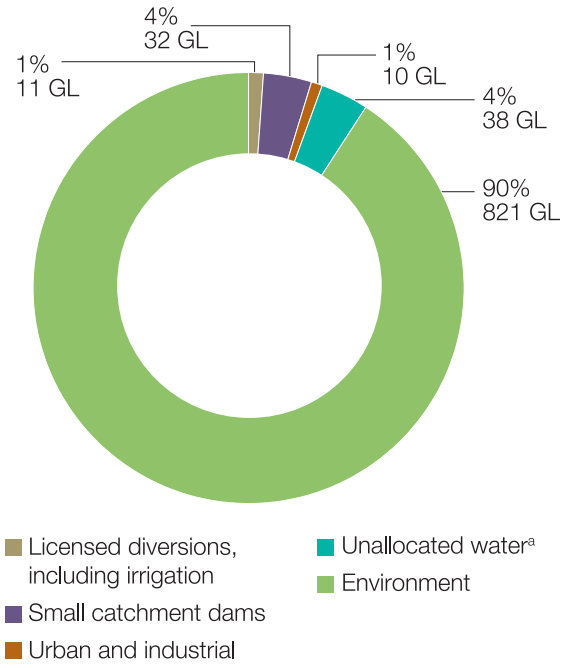
Heavy rain in 2010/11 resulted in some South Gippsland catchments experiencing flooding. Wilsons Promontory had about 370 mm of rainfall in 24 hours in March 2011, resulting in extreme local flooding, landslips and damage to infrastructure.

Water extracted from the unregulated catchments of South Gippsland is used for agriculture, towns and local industry. Towns use about 10 GL or 1 per cent of South Gippsland's water each year. Most of this water is supplied from:

- Lance Creek Reservoir (Wonthaggi, Cape Patterson and Inverloch); and the
- Ruby Creek storages (Leongatha, Koonwarra).

There are many smaller urban supply systems within the South Gippsland catchment. Figure 5.2 (see page 100) provides an overview of the urban supply extraction points in South Gippsland.

Figure 5.1 Surface water available for different uses from the catchments in South Gippsland (average annual)



Note:
a See Action 5.2, page 104.

It is estimated that 32 GL is used in small catchment dams for domestic and stock use. The South Gippsland basin, along with the Latrobe, has the highest density of domestic and stock dams in Gippsland.

There are no large regulated supply systems in South Gippsland and irrigation is not widespread due to the relatively reliable rainfall. About 11 GL of licences for rural purposes have been issued for diversions from on-stream storages and dams in some gullies.

South Gippsland has the highest proportion of dairy farms in Gippsland. These farms generally rely on rain-fed pastures rather than irrigation, but require water to operate dairies.

Plantation forestry is also an important industry in South Gippsland.

5.1.2 Groundwater availability and use

Parts of South Gippsland are underlain by aquifers that are used to provide water for domestic and stock, towns, irrigation and industry. There are four groundwater management units in South Gippsland with a total permissible consumptive volume of about 38,787 ML per year (see Table 5.1).

Groundwater levels in the Latrobe Group aquifer have been declining along the coast by about one metre a year over the past 30 years. Offshore oil and gas production has been identified as a component of the aquifer decline[24]. This decline has impacted on irrigators pumping from the Latrobe Group and Balook aquifers in the Yarram Water Supply Protection Area. Chapter 3 discusses offshore oil and gas extraction in more detail (see page 56).

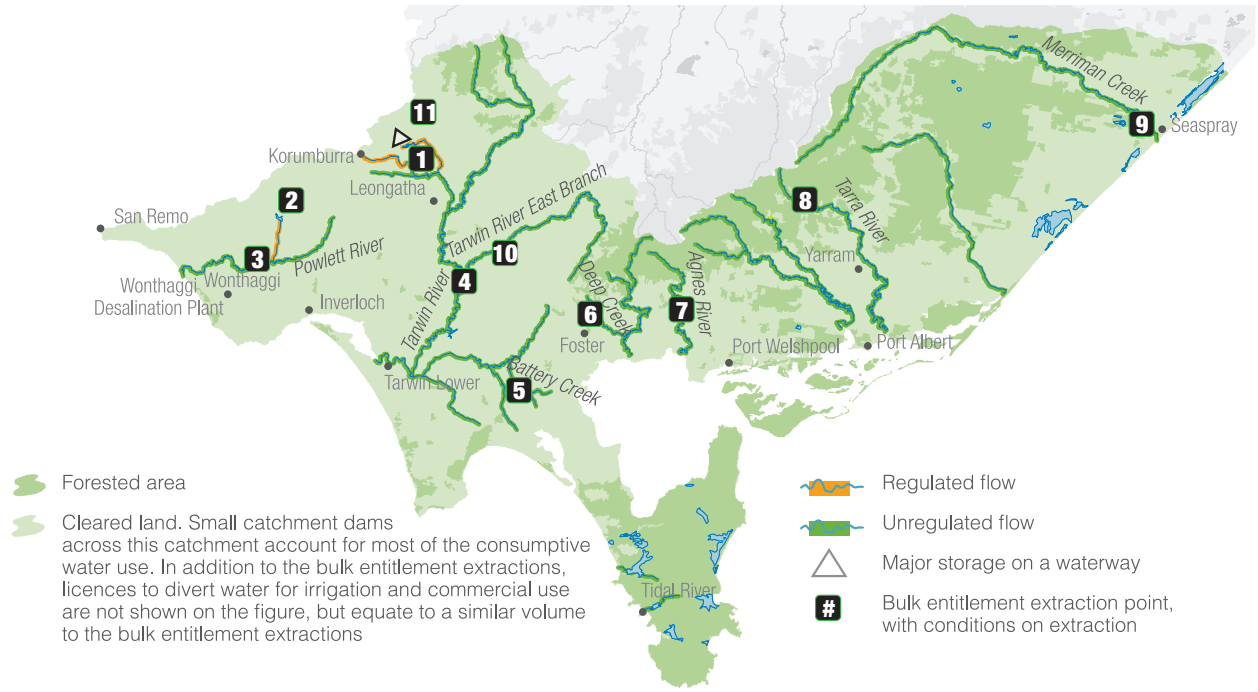
Table 5.1 Groundwater management units in South Gippsland[a]

Groundwater management unit	PCV[b] (ML)	Licensed entitlement[c] (ML)	Metered use[c] (ML)	Unallocated water[cd]	Groundwater availability
Giffard GMA	5,670	5,670	3,657	0	Only by trade, as the licensed entitlement has reached the PCV
Leongatha GMA	6,500	1,480	342	5,020	By allocation or trade
Tarwin GMA	1,300	37	88	1,263	By allocation or trade
Yarram WSPA	25,317	25,317	13,891	0	By trade only, restricted in some zones
Total	**38,787**	**32,504**	**17,978**	**6,283**	

Notes:
a Extractions for offshore oil and gas from the Latrobe Group aquifer are not shown. Extractions are almost 100 GL per annum, which occurs up to 100 km offshore.
b The PCV is defined as the volumetric amount plus any licences issued for dairy under the Dairy Shed Water Licence Transition Program, MAR and pumping tests.
c These amounts are taken from the 2009/10 Victorian Water Accounts.
d Although water is available under the PCV in some GMUs, Southern Rural Water may not issue licences due to considerations under Section 40 of the *Water Act 1989*.

South Gippsland

Figure 5.2 Urban extractions from the larger tributaries in South Gippsland



1	**Coalition Creek storages, Coalition Creek**	• Capacity of 610 ML • South Gippsland Water may take up to 1,000 ML/year from the storages at a maximum rate of 1.6-4.8 ML/day • South Gippsland Water must allow a minimum passing flow of 0.6-1 ML/day or lesser natural flow
2	**Lance Creek Reservoir, Lance Creek**	• Capacity of 4,200 ML • South Gippsland Water may take up to 3,800 ML/year at a maximum rate of 35 ML/day • Must release 100 ML/year if the reservoir holds more than 3000 ML on 1 December, otherwise no minimum passing flow
3	**Powlett pump station, Powlett River**	• South Gippsland Water must allow 7 ML/day, or the natural flow, to pass • South Gippsland Water may take up to 1,800 ML/year at a maximum rate of 10 ML/day
4	**Meeniyan pump station, Tarwin River**	• South Gippsland Water may take up to 200 ML/year at a maximum rate of 1.3 ML/day • No minimum passing flow
5	**Battery Creek Reservoir, Battery Creek**	• Capacity of 90 ML • South Gippsland Water may take up to 251 ML/year at a maximum rate of 1 ML/day • No minimum passing flow
6	**Deep Creek Reservoir, Deep Creek**	• Capacity of 42 ML • South Gippsland Water may take up to 326 ML/year at a maximum rate of 3.5 ML/day • South Gippsland Water must allow 0.2 ML/day, or the natural flow, to pass
7	**Agnes River storage, Agnes River**	• Capacity of 90 ML • South Gippsland Water may take up to 1,617 ML/year at a maximum rate of 4.8 ML/day • South Gippsland Water must allow 1 ML/day, or the natural flow, to pass
8	**Tarra River diversion weir, Tarra River**	• South Gippsland Water may take up to 853 ML/year at a maximum rate of 6 ML/day • South Gippsland Water must allow a minimum of 3 ML/day to pass, unless Stage 4 restrictions are applied when the minimum passing flow is lower and variable
9	**Seaspray pump station, Merriman Creek**	• Gippsland Water may take up to 133 ML/year at a maximum rate of 2.4 ML/day • Gippsland Water must allow 39.6 ML/day, or the natural flow, to pass between July to October • No minimum passing flow between November to June
10	**Dumbulk pump station, Tarwin River East Branch**	• South Gippsland Water may take up to 100 ML/year at a maximum rate of 0.72 ML/day • No minimum passing flow
11	**Ruby Creek storages, Ruby Creek**	• Capacity of 1,910 ML • South Gippsland Water may take up to 2,476 ML/year from the storages at a maximum rate of 17.3 ML/day • South Gippsland Water must allow a minimum passing flow of 0.5 ML/day or lesser natural flow

5.1.3 Environmental and cultural values

South Gippsland includes the ecologically and culturally significant Corner, Anderson and Shallow inlets and the mouth of the Powlett River, which are all wetlands of international importance. South Gippsland waterways support populations of threatened fish species such as Australian grayling, Cox's gudgeon and river blackfish, which rely on healthy streams with variable flow regimes.

South Gippsland also contains popular tourism and recreational destinations including Wilsons Promontory National and Marine National Park. Wilsons Promontory is one of the largest coastal wilderness areas in Victoria and has very high conservation and recreational values.

Rich Indigenous cultural sites, places and objects extend throughout South Gippsland. Wilsons Promontory has long been part of the sacred *Country of Yiruk* for the Gunai/Kurnai and *Wamoom* for the Boon Wurrung Indigenous people[25]. Seascapes of the Corner Inlet and Wilsons Promontory National Parks and surrounding landscapes and waters are culturally and spiritually significant to the local Indigenous communities. The health of waterways and land remains central to Indigenous culture, particularly fish and bird species, plant foods and medicines.

5.1.4 Pressures on future water availability

There will be significant pressures on South Gippsland's future water use arising from climate variability and population growth, as well as other pressures on environmental values

South Gippsland's characteristic small water storages were designed to build up reserves of water over the winter months for supply over the next summer. Over the recent drought severe water restrictions were needed in the summers following winter/springs that had very low runoff.

Industrial and agricultural water use is also likely to increase and exert pressure with a growing population. Offshore oil and gas production is likely to continue to draw down groundwater resources in the region.

The following sections of this chapter present actions and policies to respond to these pressures.

5.2 Promoting sustainable use of water

5.2.1 Providing certainty and improved flexibility for water users

Most waterways in South Gippsland have no significant flow regulation. In these unregulated catchments, water is allocated to:

- individuals with private rights under Section 51 of the *Water Act 1989* to take and use surface water or groundwater for domestic and stock purposes;
- individuals with a take and use licence under Section 51 of the *Water Act 1989* to take and use surface water or groundwater; and
- water corporations with bulk water entitlements to access surface water.

If water is available, it can be taken and used in accordance with the licence or bulk water entitlement conditions.

If there is not enough water available for all needs, water use is restricted to share the available water between consumptive users and to protect the environment, domestic and stock water users and the long-term use of the resource.

Local management plans[26]

In many areas, management of licensed use needs to be more responsive and adaptable to local conditions and the characteristics of each groundwater or unregulated river system. Triggers for applying and removing restrictions on using water need to:

- closely match the characteristics of each system, with every opportunity explored to apply them in a way that best meets the needs of users and the environment; and
- be clearly documented and well understood by users, with any proposed changes to these triggers subject to appropriate consultation with users and environmental managers.

Local management plans will be used across the catchments and groundwater systems of South Gippsland to clearly define the rules to manage section 51 take and use licences. They will include rules and triggers for imposing restrictions during times of shortage, and local water trading rules where needed (see Action 5.1, over page).

More information on the basis for developing local management plans is described in Chapter 3 (Section 3.2.2, page 41).

In some systems increased groundwater extraction can reduce streamflow and therefore impact on groundwater dependent ecosystems and the reliability of existing surface water users. Local management plans will consider these interactions to ensure the interests of existing surface water and groundwater users and the environment are protected.

Local management rules are already in place for the following catchments in South Gippsland: Agnes River, Albert River, Bruthen Creek, Franklin River, Tarra River and Tarwin River. For each of these catchments the rules specify arrangements for introducing rosters, restrictions and bans. In the first instance, these rules will simply be converted to management plans (see Table 5.2). This will not require significant resources or be costly. Over time these plans may be revised to incorporate more detailed management arrangements to meet local needs. For example, more detailed water trading rules may be required in the future.

Local management plans will be developed for groundwater management areas as described in Table 5.3.

In the Tarra catchment it is proposed to undeclare the Water Supply Protection Area (WSPA) by the end of 2012 and develop a local management plan. The existing water supply protection area and the associated management plan for Yarram WSPA will be retained.

Water for new entitlements

Sharing water between consumptive use and the environment is a key issue for this Strategy. Water that is not extracted for consumptive use provides environmental, recreational and cultural benefits to the community.

Many locations across South Gippsland do not have additional water entitlements available – instead, water entitlements for new users need to be purchased (traded) from an existing entitlement-holder. However there are some areas in South Gippsland where new water entitlements can be made available.

Chapter 3 (Section 3.1.1, page 36) presents principles for how new water licences can be issued in a balanced way that protects environmental values and the reliability of supply to existing water users. This approach has been used to determine the amount of additional water set out in Action 5.2 (over the page) that can be licensed for consumptive use in South Gippsland. The amount of unallocated surface water available for winter diversion was determined having regard to:

- Environmental, economic and social values supported by the catchment and the costs associated with maintaining and improving those values.
- The need to protect the reliability of supply to existing water users and the health of the environment.
- Existing and projected availability of water in the river basin, including the reliability of supply during dry years.
- The economic benefit of allocating more water for economic development in the area.
- The need for a precautionary approach to promote intergenerational equity and sustainable water resource management.

This balanced approach will help protect the reliability of supply to existing users and environmental values. It will also enable new allocations to be made as knowledge of the resource improves over time. By applying the principles outlined above, this Strategy provides the flexibility to adapt over time, with volumes to be evaluated again in 10 years as part of the Strategy review.

Action 5.1 Local management plans for the main river systems in South Gippsland

Who: Southern Rural Water, West Gippsland Catchment Management Authority

Timeframe: as needed

Existing operating arrangements for Gippsland's surface water and groundwater systems will be formalised as local management plans.

These plans will be developed and reviewed in accordance with the Minister's *Policies for Managing Section 51 Take and Use Licences.*

Rural water corporations will consult stakeholders during the development and amendment of local management plans, particularly when the proposed plan will affect the issue, renewal or transfer of licences and groundwater carryover.

In developing local management plans, water corporations in close consultation with water users and catchment management authorities, will seek to explore opportunities to develop operating rules that, where practical, deliver multiple benefits to consumptive users and the environment.

When revised local management plans are prepared, interactions between surface and groundwater resources will be considered.

New groundwater entitlements are available in the Leongatha and Tarwin GMAs (see Table 5.1). In these areas, groundwater will continue to be allocated on a case-by-case basis consistent with the *Water Act 1989*. The Act specifies the matters that must be considered before the water is allocated, including the impact on existing users and the environment. Consideration of these matters sometimes means water cannot be allocated even though it is available within the total cap on entitlements (permissible consumptive volume) within these areas.

The Government supports additional water being made available where a resource appraisal shows this can be done sustainably.

Water trading

In those parts of South Gippsland where no new water entitlements are available, the only way to obtain more water is to buy it from another water user unless an alternative source (such as recycled water) is available.

Very little water has been traded in South Gippsland to date. In some parts of South Gippsland, there are a number of constraints to trading a licence from one location to another.

Stock grazing, South Gippsland, DSE

Table 5.2 Local management plans for surface water[a]

Action	River basin	Unregulated river system	Timeframe
Areas where existing rules will be documented as local management plans	South Gippsland	Agnes River	End 2012
		Albert River	
		Bruthen Creek	
		Franklin River	
		Merrimans Creek	
		Tarra River	
		Tarwin River	

Note:
a A local management plan will be developed for each unregulated river basin. Where needed, plans for specific unregulated rivers within each basin will be developed and attached as a schedule to the local management plan for the basin.

Table 5.3 Local management plans for groundwater

Action	River basin	Timeframe
Areas where existing rules will be documented as local management plans	Leongatha GMA	End 2012
	Tarwin GMA	
	Gifford GMA	
	Unincorporated areas[a]	End 2012

Note:
a Areas that are not included in either a GMA or WSPA are called unincorporated areas.

An investigation[27] into water demands in unregulated catchments including those in South Gippsland was undertaken as part of this Strategy. The conclusions and consequent actions to improve the ability to trade surface and groundwater entitlements across Gippsland are presented in Chapter 4, Section 4.1.2 (page 63). Actions include:

- market development and education;
- better water trading information;
- improving trading rules in unregulated river systems; and
- better information about groundwater trading.

Other actions and policies to improve flexibility and provide certainty

The other actions and policies contained within this strategy to help improve flexibility and provide certainty for water users are presented in Section 3.2, page 41.

5.2.2 Improving reliability of supply for urban and industrial water users

Towns in South Gippsland with reticulated supplies are serviced by South Gippsland Water, except Seaspray, which is serviced by Gippsland Water. In South Gippsland, about 27,000 people are supplied from the reticulated supply systems. Most industrial water use occurs from within these supply systems, with the largest industrial water user being the Murray Goulburn milk processing plant in Leongatha.

The water supply systems are shown in Figure 5.2 (page 100) and Figure 5.3. Many of these towns are also provided with a wastewater removal and treatment service.

Wonthaggi, SGW

Action 5.2 Revised cap on the amount of unallocated surface water available for winter-fill (July to October) diversions in South Gippsland's catchments

Who: Department of Sustainability and Environment, Southern Rural Water, catchment management authorities

Timeframe: End 2012

Consistent with the principles outlined in Chapter 3, the following caps will be placed on the amount of unallocated surface water that remains available for new uses:

- 2,500 ML across the Tarwin River catchment;
- 500 ML across the Powlett River catchment;
- 300 ML across each of the Franklin River, Albert River, Ten Mile Creek, Dividing Creek and Nine Mile Creek/ Shady Creek catchments; and
- 500 ML across other catchments in South Gippsland where water is still available under the SDL.

The Tarra River will be capped at the current level of allocation.

The availability of water within each catchment will depend on location and access conditions on the licences.

Not all of this water will be sold immediately. A staged approach will be taken, with Southern Rural Water determining how this water will be allocated in each catchment. It may occur initially through expressions of interest, auctions or through allocations based on a reserve price.

Licences to unallocated water will only be made available at or above a reserve price. Allocations may be made through an auction process in some catchments and in accordance with the *Water Act 1989*, which includes the need to demonstrate that the purchase is for a genuine water demand.

The amounts of water available for new entitlements in South Gippsland will be assessed as part of the Strategy review in 10 years.

Balancing future supply and demand for South Gippsland's towns

Most of South Gippsland's urban water storages are relatively small, and rely on reasonable winter and spring run-off to fill the storages for the following summer. Given the historically reliable rainfall in South Gippsland, this has generally worked well, however during the winter and spring of 2006 the storages did not fill, which led to harsh urban restrictions and emergency pumping from rivers over the summer.

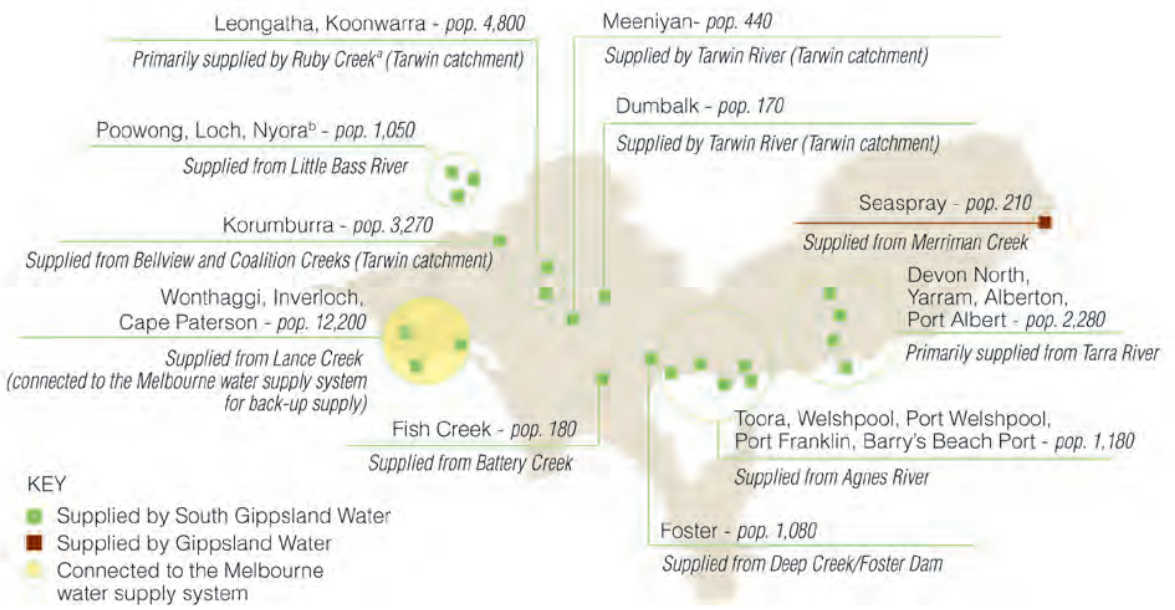
Potential climate impacts on run-off and the increase in water demand from growing populations in South Gippsland are considered as part of the long-term planning developed through the water supply-demand strategies being prepared by South Gippsland Water and Gippsland Water. All urban water corporations in Victoria are required to develop water supply-demand strategies to ensure adequate supply reliability in the future.

Actions considered as part of South Gippsland Water's water supply-demand strategy[28] to improve the reliability of supply include:

- water conservation;
- interconnecting supply systems, including connecting some systems to the Melbourne water supply system;
- accessing groundwater reserves and high winter streamflows;
- increasing the storage capacity of existing reservoirs;
- recycling for fit-for-purpose use; and
- using alternative water sources.

The latest version of South Gippsland Water's water supply-demand strategy is in a draft form. This document is available from South Gippsland Water, and a summary is presented in Appendix 5. South Gippsland Water is consulting with its customers on the strategy (see Action 5.3).

Figure 5.3 Urban water supply systems in South Gippsland[a]



Notes:
a Figures used to represent the population served are estimates and supplied by South Gippsland Water.
b The Poowong, Loch, Nyora supply system is outside of the Strategy boundary but is managed by South Gippsland Water so it has been considered from a supply point of view.

Action 5.3 Water supply-demand strategy – South Gippsland Water

Who: South Gippsland Water **Timeframe:** by March 2012

South Gippsland Water will develop its revised water supply-demand strategy, which will detail how water supplies and water demands will be balanced over the long term. South Gippsland Water will consider community feedback to the draft strategy in the preparation of its revised water supply-demand strategy.

South Gippsland

The strategy presents the projected supply and demand for all urban water supply systems in South Gippsland. An example for South Gippsland Water's northern and southern systems is shown in Figure 5.4.

In developing water supply-demand strategies, the target level of reliability for each supply system will be determined by South Gippsland Water and Gippsland Water through consultation with customers. This target level will be clearly defined in the strategies, consistent with the requirements of Action 4.8 (page 78).

Interconnecting systems to improve reliability – South Gippsland Water's western and northern systems

One option being considered by South Gippsland Water in its draft water supply-demand strategy is interconnecting supply systems, which can increase the reliability of supply, reduce the need for restrictions and reduce the risk of supply failures.

The construction of a desalination plant at Wonthaggi and its connection to the Melbourne water supply system provides an opportunity for South Gippsland Water to increase the reliability of some of its supply systems. A pipeline connecting the Lance Creek system to Melbourne's supply system from the desalination plant was constructed in 2010, which will allow water to be supplied from the Melbourne water supply system to the towns serviced by the Lance Creek system (Wonthaggi, Cape Paterson and Inverloch) when the local supply is inadequate. When the desalination plant is not operating, any backup supply required by the Lance Creek system would be able to be supplied from Melbourne's other water sources through the interconnection.

South Gippsland Water's preferred approach for its northern towns of Leongatha, Korumburra, Poowong, Loch and Nyora is to provide an additional pipeline from Lance Creek Reservoir – utilising this storage as the prime source of water and the Melbourne supply system when needed.

Three water treatment plants will be decommissioned if this plan is fully implemented. Also a number of relatively small reservoirs, serving these towns, will no longer be needed for urban supplies. South Gippsland Water will determine the future management arrangements for these storages, including how the available water will be used.

Accessing groundwater reserves

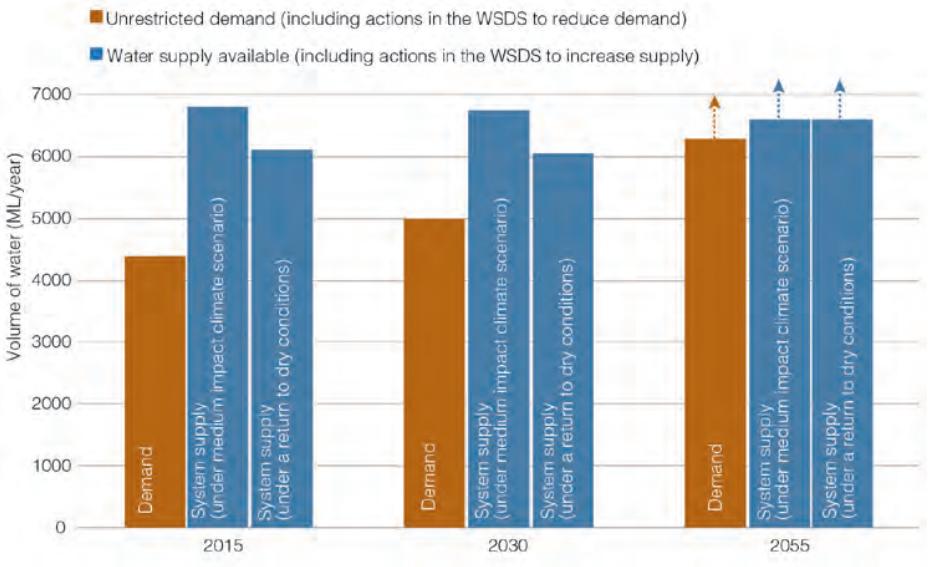
South Gippsland Water has augmented the water supply to the townships supplied from the Tarra River with groundwater, and has bought groundwater licences from existing entitlement-holders to extract water from its recently constructed bore in Yarram. The new groundwater licence will enable South Gippsland Water to draw water from the Latrobe Group aquifer, and transfer it to its treatment plant at Yarram to improve reliability of supply for Yarram, Alberton, Port Albert and Devon North.

Increasing storage capacity and accessing winter streamflows

Through its draft water supply-demand strategy, South Gippsland Water is considering increasing storage capacity in the Battery Creek and Agnes River systems.

In addition, South Gippsland Water is improving its supply reliability by considering how to use existing entitlements more efficiently and by accessing winter streamflows. For example, the temporary diversion pump and pipeline used as an emergency in 2006/07 to divert water from the Powlett River at Wonthaggi to Lance Creek Reservoir, is now operating annually as a winter-fill diversion.

Figure 5.4 Future water demand and availability projections for South Gippsland Water's northern and southern towns



Assumptions

- This figure shows the towns being considered for connection to the Melbourne system as part of South Gippsland Water's draft water supply-demand strategy.
- Demand has been determined using Victoria in Future population growth estimates.
- System supply is based on the limitations of the current pumping rates of 10 ML per day. This supply can be increased by upgrading the supply transfer capacity if demand increases.
- If implemented, the connection of the northern and southern towns will be staged.

Water conservation in reticulated supply systems

Water conservation is promoted in all of South Gippsland Water's supply systems. Many existing conservation measures (such as a showerhead exchange program and promoting the installation of rainwater tanks) have been implemented through grants and community education. South Gippsland Water also implemented permanent water saving measures in 2005/06 which have encouraged residents to reduce water consumption.

South Gippsland Water has strongly promoted measures to businesses to reduce reliance on its supply systems. It is part of the 'savewater!' alliance which offers initiatives on water conservation, runs competitions for water conserving products and provides access to suppliers of water conserving products (see Appendix 5).

Murray Goulburn, a major industrial water user in the region, is saving water by using what it has more efficiently and by looking to recycled water to reduce its demand on South Gippsland Water's supplies.

South Gippsland Water is also taking part in the ResourceSmart schools program. The program aims to improve primary and secondary students' knowledge on sustainability and how to incorporate environmental practices into the school and community. The program helps identify water-saving actions and plan improvements to water efficiency in schools.

Review of drought response plans

In addition to long-term planning undertaken through water supply-demand strategies, South Gippsland Water and Gippsland Water have drought response plans in place to manage temporary water shortages. These plans outline a staged approach to managing temporary water shortages, which can include measures to progressively reduce demand by introducing water restrictions.

The water corporations will be updating their plans to take account of the lessons from recent experience, which is being undertaken in parallel with the review of their water supply-demand strategies. For more information on the review of drought response plans, see Action 4.9 (page 79).

5.2.3 Improving reliability of supply for agriculture and rural water users

Most freehold land in South Gippsland is used for dryland (non-irrigated) farming due to the relatively reliable rainfall in the area. Figure 5.5 shows the broad distribution of different types of agriculture across South Gippsland. Grazing and dairy make up most of the farming enterprises, but there are some extensive areas of hardwood and softwood plantation. Water is used for domestic and stock purposes across South Gippsland. There are some irrigated dairy areas near Yarram that rely on groundwater, and some isolated areas of irrigated horticulture.

Opportunities exist to improve the reliability of supply for agricultural and rural water users across South Gippsland. These opportunities vary depending on the location and water requirements of the activity. Opportunities for the main user groups are described below.

Pipe laying project, SGW

South Gippsland

Domestic and stock users

Water for domestic and stock water use is required in South Gippsland where access to town supply systems is not available. Reliable water supplies are needed for domestic use, and supplies for stock watering are vital for dryland farming enterprises. Rainfall collected from roofing is the predominant source of water for rural domestic use, and stock watering is mostly supplied by small catchment dams. Landowners generally have the right to access these supplies for domestic and stock use, with this being an 'as of right' activity under Section 8 of the *Water Act 1989*.

Depending on location, there can be opportunities to supplement domestic and stock water supplies with groundwater or by pumping from waterways. The ability to access these supplies depends on where aquifers and waterways are located, the reliability of supply, and in the cases where a licence is required, whether a licence can be obtained. Southern Rural Water is responsible for assessing licence applications throughout Gippsland.

Actions relating to domestic and stock use are presented in Section 3.3.1 (page 53) and Section 4.2.1 (page 76).

Licensed surface water users

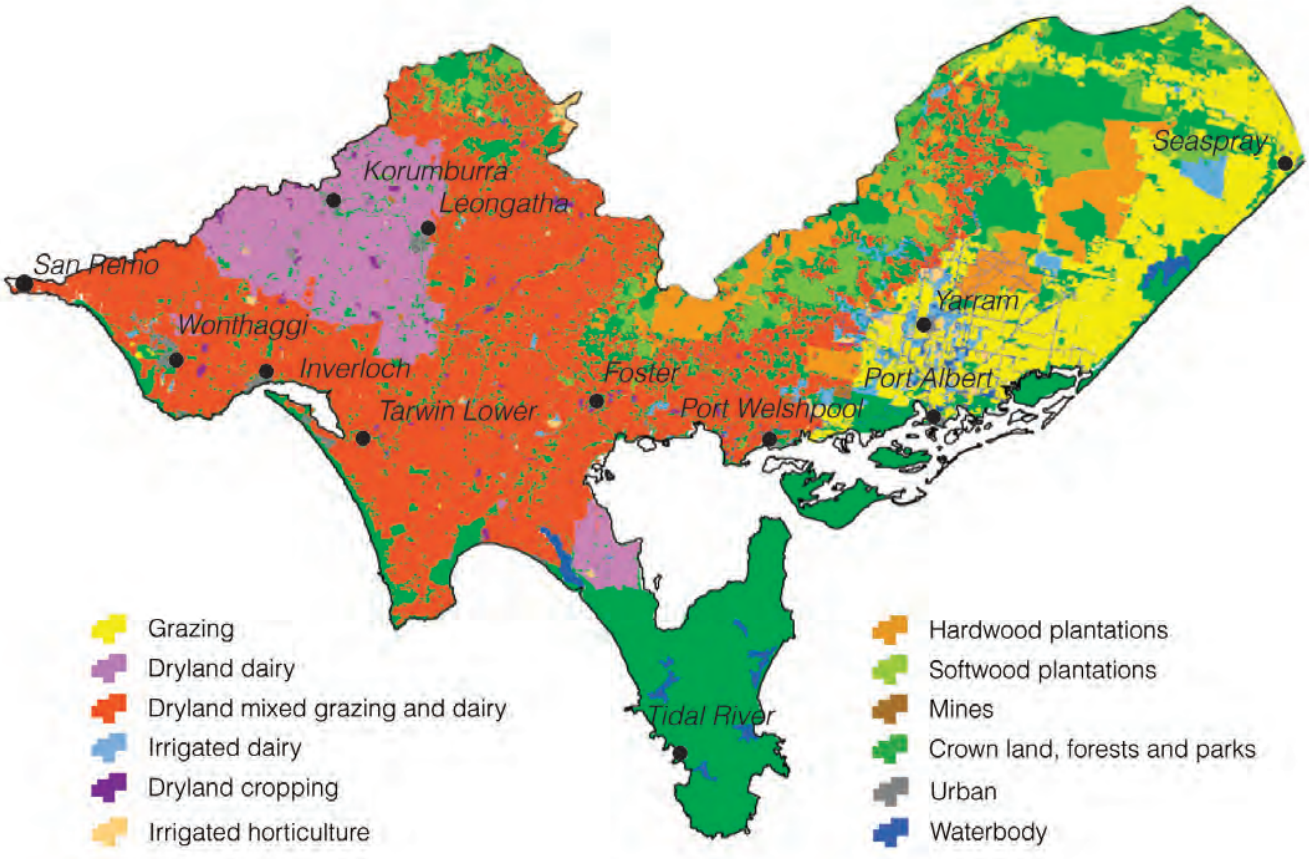
There are a relatively small number of licensed diverters in South Gippsland. There are opportunities in some locations in Gippsland to obtain new winter-fill surface water licences (see Action 5.2, page 104), and where new licences are not available, there may be opportunities to trade winter-fill or year-round licences from existing licence-holders.

Where winter-fill licences are obtained, the water needs to be stored so that it is available when needed. If suitable sites are available, off-stream storages can be constructed, however pumping and storage construction costs can be prohibitive for some users.

Licensed groundwater users

In South Gippsland, there are a relatively small number of groundwater users, with most use occurring in the Yarram Water Supply Protection Area. Water licences sought within the Yarram and Gifford groundwater management units need to be traded from existing licence-holders, whereas in the Leongatha and Tarwin groundwater management areas, new licences may be available. Groundwater use outside existing groundwater management units is unlikely to be significant because of low yields.

Figure 5.5 Agricultural and rural water uses in South Gippsland



The declining groundwater level in the Latrobe Group aquifer has affected and will continue to affect groundwater users in the Yarram area by increasing the costs for bores, pumps and power to access groundwater. In response to the long-term effects of falling groundwater water levels in the area, a financial assistance package funded by the State and Commonwealth governments has been implemented for irrigators to help cover these costs. Policy 3.9 (page 49) aims to address the impacts that any new mining projects could have on groundwater availability, and Action 3.16 (page 56) considers any significant new risks from existing activities

Actions and policies to improve agricultural and rural supply reliability

The main actions in this Strategy that will help protect the future water supply reliability of agriculture and rural water uses in South Gippsland are discussed in Section 4.2.1 (page 76)

5.2.4 Managing other pressures on future water availability

Land use change

Large-scale changes in land use can affect water availability for other water users and the environment by taking more water that would otherwise reach streams and/or extracting more water directly from shallow aquifers. These impacts are felt most keenly during dry years and in summer, and where the available water is already fully committed. During the development of the Western and Gippsland sustainable water strategies, the community expressed concerns about land use change impacts on the reliability of supply for water users especially in dry times. Concerns were greatest in Western Victoria, where rapid plantation forestry development has occurred in the past 10 to 20 years. The community also expressed support for a sound policy to protect water resources from the impact of rapid expansion of water-intensive land uses in the future.

Forestry is an important economic activity in parts of South and West Gippsland. While many of the early plantations established in South and West Gippsland replaced native forest (minimising any impact on the water balance), the more recent plantations have been established on cleared grazing land.

This Strategy includes the ability for targeted management of the impact of plantations in the future. This approach is described in Section 3.3.1 (page 51).

Managing the impact of mining and extractive industries on groundwater availability

A range of emerging technologies may have significant implications for groundwater, including geothermal, carbon capture and storage, and coal seam methane. For example, there is an exploratory coal seam methane program near Longford in the Yarram WSPA. Each of these technologies would raise new challenges for the licensing and management regime that applies to groundwater under the *Water Act 1989*. There are significant coal deposits within South Gippsland, and historically, coal mining occurred near Wonthaggi, Korumburra, Yarram and Gelliondale.

As new technologies and industries emerge over time, their potential impact on the availability of groundwater must be considered. The Department of Sustainability and Environment and the Department of Primary Industries will identify any groundwater issues associated with new and emerging technologies, to ensure that any projects consider the impacts on the groundwater system and obtain appropriate licences (see Action 3.19, page 59).

In addition, the Strategy ensures that for any major new earth resource projects the proponents are aware of the potential impacts of earth resource developments on water resources and the environment, and that these impacts are addressed through the approval processes. Where the water requirements of any major new earth resource projects cannot be met by obtaining a new or traded licence within the existing permissible consumptive volume (due to the size of the water demand), the project proponent will need to put in place appropriate measures to mitigate or offset this impact (see Policy 3.9, page 49). Environmental Effects Statements prepared for major new projects under the *Environment Effects Act 1978* need to adequately consider the impacts on other water users or water-dependent environmental values.

Better aligning groundwater management boundaries with aquifer systems

New groundwater management boundaries in South Gippsland will be developed based on groundwater systems. This will ensure that all uses of the same groundwater system are subject to a consistent set of rules. Revised boundaries will be considered for all groundwater systems. The boundaries will be developed through the Secure Allocation, Future Entitlements (SAFE) project (see Action 3.15, page 55).

Other actions and policies to manage pressures on future water availability

Other actions and policies in this Strategy to help manage the pressures on future water availability in South Gippsland are presented in Chapter 3 (see page 33).

5.3 Protecting waterways, aquifers, wetlands and estuaries

The major waterways of South Gippsland include the Powlett, Tarwin, Agnes, Franklin, Tarra and Albert rivers, and the Screw, Pound, Stockyard, Bruthen and Merriman creeks. The waterways contain significant environmental values, and provide freshwater flows to South Gippsland's high value inlets and estuaries. Most waterways in South Gippsland do not have significant amounts of flow regulation.

Anderson Inlet and the mouth of the Powlett River are listed as wetlands of national importance. Corner Inlet is a Ramsar-listed wetland with high biodiversity values and provides an important habitat for resident and migratory waders. South Gippsland's inlets and estuaries support recreation and tourism, and maintaining the health of these systems is important for the social and economic values they support.

Protecting the high environmental values in South Gippsland is an important part of this Strategy. The most significant environmental risk to each of these systems is generally from poor water quality resulting from elevated nutrient and sediment levels from unsewered towns, run-off from cleared areas of upstream catchments, bank erosion and unfenced stock in riparian zones. The exceptionally dry conditions from 1997 to 2009 has also placed pressure on environmental values, with some systems suffering during low-flow periods in dry summers where there is a greater impact from consumptive uses. These impacts on water quality and stream flows will continue to put pressure on environmental values.

Improving the health of unregulated waterways in South Gippsland will require investing in best practice catchment management activities and complementary works and programs to improve water quality.

5.3.1 Complementary works and programs

Complementary works and measures, such as revegetation and streamside fencing, are particularly important in South Gippsland. There is little need to provide additional environmental flows as most rivers have no significant flow regulation and relatively small volumes of water are diverted for consumptive use.

An important focus in the catchments of South Gippsland is to improve the water quality entering these systems by continuing to build on the work undertaken with landholders to improve catchment management. This includes continuing to invest in fencing to keep stock off stream banks and out of waterways, weed removal and revegetation (see Action 5.4).

The West Gippsland Catchment Management Authority will continue to implement complementary in-stream and streamside works consistent with the priorities in the Victorian and West Gippsland Regional Strategy for Healthy Rivers, Estuaries and Wetlands (see Appendix 6).

Action 5.4 Protecting and improving the condition of South Gippsland inlets and estuaries through a continued focus on catchment management

Who: West Gippsland Catchment Management Authority **Timeframe:** ongoing

Catchment management will continue to be a focus of the work of the West Gippsland CMA in South Gippsland, through on-ground actions including revegetation of the riparian zone, removal of willows and fencing. Improvements in catchment management will also help to improve the water quality entering the estuaries and inlets along the South Gippsland coast, including Anderson, Shallow and Corner inlets.

Decommissioning urban sewage treatment plant outfalls

South Gippsland Water has three sewage treatment plant outfalls that discharge into Corner Inlet. South Gippsland Water is undertaking a five-year program to close these ocean outfalls which will prevent lagoon-treated effluent from being discharged into Corner Inlet.

Treated water from the Welshpool and Toora plants will be recycled and provided as an alternative supply for irrigation and farming. The Foster plant will be augmented on a new site to improve effluent quality, establish a winter balancing storage and provide an environmental benefit by creating a wetland bird habitat to complement the Corner Inlet ecology. The high quality effluent from the Foster plant will be recycled for land-based irrigation and farming.

5.3.2 Protecting the environment's share

Protecting high environmental values in South Gippsland is an important part of this Strategy, with a balanced approach taken to issuing any new water entitlements for consumptive use. This approach will help to ensure that new water allocations occur only where there is a relatively low risk to environmental values (see Action 5.2, page 104 and Section 3.1.1, page 34).

Tarra River, SGW

The headwaters of the Tarra River catchment traverse part of the Latrobe Group aquifer recharge areas. In areas where the Tarra River flows across the outcrop of the aquifer, there may be a reduction of surface flows due to groundwater recharge. Many studies have attempted to assess the interaction between reduced baseflows in the Tarra River and declining groundwater levels and whether there is a connection with the extraction of groundwater Latrobe Group aquifer for offshore oil and gas production. Improvements to the observation bore network in the upper Tarra River catchment have begun, and these will increase knowledge of groundwater levels in this area.

This Strategy also proposes to cap the Tarra River at the existing level of allocation, consistent with the adaptive management approach, and the additional risk posed by the significant and continuing decline of groundwater levels in the Latrobe Group aquifer. This cap will complement the existing cap on groundwater allocation from the Yarram WSPA.

5.3.3 Adapting to a changing environment

Over the long term, sea level rise in response to climate change and increases in storm surge frequency and intensity are likely to affect the estuaries and inlets in South Gippsland, with impacts including an increase in coastal erosion and flooding. Any rises in sea level will threaten coastal assets, including sea walls built to protect farming land along some parts of South Gippsland's coastline. Any future changes in rainfall patterns may also impact on the amount of streamflow entering the wetlands and estuaries, altering the location of the freshwater-saltwater interface in the estuaries.

Adapting to a changing environment may mean that in the future some environmental objectives cannot be met. If environmental objectives can no longer be met as a result of long-term changes in climate and water availability, they will be formally amended as part of the development of regional *Strategies for Healthy Rivers and Wetlands* (see Action 4.16, page 90).

5.3.4 Risk-based approach to managing groundwater dependent ecosystems

This Strategy aims to establish management arrangements that make the best use of groundwater resources while protecting the environment. The environment's reliance on groundwater is generally understood, but in most areas it is not understood in detail. There is a risk that in some aquifers, excessive groundwater extraction could damage environmental assets. Ministerial guidelines will be developed to help licensing authorities consider the risk to groundwater dependent ecosystems when making licensing decisions (see Action 4.17, page 93.

This chapter contains actions and policies specific to the catchments of the Gippsland Lakes. The chapter also describes how the actions and policies presented in chapters 3 and 4 will apply in these catchments.

Catchments of the Gippsland Lakes

Guide to this chapter

6.1 Water availability and use

- Surface water availability and use
- Groundwater availability and use
- Environmental and cultural values
- Pressures on future water availability

6.2 Promoting sustainable use of water

- Providing certainty and improved flexibility for water users
- Improving reliability of supply for urban and industrial water users
- Improving reliability of supply for agriculture and rural water users
- Managing other pressures on future water availability

6.3 Managing waterways, aquifers, wetlands and estuaries

- Managing and improving waterways within the catchment areas of the Gippsland Lakes
- Managing and improving the health of Gippsland Lakes

Catchments of the Gippsland Lakes

Introduction

The actions and policies presented in this chapter aim to meet the specific water needs in the catchments of Gippsland Lakes. They focus on managing the reliability of supply for existing and future consumptive water users as well as protecting environmental values. Together with region-wide actions, this Strategy aims to provide the flexibility needed to respond to pressures on future water availability. This chapter presents information on how these actions will be delivered, the responsible organisation(s) and timelines for completion.

The catchments of the Gippsland Lakes stretch from Warragul in the west, to Lakes Entrance in the east, and from the northerly draining slopes of the Strzelecki Ranges to the Great Dividing Range in the north.

The Latrobe, Thomson, Macalister and Avon river systems that feed the Gippsland Lakes from the west support irrigation including in the Macalister Irrigation District (MID), urban demands, and large industrial water users such as coal-fired electricity generators and paper production. The Mitchell, Nicholson and Tambo rivers further east have much less consumptive use. There are no major dams on the Mitchell, Nicholson, Tambo and Avon rivers, allowing these rivers to provide more natural patterns of flow to the Gippsland Lakes.

The Gippsland Lakes are a collection of different types of lakes and wetlands, most of which require freshwater to maintain a healthy ecosystem. They are internationally recognised for their outstanding environmental values. Each of the major rivers that flow into the Gippsland Lakes (Latrobe, Thomson, Macalister, Avon, Mitchell, Nicholson and Tambo) contributes freshwater with different volumes, frequency, timing and duration to different parts of the Gippsland Lakes system.

Lake Wellington is the western-most lake in the Gippsland Lakes system. The Latrobe, Thomson, Macalister and Avon catchments are the main catchments that feed Lake Wellington. At the eastern end of the Gippsland Lakes system, the Mitchell and Nicholson rivers drain into Jones Bay, and the Tambo River into Lake King.

The western rivers that feed the Gippsland Lakes are fully allocated, whereas some of the eastern rivers have water that could be made available for consumptive use. This Strategy describes where more water will be made available to protect and improve environmental values on the western rivers, and where more water can be extracted for consumptive use from some of the eastern rivers.

6.1 Water availability and use

Average annual rainfall varies across the catchments but is relatively high compared with the rest of the Victoria. The average annual rainfall in some areas is less than 600 mm, while in other areas it is more than 1,100 mm per year. The catchments of the Gippsland Lakes that typically receive higher amounts of average annual rainfall are the Latrobe and Thomson catchments in West Gippsland, along with the upper parts of the Macalister, Mitchell, Nicholson and Tambo catchments in the Great Dividing Range.

Across the catchments of the Gippsland Lakes, many consumptive users and environmental values rely on surface water and groundwater.

6.1.1 Surface water availability and use

The western catchments of the Gippsland Lakes (Latrobe, Thomson and Macalister) have higher levels of consumptive water use than the catchments further east (Avon, Mitchell, Nicholson and Tambo). The western catchments are considered to be fully allocated, except for an unallocated share of water in the Latrobe catchment. The eastern catchments, in particular the Mitchell and Tambo catchments, still have some water available for new water users – under a range of licence conditions. These include that diversions from waterways can occur only during the wetter July to October period.

The Thomson, Macalister and Latrobe river systems are the only rivers in Gippsland with significant levels of flow regulation in the lower reaches, resulting from the large storages in these catchments. These regulated western river systems supply most of the surface water extracted for consumptive use from the catchments of the Gippsland Lakes, and also support some high environmental values.

Water extracted from the western catchments is used in urban areas, industry and agriculture, and to generate electricity in the Latrobe Valley. The main storages on the western rivers are the Thomson Reservoir (1,068 GL), Blue Rock Reservoir (208 GL), Moondarra Reservoir (30 GL), Lake Glenmaggie

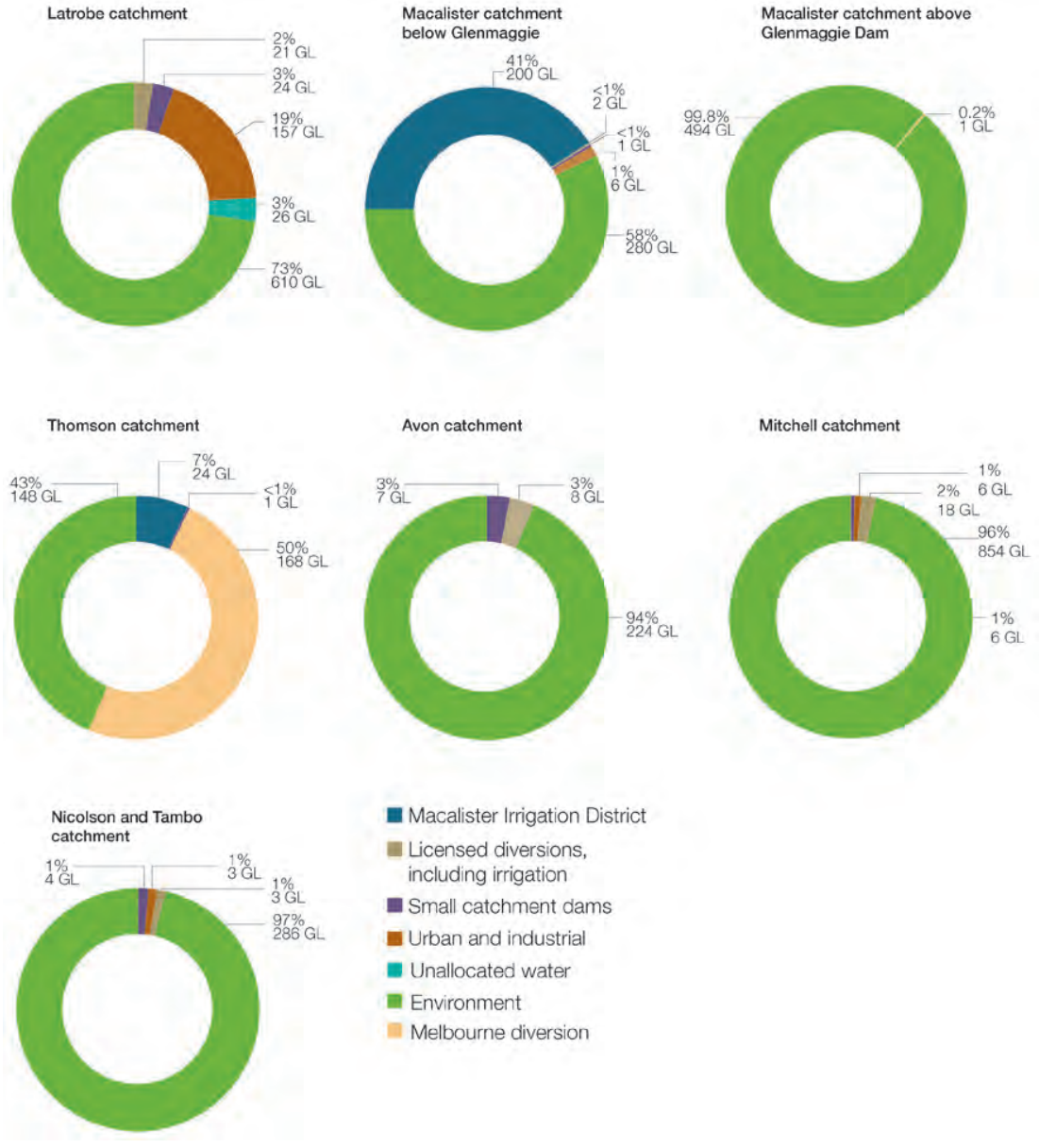
(178 GL) and Lake Narracan (7 GL). Thomson Reservoir is used primarily to supply water to Melbourne, but also supplies some water to irrigators in the Macalister Irrigation District (MID). Most water used in the MID is supplied from Lake Glenmaggie. Blue Rock Reservoir and Lake Narracan are the main water sources for major industry in the Latrobe Valley, including power generation, and Moondarra Reservoir supplies urban and industrial water needs in the Latrobe Valley.

Water extracted from the unregulated catchments to the east is used in agriculture, towns and local industry. There are no major storages on these rivers, but there are many off-stream storages within the catchments and storages on some gullies and creeks.

The Mitchell River system is the largest remaining river system in Victoria that does not have a large on-stream dam, and is a heritage-listed river. This, combined with the natural condition of much of the catchment, has maintained the high environmental values that still exist in this river system.

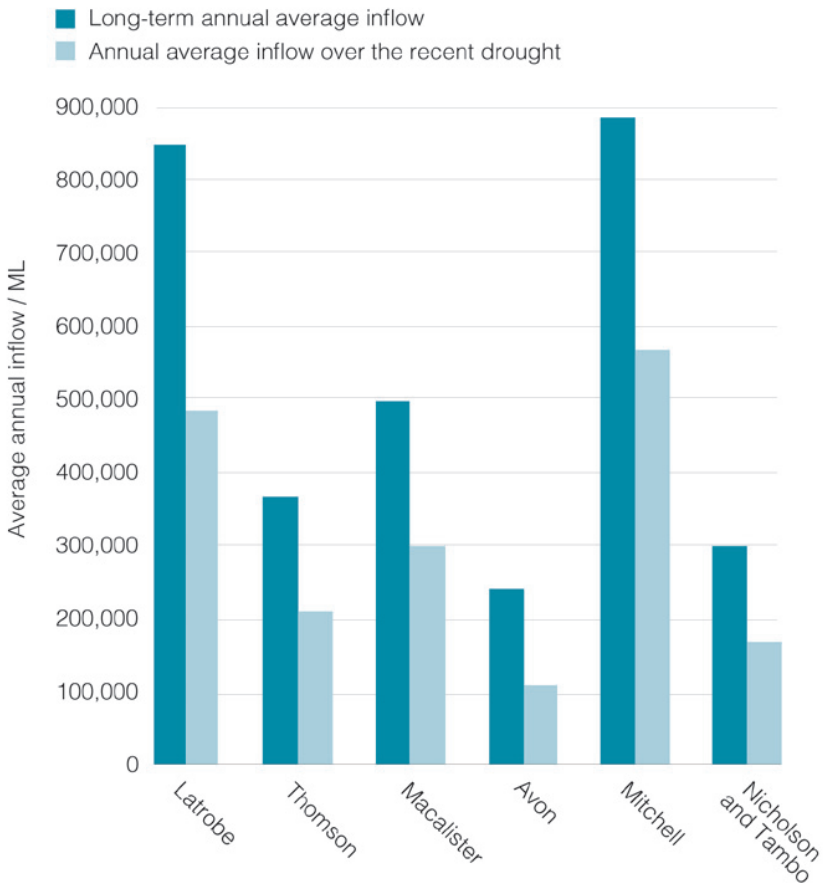
Figure 6.1 presents the water available for different uses on an average annual basis. The information shown in Figure 6.1 is based on the long-term climate record. During dry years and dry months, much less water may be available. Over the recent drought, average annual rainfall across the catchments of the Gippsland Lakes was about 16 per cent less than the long-term average. The impact of the reduction in rainfall on streamflow was magnified, with the greatest reduction in streamflow occurring in the Avon catchment where streamflows over the recent drought were about half the long-term average. Average annual streamflows are shown in Figure 6.2, for the long-term record and the recent drought period.

Figure 6.1 Surface water available for different uses in the catchments of the Gippsland Lakes



Catchments of the Gippsland Lakes

Figure 6.2 Average annual surface water availability



Latrobe catchment

The upstream tributaries of the rivers in the Latrobe River system do not have significant amounts of flow regulation, and tributaries in the more forested parts of the catchment have very small amounts of consumptive water extraction. The parts of the catchment with intensive industry or agriculture, particularly below the large storages, have relatively high levels of consumptive water use. The sections of river below Blue Rock Reservoir and Moondarra Reservoir are regulated.

Surface and groundwater extracted from the Latrobe catchment is used for domestic and stock purposes, in urban areas, for agricultural production, and by industry including for generation of much of the State's electricity. Most urban demands are supplied from Moondarra Reservoir, although there are many smaller supply systems in the catchment.

The water supply for Warragul and some surrounding towns is supplied from the Tarago catchment, west of the Latrobe catchment.

Along with many high environmental values in the upstream tributaries, the Latrobe catchment supports some significant environmental values at the downstream end of the system, including the lower Latrobe wetlands (Sale Common, Heart Morass and Dowd Morass) and Lake Wellington.

Thomson, Macalister and Avon catchments

The Thomson, Macalister and Avon catchments also feed into Lake Wellington. The Thomson catchment extends from the headwaters near Mount Baw Baw, and joins the Latrobe River at Sale. The Thomson Reservoir, which was completed in 1984, is located in the upper reaches of the catchment. It is used primarily for Melbourne's water supply (up to 171 GL per year) but also provides water for irrigation in the MID and a 10 GL environmental entitlement.

The Macalister River joins the Thomson River between Maffra and Sale. Little water is extracted from the middle and upper reaches of Macalister River, and much of the Macalister catchment is forested. Lake Glenmaggie, located on the lower section of the river, is the main source of water for the MID and also provides for recreational uses.

The Avon catchment flows from the foothills of the Great Dividing Range to Lake Wellington. There are no large on-stream storages in the major waterways of the Avon catchment, but water is diverted for irrigation from waterways and from the shallow groundwater aquifer, with which there is significant interaction with surface water.

Mitchell, Nicholson and Tambo catchments

The Mitchell and Nicholson rivers flow into Jones Bay, and the Tambo River flows into Lake King. These rivers are unregulated aside from the Nicholson River below East Gippsland Water's Nicholson Dam.

Water is diverted from the Mitchell River to meet most of the urban and industrial water demands in the area and high value irrigated vegetable production along the lower section of the river near Lindenow. Some small areas of irrigation also occur outside the Lindenow Flats.

The catchments of the Gippsland Lakes and the main water extractions are shown in Figure 6.3 (page 118).

6.1.2 Groundwater availability and use

Aquifers under parts of the catchments of the Gippsland Lakes hold significant volumes of groundwater. The aquifer system is generally referred to as the Gippsland groundwater basin, and consists of a series of aquifers that are used to provide water for domestic and stock, town, irrigation and industry use. Groundwater is pumped to enable safe coal mining in the Latrobe Valley, and as part of oil and gas extraction in Bass Strait. Groundwater also sustains environmental values where ecosystems depend on groundwater for all or part of their water needs.

The major aquifers that supply groundwater in the basin are the sands and gravels of the Latrobe Group aquifer, Latrobe Valley Coal Measures, Balook Formation and the Boisdale Formation (see Figure 2.2, page 17). The Latrobe Group aquifer is the largest and most extensive, occurring in the Latrobe Valley and extending to form a basin-wide aquifer that extends far out to sea. The Latrobe Valley Coal Measures are a sequence of coal seams with sand and silt layers in the Gippsland Basin and the Balook is a sands formation lying further to the east. The Boisdale Formation is a shallow sand and gravel layer deposited by rivers, which forms a significant source of shallow groundwater across much of Gippsland.

Other aquifers in the Gippsland Basin include the Childers Formation, Thorpdale Volcanics, and the Haunted Hills Gravels. Locally, each of these aquifers provides important groundwater resources.

Seven groundwater management units are located at least partly within the catchments of the Gippsland Lakes. These have a total permissible consumptive volume of about 135 GL per year, as shown in Table 6.1.

The licensed entitlements volume shown in Table 6.1 includes water extracted for towns, irrigation, industry and estimates of domestic and stock use (within the groundwater management units). Water supplies of some towns use groundwater as a backup but Sale relies mainly on groundwater extracted from the Sale Groundwater Management Area for its water supply.

Industrial uses of groundwater include water extracted as part of dewatering coal mines in the Latrobe Valley. The power generation companies (excluding Loy Yang B) have licences to pump a total of up to about 45 GL of groundwater per year in addition to their surface water entitlements, which is used within the coal mines. In recent years, the coal mines have extracted up to about 30 GL of groundwater per year.

6.1.3 Environmental and cultural values

There are many water-dependent environmental values in the catchments of the Gippsland Lakes. The lakes themselves are Ramsar-listed wetlands of international importance for waterbird habitat (see Section 6.3.2, page 147), and the Mitchell River silt jetties between Jones Bay and Lake King are high value conservation sites of international significance.

Most waterways within the catchments of the Gippsland Lakes support populations of native fish species, including Australian grayling, Australian bass and river blackfish. The Mitchell River, the Thomson River above Cowwarr Weir and the Aberfeldy River are heritage-listed rivers under the Victorian *Heritage Rivers Act 1992.*

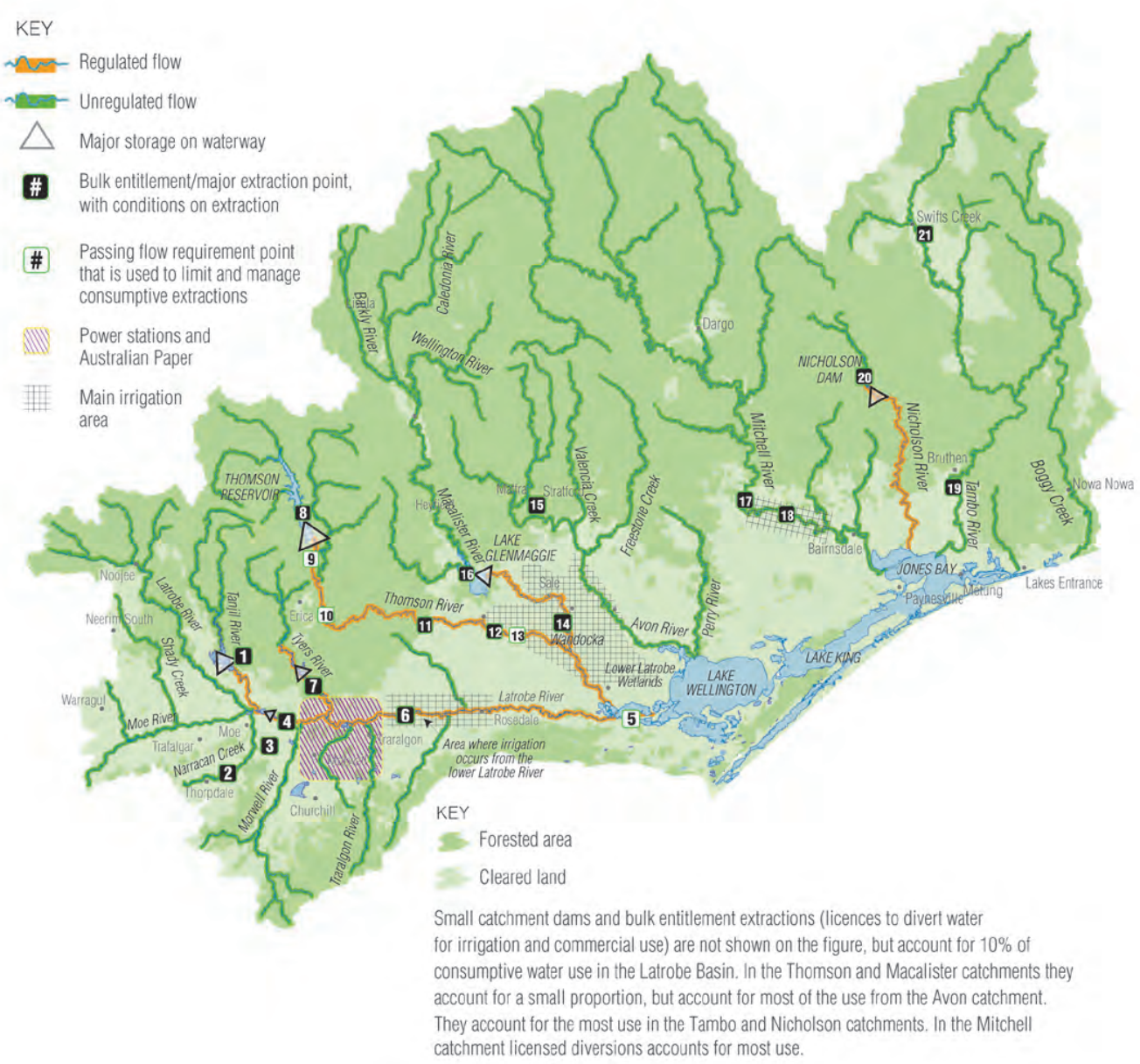
Table 6.1 Groundwater availability and use

Groundwater management unit	PCV (ML)	Licensed entitlement (ML)	Metered use (ML)	Unallocated water	Groundwater availability
Denison WSPA	17,743	17,741	7,987	302	Permanent and temporary trade
Moe GMA	8,200	3,803	1,095	4,397	By allocation or trade
Rosedale GMA	22,313	22,257	6,549	56	By allocation or trade
Sale WSPA	21,212	21,107	11,094	105	Permanent and temporary trade allowed
Stratford GMA	27,645	27,645	100	0	Only by trade, as the licensed entitlement has reached the PVC
Wa De Lock GMA	30.172	28,805	10,386	1,367	By allocation or trade
Wy Yung WSPA	7,463	7,462	798	1	Permanent and temporary trade
Total	**134,748**	**128,820**	**38,009**	**6,228**	

Note:
a Although water is available under the PCV in some GMUs, Southern Rural Water may not issue licences due to considerations under Section 40 of the *Water Act 1989*.

Catchments of the Gippsland Lakes

Figure 6.3 Main water extractions from the catchments of the Gippsland Lakes[a]



Small catchment dams and bulk entitlement extractions (licences to divert water for irrigation and commercial use) are not shown on the figure, but account for 10% of consumptive water use in the Latrobe Basin. In the Thomson and Macalister catchments they account for a small proportion, but account for most of the use from the Avon catchment. They account for the most use in the Tambo and Nicholson catchments. In the Mitchell catchment licensed diversions accounts for most use.

1	**Blue Rock Lake, Tanjil River**	Catchment of 360 km2 with a capacity of about 208 GL • Southern Rural Water must allow 630 to 1,050 ML/week (or natural) to pass through depending on the time of year • 90 ML/day (or natural) minimum passing flow • Water held in storage is distributed to holders of inflow shares, including urban, industry and irrigator demands
2	**Thorpdale pumping station, Easterbrook Creek**	• Gippsland Water can extract up to 80 ML/year at a maximum rate of 1.73 ML/day to supply Thorpdale • Gippsland Water must allow at least 1 ML/day, or the natural flow, to pass
3	**Moe diversion weir, Narracan Creek**	• Gippsland Water can extract up to 3,884 ML/year at a maximum rate of 16 ML/day to supply urban demands including Moe • Gippsland Water must allow at least 11 ML/day, or the natural flow, to pass

5	**Swing Bridge, Latrobe River**	**Swing Bridge, Latrobe River**
6	**Irrigation, primarily for dairy**	• May extract up to 13,400 ML/year when natural flow exceeds passing flow requirements
7	**Moondarra Reservoir, Tyers River**	• Catchment of 275 km^2 • with a capacity of about 30 GL. • Gippsland Water must allow a minimum of either 8 or 30 ML/day to pass through, depending on the recent (six months) inflow • Water held in storage is used by Gippsland Water to supply urban and industrial demands
8	**Thomson Dam, Thomson River**	• Catchment of 487 km^2 and a capacity of 1,068 GL • Melbourne Water must allow 25 or 75 ML/day to pass, depending on the time of year • Melbourne Water may take up to an average of 171,800 ML/year to supply Melbourne • Southern Rural Water holds a 6 per cent share of Thomson Reservoir which it uses to supply the Macalister Irrigation District during extended dry periods
9	**Narrows gauging station, Thomson River**	• Melbourne Water must provide a minimum passing flow of 80 or 120 ML/day depending on the time of year
10	**Coopers Creek gauging station, Thomson Rive**	• Melbourne Water must provide between 150 to 245 ML/day depending on the time of year
11	**Cowwarr Weir**	• Southern Rural Water may take water at a maximum rate of 720 ML/day to supply the Macalister Irrigation District • Gippsland Water may take water at a maximum rate of 2.3 ML/day to supply towns
12	**Heyfield, Thomson River**	• Gippsland Water may take water at a maximum rate of 6.5 ML/day to supply towns
13	**Between Cowwarr Weir and Wandocka, Thomson River and Rainbow Creek**	• Southern Rural Water must allow 125 ML/day or the natural flow to pass, or, provide 50 ML/day when the natural flow is below 50 ML/day
14	**Maffra Weir, Macalister River**	• Southern Rural Water must allow 30 or 60 ML/day, or the natural flow, to pass depending on various seasonal conditions • Southern Rural Water may take water at a maximum rate of 460 ML/day to supply the Macalister Irrigation District • Gippsland Water may take water at a maximum rate of 12 ML/day to supply towns
15	**Main Southern Channel at Meter Outlet**	• Gippsland Water may take water at a maximum rate of 6.5 ML/day to supply towns
16	**Lake Glenmaggie, Macalister River**	• Large catchment of 1,891 km^2 with a capacity of 178 ML • Water held in storage is used primarily by Southern Rural Water to supply the Macalister Irrigation District • Gippsland Water may take water at a maximum rate of 3 ML/day to supply towns
17	**Glenaladale pump station, Mitchell River**	• East Gippsland Water can extract up to about 5,900 ML/year at a maximum of 35 ML/day to supply towns including Bairnsdale and Lakes Entrance • East Gippsland Water must allow at least 30 ML/day, or the natural flow to pass
18	**Irrigation on Lindenow Flats**	• Southern Rural Water manage unregulated licence extractions to ensure at least 15 ML/day, or the natural flow reaches Jones Bay
19	**Bruthen pump station, Tambo River**	• East Gippsland Water may take up to 313 ML/year at a maximum rate of 2.1 ML/day
20	**Nicholson Dam, Nicholson River**	• Capacity of 640 ML • During times of low inflow, East Gippsland Water must allow half the flow to pass
21	**Swifts Creek pump station, Tambo River**	• East Gippsland Water can take up to 224 ML/year at a maximum rate of 1.1 ML/day to supply Swifts Creek

Note:
a Gippsland Water may take up to 2,335 ML/year in total at diversion locations 11, 12, 14, 15 and 16 to supply towns.

The upper Latrobe River is ecologically healthy and a representative waterway[29] in the *Victorian River Health Strategy (2002)*. In the lower reaches of the Latrobe River, below the junction with the Macalister and Thomson catchments, there are some Ramsar-listed high value freshwater and variably saline wetlands (see Section 6.3.2, page 148).

The waterways and lakes in the catchment system are popular for recreational activities, including boating and fishing.

The Gippsland Lakes has a long history as a resource-rich refuge for the traditional Aboriginal Tatungalung clan of the GunaiKurnai people. This long occupation has resulted in a deep cultural and spiritual relationship between Indigenous people and their country.

Waterways and coastal areas provided opportunities for higher density occupation by Indigenous populations, and this was revealed by the location of many archaeological sites. Lands surrounding the Gippsland Lakes are an extremely sensitive Indigenous cultural landscape with one of the highest incidences of Aboriginal sites in the State. The sites are predominantly middens surrounding the wetlands containing a large number of shellfish remains. Many stories about the cultural landscape are still shared by descendents living in the area today.

6.1.4 Pressures on future water availability

Significant pressures on water availability in the catchments of the Gippsland Lakes will arise from climate variability and population growth, as well as other pressures on environmental values. Coal mining in the Latrobe Valley is likely to continue to have an influence on groundwater systems in the area for some time to come, including beyond the productive lifespan of the existing mines.

Industrial water demands are likely to change as industries change over time. Changes in agricultural and urban water use may also occur in response to population growth or changing economic conditions. The following sections of this chapter present the Strategy actions and policies that respond to these pressures.

6.2 Promoting sustainable use of water

6.2.1 Providing certainty and improved flexibility for water users

Within the unregulated parts of the catchments, water is allocated to:

- individuals with private rights under Section 51 of the *Water Act 1989* to take and use surface water or groundwater for domestic and stock purposes;
- individuals with a take and use licence under Section 51 of the *Water Act 1989* to take and use surface water or groundwater; and
- water corporations with bulk water entitlements to access surface water.

If water is available, it can be taken and used in accordance with the licence or bulk water entitlement conditions.

If there is not enough water available for all needs, water use is restricted to share the available water between consumptive users and to protect the environment, domestic and stock water users and the long-term use of the resource.

Local management plans[30]

In many unregulated areas, management of licensed use needs to be more responsive and adaptable to local conditions and the characteristics of each groundwater or unregulated river system. Triggers for applying and removing restrictions on using water need to:

- closely match the characteristics of each system, with every opportunity explored to apply them in a way that best meets the needs of users and the environment; and
- be clearly documented and well understood by users, with any proposed changes to these triggers subject to appropriate consultation with users and environmental managers (see Action 6.1).

Local management plans will be used across the catchments and groundwater systems of the Gippsland Lakes to clearly define the rules to manage section 51 take and use licences. They will include rules and triggers for introducing restrictions during times of shortage as well as local water trading rules where needed.

More information on the basis for developing local management plans is described in Chapter 3 (Section 3.2.2, page 41).

In some systems increased groundwater extraction may reduce streamflow and therefore impact on groundwater dependent ecosystems and the reliability of existing surface water users. Local management plans will consider these interactions to ensure the interests of existing surface water and groundwater users and the environment are protected.

Local management rules are already in place for the following catchments of the Gippsland Lakes: Avon River and Valencia Creek, Mitchell River, Moe River, Morwell River, Narracan Creek, Tambo River and the Upper Latrobe. For each of these catchments the rules specify the arrangements for introducing rosters, restrictions and bans. In the first instance these rules will simply be converted to management plans. This will not require significant resources or be costly. Over time these plans may be revised to incorporate more detailed management arrangements to meet local needs (see Table 6.2). For example, more detailed

Mitchell River silt jetties, DSE

water trading rules may be required in the future. In the Avon and Mitchell catchments it is proposed that more work be undertaken to develop a local management plan in the short term.

Local management plans will be developed for groundwater management areas as described in Table 6.3. In areas where a water supply protection area has already been declared but the statutory management plan has not been finalised or is due to be reviewed or updated, consideration needs to be given to whether a statutory management plan is still required (see Table 6.4). If not required, the rural water corporation will initiate the process for undeclaring the area and preparing a local management plan.

Water for new entitlements

Sharing water between consumptive use and the environment is a key issue for this Strategy. Water that is not extracted for consumptive use provides environmental, recreational and cultural benefits to the community. The more highly developed catchments of the Thomson, Latrobe, Macalister and Avon rivers are fully allocated, apart from a share of Blue Rock Reservoir (see page 123). In the catchments that do not have additional water entitlements available, water entitlements for new users need to be bought (traded) from an existing entitlement holder. But there are some locations in the Mitchell and Tambo catchments where new water entitlements can be purchased.

Unallocated water in the Mitchell catchment

Some water is available in the Mitchell catchment for new consumptive use, but it is available only in the wetter months, and can be extracted only under rules that share the resource between different users and minimise the risk to environmental health. To meet the water needs of consumptive users during the dry summer periods, the additional water that can be extracted over the wetter months needs to be stored.

Options for storing additional winterfill extractions from the Mitchell catchment include using managed aquifer recharge or by constructing surface storages that are not located on major tributaries. Options to increase winter-fill storage capacity are being considered as part of the Lindenow Valley Water Security Project (see Section 6.2.3). Some submissions made in response to the Draft Strategy called for a dam to be built on the Mitchell River, but the Government does not support constructing new storages on rivers or major tributaries within the Mitchell catchment.

Given the possibility of additional capacity to store water extracted from the Mitchell River during periods of high flow, the cap on winter-fill extractions will be lifted to 6 GL (see Action 6.2). This cap is consistent with the proposal in the Draft Strategy. The additional winter-fill allocation will allow for continued regional development in the area, but will come at a low risk to the high environmental values of the river system and downstream estuary. The decision to lift the cap on winter-fill allocations has taken into account the findings of the studies undertaken to understand the freshwater needs of the Gippsland Lakes[31,32]. These studies found that a relatively small amount of additional water extraction from the Mitchell catchment in the wetter months poses a small risk to ecological functioning of the estuary if adequate operational rules are in place to protect important components of the flow regime.

Action 6.1 Local management plans for unregulated river systems

Who: Southern Rural Water, East and West Gippsland catchment management authorities

Timeframe: as needed

Existing operating arrangements for the Gippsland Lakes' surface water and groundwater systems will be formalised as local management plans.

Local management plans will be developed and reviewed in accordance with the Minister's *Policies for Managing Section 51 Take and Use Licences.*

Rural water corporations will consult stakeholders during the development and amendment of local management plans, particularly when the proposed plan will affect the issue, renewal or transfer of licences and groundwater carryover.

In developing local management plans, water corporations in close consultation with water users and catchment management authorities, will seek to explore opportunities to develop operating rules that, where practical, deliver multiple benefits to both consumptive users and the environment.

When revised local management plans are prepared, interactions between surface and groundwater resources will be considered.

Catchments of the Gippsland Lakes

Unallocated water in the Tambo River catchment

The Tambo catchment has a relatively low level of use. Like the Mitchell catchment, there is potential for new winter-fill extraction from the Tambo River. The cap on additional winter-fill extractions will be set at 1.5 GL (see Action 6.2).

Less is known about the Tambo River estuary than the Mitchell River estuary, but the findings of the studies undertaken to understand the freshwater needs of the Gippsland Lakes were similar for the Tambo River estuary. As for the Mitchell River system, the studies found that a relatively small amount of additional water extraction in the wetter months poses a small risk to ecological functioning of the estuary if adequate operational rules are in place to protect important components of the flow regime.

This balanced approach will help to protect the reliability of supply to existing users as well as protecting environmental values. It will also enable new allocations to be made as knowledge of the resource improves over time. By applying the principles outlined above, this Strategy provides the flexibility to adapt, with volumes to be evaluated again in 10 years as part of the Strategy review.

In future, it is possible that there could be large new water demands, for example new mining operations could require water as part of the mining process. If calls are made for additional large water extractions in addition to the caps set for the Mitchell, Nicholson and Tambo catchments, a change in the caps would be considered if studies of the possible impacts on the estuary and river systems can demonstrate, using a precautionary approach, a low risk to environmental values and existing consumptive users. The regional economic benefits of the additional allocation would also be considered (see Policy 6.1).

Table 6.2 Local management plans for surface water

Action	River basin[a]	Unregulated river system	Timeframe
Areas where existing rules will be documented as local management plans	Latrobe[b]	Moe River	End 2012
		Morwell River	
		Narracan Creek	
		Upper Latrobe	
	Tambo	Tambo	
Areas where existing rules will be reviewed or improved[c]	Mitchell	Mitchell River	End 2012
	Avon[b]	Avon River and Valencia Creek	End 2014

Notes:
a A local management plan will be developed for each unregulated river basin. Where needed, plans for specific unregulated rivers within each basin will be developed and attached as a schedule to the local management plan for the basin. Licensed water use in the regulated Thomson and Macalister rivers is managed through bulk entitlements. Tambo River will be included in East Gippsland Basin, see Table 7.2, page 156.
b Existing rules will continue to apply in these areas until they are reviewed/revised and incorporated in a new local management plan.

Table 6.3 Local management plans for groundwater

Action	Management Area	Timeframe
Areas where existing rules will be documented as local management plans	Rosedale/Stratford GMA	End 2012
	Moe GMA	
	Wa De Lock GMA in conjunction with Avon River local management plan	
	Unincorporated areas	End 2012

Note:
a Areas that are not included within either a GMA or WSPA are called unincorporated areas.

Table 6.4 Water supply protection areas

Action	Management Area	Timeframe
Undeclare existing WSPAs and revise associated management plans	• Denison WSPA (1997) due to self-regulating system • Wy Yung WSPA (1997) due to stable water levels • Sale WSPA (1997) no statutory management plan in place • Avon WSPA no statutory management plan in place • Upper Latrobe WSPA	End 2012
Further investigation needed to undeclare WSPA	Sale WSPA (1997) – no management plan in place	End 2012

Water trading

In those catchments where no new water entitlements are available, the only way to obtain more water is to buy it from another water user unless an alternative source (such as recycled water) is available.

Water trading can be a tool that can help water users manage their water needs, including getting more water entitlement to improve reliability or grow a new business, or sell water they no longer need. Regional development can benefit from active water markets, which enable water to move from lower value to higher value uses as demands change over time, boosting the regional economic returns that can be made from the available water. Trades can be permanent or temporary (where the trade is only for a fixed period of time).

Within the regulated MID trading of water shares and licences is quite common. Trade is also becoming common between irrigators along the lower Latrobe.

Outside the regulated Macalister Irrigation District and the lower Latrobe River, a relatively small number of water trades have occurred to date (see Table 6.5)

An investigation[33] into water demands in unregulated catchments including those in the Gippsland Lakes was undertaken as part of this Strategy. The conclusions and consequent actions to improve the ability to trade surface and groundwater entitlements in Gippsland is presented in Chapter 4, Section 4.1.2. Actions include:

- market development and education;
- better water trading information;
- improving trading rules in unregulated river systems; and
- better information about groundwater trading

Establishing a drought reserve in Blue Rock Reservoir

The Latrobe River system is the only regulated surface water system in Victoria where the Government still holds unallocated water. The Government holds a 35.6 per cent unallocated share of inflows and storage capacity of Blue Rock Reservoir. Depending on assumptions on how the share is used, it would yield about 26 GL per year based on long-term climate records, or about 19 GL per year under a return to the conditions experienced over the recent drought.

Action 6.2 Revised cap on the amount of unallocated surface water available for winter-fill (July to October) diversions in the Mitchell and Tambo catchments

Who: Department of Sustainability and Environment, Southern Rural Water, East Gippsland Catchment Management Authority

Timeframe: End 2012

Consistent with the principles outlined in Chapter 3, the cap on any new winter-fill entitlements will be:

- increased to a total of 6 GL across the Mitchell catchment; and,
- set at a total of 1.5 GL across the Tambo catchment.

No additional entitlements will be made available in the Nicholson catchment, so water entitlements for new uses in the Nicholson catchment need to be bought (traded) from existing entitlement-holders.

The availability of these entitlements will depend on location and access conditions imposed on the licences.

Not all of this water will be sold immediately. A staged approach will be taken, with Southern Rural Water determining how this water will be allocated in each catchment – which may occur initially through expressions of interest, auctions or based on a reserve price.

Licences to unallocated water will only be made available at or above a reserve price. Allocations may be made through an auction process in some catchments and allocated in accordance with the *Water Act 1989*, which includes the need to demonstrate that the purchase is for a genuine water demand.

The amounts of water available for new entitlements in the Mitchell and Tambo catchments will be reviewed as part of the Strategy review in the next 10 years.

The extra 6 GL in the Mitchell catchment is in addition to the transfer of East Gippsland Water's bulk entitlement from the Nicholson and Tambo rivers.

Policy 6.1 Future demands for water in the Mitchell and Tambo catchments

Where future water demands exceed the caps for the Mitchell and the Tambo catchments set in Action 6.2, a change in the caps would be considered where, using a precautionary approach, there is shown to be a low risk to the reliability of existing consumptive users and the environment, and significant economic benefits to the region.

The unallocated share held by the Government in Blue Rock Reservoir will be used to establish a drought reserve. In addition, part of the unallocated share will be set aside as an environmental entitlement for the downstream river system, and shares made available to Gippsland Water to meet urban growth needs and to irrigators on the lower Latrobe.

Using the unallocated share to establish a drought reserve maintains public ownership over most of the unallocated share, giving the State the flexibility to change the arrangements in the future if there is a significant change in the water demands in the Latrobe Valley. At the same time, the drought reserve will ensure secure supplies for essential service industries and urban users.

Establishing a drought reserve also gives water users certainty about how the Government intends to use the unallocated share, so they can plan and invest with certainty when it comes to managing their own water needs.

Almost half of the 85 submissions in response to the Draft Strategy expressed a view on the drought reserve. Of these, about 80 per cent supported the proposal in the Draft Strategy to develop a drought reserve.

"The formal establishment of a drought reserve will provide a level of certainty for all entitlement holders that has not existed previously."
– Draft Strategy submission number 052

Establishing a drought reserve was also supported by the Strategy's Independent Panel[34].

The proposal to establish a drought reserve:

- has been developed having regard to future water availability if climate conditions return to those experience during the recent drought;
- protects the reliability of supply to existing water users;
- proposes a permanent allocation of entitlement for the environment and to explore other opportunities to better meet environmental needs such as flood pre-release rules;
- has considered the future levels of consumptive demand, uncertainties facing the energy industry and the impacts of a carbon price;
- has taken into account efforts by water users to reduce consumption and find alternative supplies; and
- seeks to maintain and improve the economic, social and environmental values supported by the Latrobe River system.

The proposed review of the drought reserve in 10 years provides an opportunity to reconsider the reliability of inflows over that period and any new information about climate or changes in water needs in the Latrobe Valley (see Action 6.3).

Table 6.5 Recent water trade history[a]

Year[b]	Water system source	Permanent transfers	Temporary transfers
		Bought/sold (ML)	Bought/sold (ML)
2008/09	Thomson unregulated	0	203
2009/10		0	141
2008/09	Tambo unregulated	4	10
2009/10		0	0
2008/09	Mitchell unregulated	0	192
2009/10		40	30
2008/09	Latrobe unregulated	3	537
2009/10		117	212
2008/07	MID– regulated	389	8,407
2009/08		880	2,789
2008/09		9,344	20,032
2009/10		7,024	12,145
2009/10[c]	Thomson groundwater	555	1,052
	Tambo groundwater	na	na
	Mitchell groundwater	50	61
	Latrobe groundwater	181	301

Notes:
a This table shows the volume of permanent and temporary transfers of bundled entitlement volume during 2009/10. Transfers of a water entitlement with land are not included.
b Unbundling of water shares occurred in July 2008.
c This was the first year of recorded groundwater trades.

To help assess the options for using the unallocated water and the drought reserve, the Consultative Committee guiding the development of this Strategy established a technical working group with representatives from local stakeholders and relevant Government departments. This working group used hydrological modelling undertaken by the Department of Sustainability and Environment to evaluate the options and report back to the Consultative Committee (see Technical Paper 6).

The hydrological modelling showed that under a continuation of the conditions experienced during the recent drought, permanently allocating the water for new use or to the environment could significantly impact on the reliability of supply for existing users. The reliability of supply to existing users would be affected because if all the unallocated water was allocated to a new user, there would be no internal spills into other users' shares within the reservoir.

The permanent transfers to Gippsland Water and the lower Latrobe irrigators will be made available based on a reserve price set by Government.

Users who purchase or receive a permanent share of the unallocated inflows and storage capacity of Blue Rock Reservoir, including the environment, would be responsible for paying the ongoing headworks charges associated with those shares.

Opportunities will be explored to provide additional environmental benefits when operating rules for Blue Rock Reservoir are revised (for example on revision of the flood pre-release rules), where there are no impacts on the reliability of supply to existing users.

Terms and conditions for access to the drought reserve

In implementing the drought reserve, the Government will need to determine the terms and conditions of access to the drought reserve in the future. The principles for setting the terms and conditions for access to the drought reserve are described in Policy 6.2. These were strongly supported in many submissions in response to the Draft Strategy.

> *"All entitlement holders who have access to the drought reserve should contribute to the headwork's charges…"*
> *– Draft Strategy submission 079*

Consistent with the principles in Policy 6.2, rules will be established for the recovery of headworks costs associated with the drought reserve based on:

- making a small portion available for temporary sale each year to cover the headworks costs; and
- recovering the rest of the costs through annual charges to all entitlement-holders because they benefit from water spilling from the drought reserve into their capacity shares and they have the ability to access the drought reserve in the future.

Once the proposed drought reserve is established and the broad terms and conditions for access have been confirmed, Southern Rural Water will manage the drought reserve on the Government's behalf. Southern Rural Water already operates Blue Rock Reservoir on behalf of all the entitlement-holders in Blue Rock Reservoir.

Southern Rural Water will be required to manage the drought reserve in accordance with the principles described in Policy 6.2, and the terms and conditions as agreed by the Government in consultation with Southern Rural Water and the beneficiaries.

Blue Rock Reservoir, Alison Pouliot

Action 6.3 Establishing a drought reserve in Blue Rock Reservoir

Who: Department of Sustainability and Environment, Southern Rural Water

Timeframe: End 2012

Subject to the recovery of storage headworks costs from beneficiaries, the Government will use the unallocated water in Blue Rock Reservoir to establish a drought reserve from which current and future entitlement-holders can buy water during water shortages.

As part of establishing the drought reserve:

- the annual release caps from Blue Rock Reservoir that apply to beneficiaries will be removed;
- beneficiaries of the drought reserve will receive the internal spills from the drought reserve; and
- operating rules for the management of Lake Narracan will be altered to improve recreational opportunities on Lake Narracan, with any harvesting losses accounted for through the drought reserve (see Action 6.4).

The drought reserve will be created after the following allocations have been made from the unallocated share:

- a permanent environmental entitlement will be created in Blue Rock Reservoir equivalent to a high reliability share of an annual 10 GL (a 9 per cent share, see Action 6.15);
- a permanent share equivalent to 3 GL (a 3.87 per cent share) will be made available for purchase by Gippsland Water to meet its immediate growth needs (see Action 6.7); and
- a permanent share equivalent to 0.8 GL (a 1 per cent share) will be made available for auction (with a reserve price) to the Latrobe irrigators (see Action 6.10).

The drought reserve will be reviewed as part of the Strategy review in 10 years.

Policy 6.2 Principles for determining the terms and conditions of access to the drought reserve

The following principles will be applied when determining the terms and conditions of temporary access to the drought reserve:

- the drought reserve will be available for consumptive use during periods of water shortage;
- the Government will maximise the return on the water held on behalf of the community;
- beneficiaries of the drought reserve will be required to pay costs associated with the drought reserve;
- the reserve price for temporary access should promote the efficient use of scarce resources, reflect the other costs associated with the drought reserve paid by beneficiaries, and be set with regard to the value of water during periods of scarcity; and
- if there is competition for access to the drought reserve, water will be made available through a competitive process, such as Watermove, offered at the reserve price.

These principles will be evaluated as part of the Strategy review in 10 years.

Based on the principles in Policy 6.2, Southern Rural Water will manage the drought reserve to ensure the water is available during droughts, and make it available to all entitlement-holders at a reserve price (based on the higher of the most recent market price or weighted average historical price paid to access the drought reserve).

New users

Using the unallocated share to establish a drought reserve means that none of the unallocated share will be available for new users in the Latrobe Valley. The modelling showed that making this water available for new users could impact adversely on the reliability of supply to existing entitlement-holders.

In addition to the unallocated share, the Government holds an unused entitlement in Blue Rock Reservoir. This is known as the SECV shell entitlement, and is a share of water from Blue Rock Reservoir that is linked to the development of the 3/4 bench – a piece of land originally set aside for Victoria's next coal-based power generator. Depending on assumptions on how the share is used, it would yield about 22 GL per year based on long-term climate records, or about 12 GL per year under the conditions experienced during the recent drought.

This SECV shell entitlement has been set aside for new industries in the Latrobe Valley. However, the Department of Treasury and Finance, which manages this unused share, is working with the Department of Primary Industries and the Department of Sustainability and Environment to identify the likely water needs of new industry and to determine the best options for the use of this water. As part of this work, the reliability of supply needs for new users, and the potential impact that using the water will have on the reliability of supply for existing users, will be assessed.

In addition to the SECV entitlement, new industry could source water from trading with existing users, particularly if the composition of intensive water users in the Latrobe Valley changes over time.

Improving recreational opportunities on Lake Narracan

Blue Rock Reservoir is upstream of to Lake Narracan, and the operation of Lake Narracan is an associated issue. In 2006/07 in response to the dry conditions, the operating rules in Lake Narracan were adjusted to improve the ability of the entitlement-holders to harvest the water to which they are entitled. This change in operating rules resulted in the storage falling to very low levels during dry periods, which has limited its recreational use at some times.

The Latrobe Valley Water Ski Club is one of the recreational groups that has been affected by the change in operation of Lake Narracan. National and international water skiing events are sometimes held by the club on Lake Narracan, however when levels are low, events cannot take place.

What does the Blue Rock drought reserve and other proposed measures to improve water management on the Latrobe system mean for…?

The environment (see Action 6.15)

- Will receive a permanent share of water in Blue Rock Reservoir, which will be a high reliability share equivalent to an annual 10 GL.
- May benefit from flood pre-release rules that allow the environmental manager to call out water when there is a strong likelihood of a spill, subject to consideration of the potential impact on other users and implementation costs.
- May be able to hold water in airspace provided this can be done without impacting on the reliability of other entitlement-holders.
- Will be able to access the drought reserve in times of shortage if willing to pay.

Gippsland Water and its customers (see Action 6.7)

- Will have access to a high reliability share equivalent to an annual 3 GL to meet its immediate growth needs.
- Will be able to access the drought reserve in times of shortage if willing to pay.

Power generators

- Can access the drought reserve in times of shortage if willing to pay.
- Will benefit from the proposed removal of the Blue Rock caps on annual releases.

Irrigators (see Action 6.10)

- Will benefit from the proposal to formalise the interim agreement to share industrial water returns 50:50 between the environment and irrigators.
- Will be able to access the drought reserve in times of shortage if willing to pay.
- May be able to seek access to an increased share of Blue Rock Reservoir.

New users

- Will not be given any access to a permanent allocation from the unallocated share in the next 10 years.
- If they obtain water through other means (eg. trade or SECV shell), they will be able to access the drought reserve in times of shortage if willing to pay.

Recreational users

- Will have improved recreational opportunities on Lake Narracan.

All entitlement-holders will benefit from the drought reserve being full most of the time because it will provide internal spills that will increase their reliability of supply.

Action 6.4 Improved recreational opportunities on Lake Narracan

Who: Southern Rural Water **Timeframe:** December 2012 and ongoing

The Storage Manager (Southern Rural Water) will maintain Lake Narracan between 55 per cent and 90 per cent of capacity from 1 December to 30 April and at a level suitable for holding major water skiing events, for up to three events per annum; subject to:

- the Blue Rock storage volume being more than 80 per cent of capacity on 1 December; and
- considering the views of entitlement-holders and seasonal climate information.

These changes will not affect entitlements in Lake Narracan. Any harvesting losses in Lake Narracan that result from these new arrangements will be offset in the entitlement-holders shares of Blue Rock via substitution from the volume held in the drought reserve. This will include an allowance for any transfer losses between Blue Rock Reservoir and Lake Narracan.

Changes to storage levels to mitigate flood events will take precedence over maintaining levels suitable for recreation and any major water skiing events.

If experience with applying these criteria indicates to the Storage Manager or any entitlement-holders that adjustments to the criteria may be needed, they may write to the Minister for Water requesting an alteration.

In addition to Southern Rural Water's annual process for determining the operation of Lake Narracan, these arrangements will be reviewed when the drought reserve arrangements are reviewed in 10 years. Consumptive users maintain their rights to harvesting water from the Latrobe system, and the arrangements described in this Strategy do not provide any rights to recreational users of Lake Narracan, or any longer-term certainty beyond the 10 year period.

Southern Rural Water will develop an agreed set of operating rules in consultation with entitlement-holders that documents these arrangements and the annual process for assessing storage operation.

Modelling undertaken by the technical working group found that the operating rules could be adjusted to provide improved recreational opportunities, with relatively small impacts on the volume of water that can be harvested from the system. Action 6.4 presents how the operating rules for Lake Narracan will be altered, to provide improved opportunities for recreation on Lake Narracan.

The annual process for assessing storage operation, which includes the 80 per cent trigger on 1 December in Blue Rock Reservoir, minimises the impact of these changes on the amount of water that can be harvested in the Latrobe system.

This action will provide a significant improvement to recreational opportunities on Lake Narracan. On 1 December, Blue Rock storage levels are likely to be above 80 per cent in many years. Over the past 25 years since Blue Rock Reservoir first filled, it has been at or below 80 per cent of capacity on 1 December in only two years (2006 and 2007) (see Action 6.5, page 129).

Other actions and policies contained within this strategy to help improve flexibility and provide certainty for water users are presented in Section 3.2, page 41.

6.2.2 Improving reliability of supply for urban and industrial water users

Towns with reticulated supplies in the Latrobe, Thomson, Macalister and Avon catchments are serviced by Gippsland Water, where there is a combined population of about 100,000 people. East Gippsland Water services the towns within the catchments of the Gippsland Lakes that have reticulated supplies in the Mitchell, Tambo and Butchers River catchments, with a combined population of about 24,000 people. The area with the greatest amount of industrial water use is the Latrobe Valley. Some large industrial water users in the Latrobe Valley manage their own water supplies, but industrial water supplies in other areas are generally supplied through the reticulated supply system.

The potential impact of future climate on runoff and the increase in water demand from growing populations are considered as part of the long-term planning developed through water supply-demand strategies being prepared by Gippsland Water[35] and East Gippsland Water[36]. All urban water corporations in Victoria are required to develop water supply-demand strategies to ensure adequate supply reliability in the future.

Action 6.5 Establishing operating arrangements to improve recreation opportunities on Lake Narracan

Who: Southern Rural Water, Department of Sustainability and Environment

Timeframe: December 2012

Southern Rural Water and the Department of Sustainability and Environment will revise the existing operating arrangements for Lake Narracan based on the arrangements described in this Strategy, in consultation with Lake Narracan entitlement-holders. A revised Storage Manager instrument of appointment will be developed based on the review.

The changes in operation will not result in any water harvesting losses to entitlement-holders in Lake Narracan.

The revised Storage Manager instrument will include objectives for managing Lake Narracan, with the main objectives being to harvest and store water for the Lake Narracan bulk water entitlement holders, and ensure the structural integrity and safe operation of the storage.

Balancing future supply and demand in Gippsland Water's supply systems

The urban water systems supplied by Gippsland Water are shown in Figure 6.4. Most of these towns are also provided with a wastewater removal and treatment service. In the Latrobe Valley, Gippsland Water supplies water to Australian Paper's Maryvale pulp mill, and some of the water required by the power generators.

Every five years water supply-demand strategies are required to be updated in order to ensure that any changes in water demand or supply security can be incorporated into long-term planning. Gippsland Water's water supply-demand strategy is being revised and updated, and will be released by Gippsland Water in early 2012 (see Action 6.6).

The target level of reliability for each system will be clearly defined in the strategy, consistent with the requirements of Action 4.8 (page 78).

Changes in consumptive demands or climate are important considerations for Gippsland Water's long-term planning. Figure 6.5 presents an example of how supply and demand can be compared over the short, medium and longer term, for the Moondarra system. The information is based on Gippsland Water's 2007 water supply-demand strategy (see Appendix 5).

The permanent water saving rules introduced in 2005/06 have been included in the demand forecasts prepared by the water corporations as part of their water supply-demand strategies. The permanent water savings rules across Victoria are being reviewed in light of the recent drought experienced across the State (see Action 4.9, page 78). Gippsland Water is incorporating the findings of the review in its water supply-demand strategy.

Actions considered as part of Gippsland Water's water supply-demand strategy to improve the reliability of supply include:

- water conservation and efficiency measures;
- interconnecting supply systems;
- recycling for fit-for-purpose use; and
- accessing new water entitlements.

Water conservation and efficiency measures

Gippsland Water is part of the savewater! Alliance, which undertakes research to understand how households and businesses use water, and help them use water more efficiently in the garden, bathroom, kitchen, laundry, as well as in businesses and farms. Gippsland Water also participates in the Living Victoria Rebate Scheme to assist customers with claims for rainwater tanks, washing machines, dual flush toilets, mulch, dripper hose, showerheads and many other items.

Interconnecting supply systems

Some supply systems have no connections to others outside their local area. This can expose these systems to a risk of supply failures during drought or times of poor source water quality. Gippsland Water's water supply-demand strategy includes actions to increase the security of supply through system interconnection. For example, connection of the Tarago and Moe systems would ensure reliability of supply for Warragul and Drouin, which are expected to experience high rates of growth over the 50-year outlook.

Recycling for fit-for-purpose

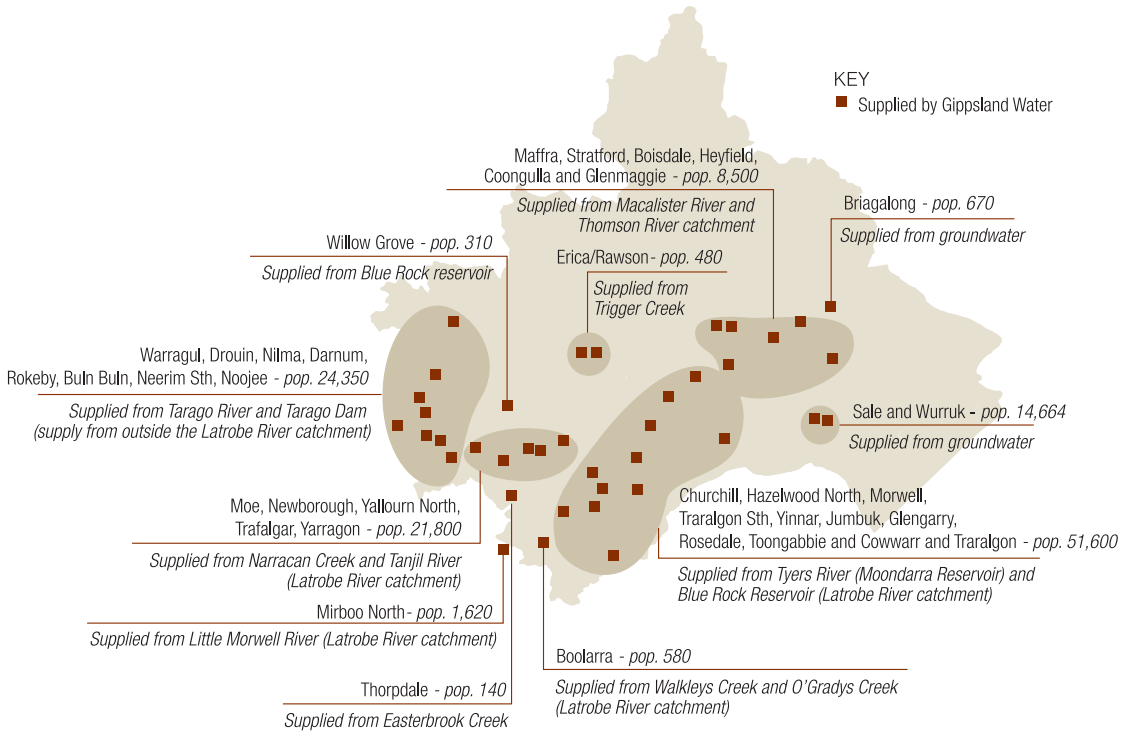
Recycled water can be a highly reliable water supply for industry and other non-drinking water purposes. Many improvements have been made to the efficient use of water resources in Gippsland, such as recycling wastewater at the Gippsland Water Factory. Gippsland Water built this facility to resolve ongoing odour problems at the regional outfall sewer. The facility treats 35 ML of domestic waste water per day from towns and businesses throughout the Latrobe Valley of which 8 ML per day is then recycled and used by local industry. About 3 GL of this recycled water a year is used in the Latrobe Valley. In addition, Sale and Fulham's wastewater is piped to Dutson Downs, where it is treated and then reused on-site for agricultural purposes.

The high reliability of recycled water and the recent drought have highlighted the increasing value of recycled water; however recycled water can have considerably higher energy and financial costs than many traditional sources. Water reuse and associated recycling schemes are likely to continue to be relatively costly.

Accessing new water entitlements

The growth in urban demands, particularly in the western towns serviced by Gippsland Water, will require Gippsland Water to source additional water supplies. Gippsland Water's water supply-demand strategy identifies additional entitlement in Blue Rock Reservoir as the preferred approach to increasing supply. This strategy provides an additional 3 GL of water entitlement in Blue Rock Reservoir for Gippsland Water's urban growth needs (Action 6.7), and also establishes a drought reserve in Blue Rock Reservoir that can be accessed by Gippsland Water at critical times (see Action 6.3). The additional share of Blue Rock Reservoir will be provided at a reserve price.

Figure 6.4 Gippsland Water's urban water supply systems including population served[a]



Note:
a Population figures are estimates supplied by Gippsland Water.

Action 6.6 Water Supply Demand Strategy – Gippsland Water

Who: Gippsland Water **Timeframe:** by March 2012

Gippsland Water will update its water supply-demand strategy, detailing how water supplies and water demands will be balanced over the long-term. Gippsland Water will consider community feedback to the draft water supply-demand strategy in the preparation of the revised Water Supply Demand Strategy.

Water use by coal-fired power generators in the Latrobe Valley

In addition to water supplied by Gippsland Water, most of the power generators in the Latrobe Valley have their own water entitlements and water supply infrastructure. During the recent drought, low streamflows over the summer of 2006/07 resulted in some power generators having to draw heavily on their water entitlements in Blue Rock Reservoir. Although no power generators ran out of water, the experience showed that they may be vulnerable to water shortages during prolonged dry periods.

The drought reserve established as part of this Strategy (see Action 6.3) ensures that during extremely dry periods, power generators will be able to buy water from the drought reserve in Blue Rock Reservoir to ensure continuity of the State's main source of electrical energy. In addition, the SECV shell share of Blue Rock Reservoir may be available for new uses, and new industry could source water by trading with existing users (particularly if the composition of intensive water users in the Latrobe Valley changes over time).

Groundwater levels around the mines in the Latrobe Valley have declined by up to 70 m since mining began, with some declines in deeper aquifers observed almost as far as Sale. The decline in groundwater levels is well documented as the cause of subsidence around each of the mines.

The mine owners are responsible for managing the effects of groundwater draw-down and mitigating unacceptable consequences of land subsidence. Mine owners are also responsible for maintaining groundwater and subsidence monitoring networks under their work plan.

In recent years there have been several incidents associated with the stability of open-cut mines. For example, in November 2007 the northern wall of the Yallourn mine collapsed, resulting in about 2 GL of water from the Latrobe River flowing into the mine pit. Also in February 2011, ground instability in the northern wall of an open-cut mine in Morwell led to surface cracking of the adjacent Princes Freeway and the extended closure of a section of the freeway.

There may be proposals for new industries in the Latrobe Valley as Victoria grows and new industries are attracted to the Latrobe Valley because of its coal and proximity to sources of power. For example, HRL Limited has proposed to construct a new power station at Morwell by 2013.

The flexible approach taken in this strategy allows for water to move between different uses, as industries and water demands in the Latrobe Valley change over time.

Figure 6.5 Future water demand and availability projections for Moondarra supply system

Assumptions

- System supply caters for a range of scenarios into the future to ensure that demand can be met under Gippsland Water's levels of service.
- Demand has been determined using Victoria in Future population growth estimates.
- This graph is based on Gippsland Water's 2007 water supply-demand strategy and is subject to updates.

Action 6.7 Additional access to water in Blue Rock Reservoir for urban use

Who: Gippsland Water **Timeframe:** by December 2012

A permanent share equivalent to 3 GL will be made available for purchase by Gippsland Water to meet its immediate growth needs. This will correspond to a 3.87 per cent share.

Water cycle impacts of any future decommissioned open-cut mines

When mining at the open-cut mines in the Latrobe Valley ceases, the mines will need to be stabilised and the area rehabilitated.

Current rehabilitation plans for open-cut coal mines involve flooding them to create artificial lakes. However, this is not considered to be an entirely viable option any longer because there is insufficient water to fill most of the mines.

Mine stabilisation and rehabilitation will require reshaping of the pits and the land surrounding the pits and possibly use of mine waste and overburden to stabilise the mine. Appropriate rehabilitation strategies will need to be developed, which may influence how the mines are operated for the rest of their productive life. The Department of Primary Industries is working with the companies that mine coal in the Latrobe Valley to review rehabilitation plans (see Action 6.8).

The companies are responsible for mine rehabilitation, and are required to provide a rehabilitation bond to ensure that they meet this obligation. The works plan and rehabilitation plan are placed on public display through either the planning permit or Environmental Effects Statement approval process and are ultimately submitted to and held by the Department of Primary Industries.

Action 6.8 Open-cut coal mine closure and restoration strategies

Who: Department of Primary Industries **Timeframe:** Ongoing

The Department of Primary Industries will review mine rehabilitation strategies, in consultation with the Department of Sustainability and Environment, the Environment Protection Authority, and companies that mine coal in the Latrobe Valley. The mine closure and restoration strategies will consider impacts on groundwater and surface water resources.

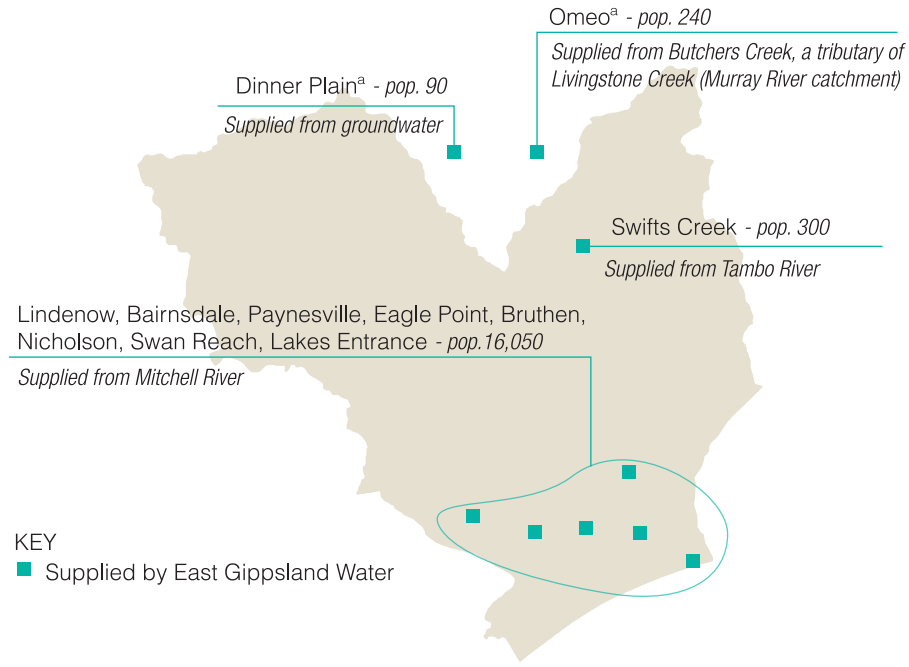
Cows with power station in background, Alison Pouliot

Balancing future supply and demand in East Gippsland Water's supply systems

East Gippsland Water is responsible for the urban water reticulation and sewerage services for towns in the Mitchell, Tambo and Butchers River catchments. The Mitchell River urban supply system is East Gippsland Water's largest supply system, extending from Lindenow to Paynesville and Lakes Entrance (see Figure 6.6).

Every five years water supply-demand strategies are required to be updated in order to ensure that any changes in water demand or supply security can be incorporated into long-term planning. East Gippsland Water has reviewed in its water supply-demand strategies for its individual systems. East Gippsland Water updated it's Mitchell River water supply-demand strategy in 2011, copies are available from East Gippsland Water (see Action 6.9).

Figure 6.6 East Gippsland Water's urban water supply systems and population served[a]



Note:
a Population figures are estimates supplied by East Gippsland Water.

Action 6.9 Water Supply Demand Strategy – East Gippsland Water

Who: East Gippsland Water **Timeframe:** by March 2012

East Gippsland Water will implement the actions set out in its water supply-demand strategy, as demand requires. The Mitchell River water supply-demand strategy 2011 is available on East Gippsland Water's website.

Catchments of the Gippsland Lakes

Figure 6.7 presents an example of how supply and demand can be compared over the short, medium and longer term for the Mitchell supply system. The information is based on East Gippsland Water's draft water supply-demand strategy, which is summarised in Appendix 5.

The permanent water saving rules introduced in 2005/2006 have been included in the demand forecasts. The permanent water savings rules across Victoria have been reviewed in light of the recent drought experienced across the State (see Action 4.9, page 79).

Actions considered as part of East Gippsland Water's water supply-demand strategy to improve the reliability of supply include:

- consolidating supply systems;
- using alternative water sources;
- improving existing water storages; and
- increasing storage capacity.

Consolidating supply systems

East Gippsland Water transferred its bulk entitlements from the Nicholson and Tambo rivers to the Mitchell River system in 2010, to allow the water corporation to consolidate water supply infrastructure around a single, reliable, high quality water source. It also enabled major water treatment infrastructure to be consolidated rather than dispersed to smaller supply systems.

With predictions of a variable future climate for Gippsland indicating that severe events such as floods and bushfires are likely to occur more frequently, resilience of the system to the impact of extreme weather and other emergencies is an important priority for water corporations in Gippsland.

Using alternative water sources

East Gippsland Water uses recycled water from the Bairnsdale wastewater treatment plant to provide the Ramsar-listed wetland site Macleod Morass with a source of freshwater inflows to improve the ecological values of this internationally important wetland[37].

Macleod Morass, DSE

Improving existing water storages

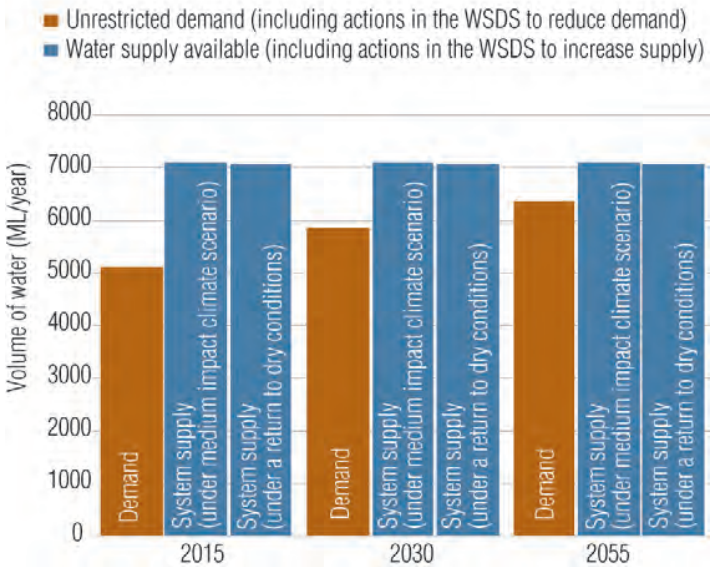
Recent actions undertaken by East Gippsland Water to secure supplies include leakage reduction, construction of a new raw water storage and water treatment plant at Woodglen, and lining and covering of open water storages at Sunlakes and Wy Yung. It is also using shade cloth covers at Swifts Creek and Lindenow to reduce contamination and evaporation, and replacing the open water storage at Eagle Point with storage tanks.

Increasing storage capacity

East Gippsland Water extracts water from the Mitchell River at Glenaladale to supply urban and industrial customers connected to the Mitchell supply system. Decreased flows in the Mitchell River in recent years and the removal of storages at other locations for operational benefits led East Gippsland Water to invest in increasing its offstream storage capacity at Woodglen.

East Gippsland Water also successfully trialled managed aquifer recharge, at its borefield in the Lindenow Valley. The trial used five groundwater bores to inject high quality water from the Mitchell River into the deep Latrobe Group aquifer (beneath the shallower alluvial Wy Yung aquifer), so that it can be extracted in the summer period when river flows are low. A diagram of the system is shown in Figure 6.8.

Figure 6.7 Future water demand and availability projections for Mitchell River supply system



Assumptions

- This figure is based on East Gippsland Water's long-term draft water supply-demand strategy.
- The graph shows the average system supply available, catering for a range of scenarios into the future.
- Demand has been determined using Victoria in Future population

East Gippsland Water recently obtained approval to store and recover up to 500 ML of water using the managed aquifer recharge system. Special conditions were placed on the licence by Southern Rural Water as a result of consideration of technical reports and community feedback. The conditions include extensive monitoring and reporting requirements as well as limiting the amount of water that can be injected and extracted for the first two years, which will allow for further information to be gathered to improve certainty about the scheme while reducing the risk of impacts to existing groundwater users and the environment.

The project is the largest of its kind in Victoria and may eliminate the need for East Gippsland Water to build another expensive off-stream storage for the foreseeable future.

The information gathered from this project may be useful to inform the Lindenow Valley Water Security Project, which is investigating whether managed aquifer recharge or an off-stream storage is the best option to provide reliability of supply to irrigators in the Lindenow Valley (See Section 6.2.3). Managed aquifer recharge is discussed further in Section 4.1.4 (page 70).

6.2.3 Improving reliability of supply for agriculture and rural water users

Much of the freehold land across the catchments of the Gippsland Lakes is used for dryland (non-irrigated) farming. There are also large areas where irrigation is used to supplement rainfall, mainly in the MID but also in other locations such as Thorpdale, and along the lower Latrobe and lower Mitchell rivers. Figure 6.9 shows the broad distribution of different types of agriculture across the catchments. Grazing, dairy and horticulture make up most of the farming enterprises, but there are some extensive areas of hardwood and softwood plantation, and large volumes of water required for coal-based energy production in the Latrobe Valley. Water is used in small volumes across the region for domestic and stock purposes (see Figure 6.9 over page).

There are opportunities to improve the reliability of supply for agricultural and rural water users, depending on the location and water requirements of the activity. Opportunities for the main user groups are described below.

Irrigators along the lower Latrobe River

On average, lower Latrobe River irrigators use a total of about 8 GL a year, most of which comes from unregulated flows on the Latrobe River. They also have a small share (2 per cent) of inflows and storage of Blue Rock Reservoir and the ability to use some water discharged into the river by the power generators and large industries.

During the recent dry years, unregulated flows have been greatly reduced and the Latrobe irrigators have often been placed on rosters or bans. They have explored options for improving their reliability of supply, such as off-stream storages, but most were considered to be too expensive and their preferred option is to seek access to an additional share of Blue Rock Reservoir.

The Government will use the unallocated water in Blue Rock Reservoir to establish a drought reserve (see Section 6.3, page 142). Before establishing the drought reserve, an additional share will be offered to irrigators by auction (see Action 6.10).

Significant improvements to the reliability of supply to the Latrobe River irrigators will also result from the arrangement that power station and industrial water returns to the Latrobe River will continue to be shared 50:50 between the environment and irrigators. This arrangement has helped these irrigators through the recent dry period and will continue to provide significant reliability of supply into the future (see Action 6.11).

Figure 6.8 How East Gippsland Water's managed aquifer recharge project works

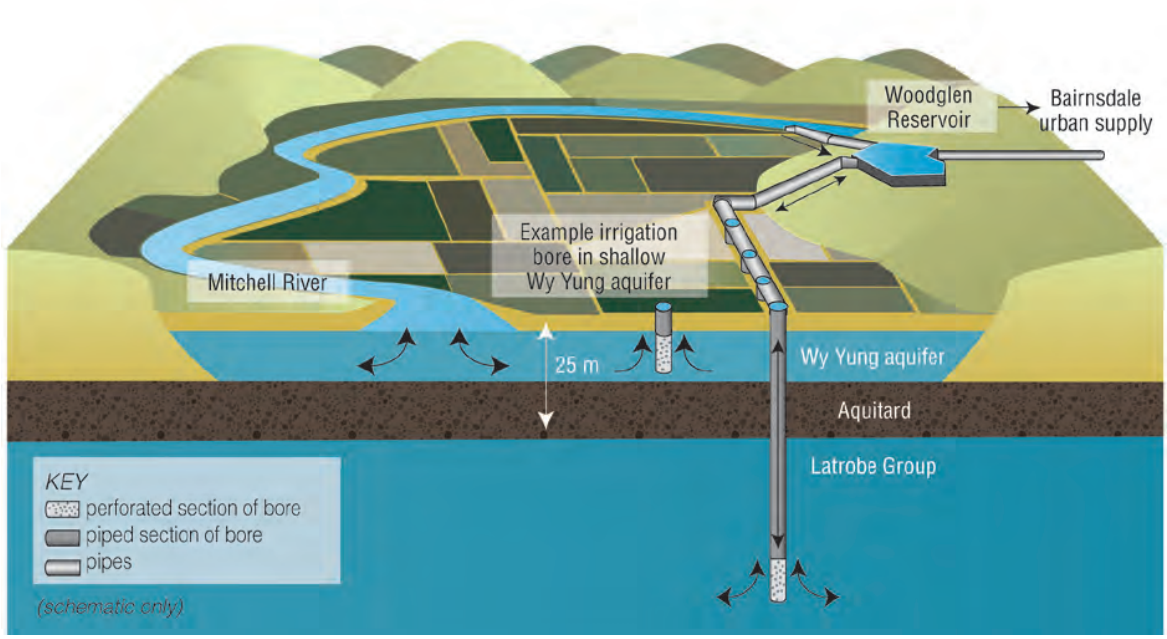
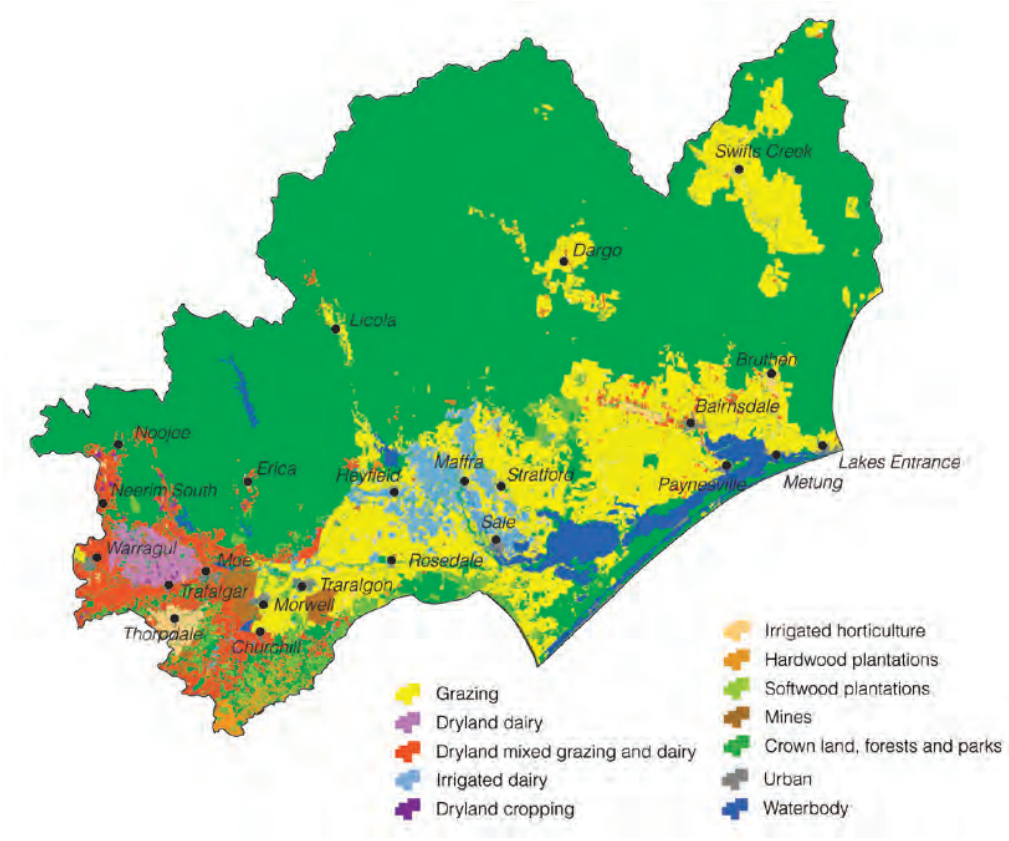


Figure 6.9 Agricultural and rural water uses



Action 6.10 Opportunity for additional access to water in Blue Rock Reservoir for irrigators

Who: Southern Rural Water **Timeframe:** by December 2012

A permanent share equivalent to 0.8 GL will be made available for purchase by irrigators along the lower Latrobe River, corresponding to an additional 1 per cent share. This will be a once-off opportunity to buy an additional permanent entitlement from the unallocated share, and will be made available available for auction (with a reserve price).

Action 6.11 Sharing of industrial water returns along the lower Latrobe River

Who: Department of Sustainability and Environment, Southern Rural Water **Timeframe:** by July 2012

Southern Rural Water will amend the rules on diversion from the lower Latrobe River to confirm that power station and industrial water returns will be shared 50:50 between the environment and irrigators.

Macalister Irrigation District – the MID2030 project

The Macalister Irrigation District (MID) is the largest irrigation area in the south of Victoria. Water for the irrigation district is primarily taken from the Macalister River via Lake Glenmaggie, supplemented by water from the Thomson and Avon rivers and some groundwater.

The district has secure water supplies supplemented by good rainfall, productive soils, a strong dairy sector and developing vegetable and cropping industries. More of the designated irrigation district could be used for food production. However, for this to occur further investment is required because increased production is constrained by a shortfall of water to supply available irrigable land. A largely antiquated supply system

Action 6.12 Development of a business case for the MID 2030 project

Who: Southern Rural Water **Timeframe:** December 2011

Southern Rural Water will develop a business case for the MID2030 project to submit to the Victorian Government.

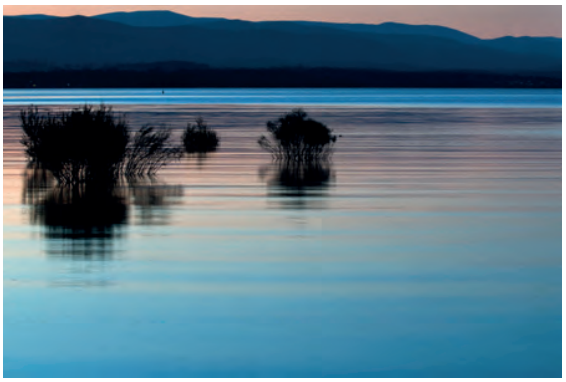
provides poor service to most customers. This poor service means that best practice on-farm water use and farm productivity cannot be achieved.

The MID supply system had a relatively low level of water efficiency, with about 32 per cent of water used lost to evaporation, seepage and leakage and through poor measurement and control of flows. To begin addressing this, the Macalister Channel Automation Project began in 2004, with funding from the Victorian Water Trust and the National Water Commission. The project has been undertaken in six stages to provide a reliable environmental water allocation to the Macalister and lower Thomson River reaches. To date, an environment entitlement of 8 GL has been created with the conversion of a further 2.5 GL in progress. Another 3 GL is expected to be available in 2012 and it is expected that approximately 13.5 GL of total savings will be achieved.

> *"I support the concept of the SRW MID2030 Project and urge Government to consider and discuss investment options with stakeholders as a priority. I would be willing to consider investing in such a project, if it were shown to be economically beneficial for my business, improve environmental outcomes and improve my water security."*
> *– Draft Strategy submission 013*

When MID2030 was being developed in 2007[38], SRW investigated several options for alternative water supply. These included raising Lake Glenmaggie, building a pipeline from Blue Rock Reservoir, dredging Lake Glenmaggie or constructing a dam on the Barkly River in the Macalister catchment. All of these options provide water at a cost much greater than MID2030. In addition, they do not address the ageing infrastructure and service constraints of the current channel supply system, or reduce nutrient export.

The district can be modernised to contemporary standards through a combination of pipelines and channel automation at a cost of about $310 M (2011 dollars). This would provide an additional 37 GL of water for irrigation use through reduced water losses and greatly improve service to customers, allowing a similar or greater amount of water to be saved on-farm.



Lake Glenmaggie, Alison Pouliot

Southern Rural Water is proposing to the Victorian Government a co-funding investment model, with government and irrigators each funding 50 per cent of the investment. Water savings would go back for use within the MID.

Southern Rural Water's initial estimates have shown the price rise from this investment is beyond the irrigators' capacity to pay at this time. Southern Rural Water is proposing to break the project into at least two stages and submitted a preliminary business case in July 2011 for stage one and is expecting to complete a final Business Case in December 2011. The preliminary business case has identified the potential for significant regional benefits including:

- opportunities to increase food and fibre production from a reliable irrigation area;
- economic growth associated with increased production, both on-farm and in local processing plants; and
- reducing nutrient loads into the Gippsland Lakes.

Southern Rural Water proposes that the first stage focuses on work that brings the greatest value in water savings and service improvements. The estimated cost of this stage is $140.5 million (2011 dollars), which includes:

- pipelining of one full supply zone (Southern Tinamba area);
- further automation of channel regulating structures in three zones;
- constructing a balancing storage;
- some outlet modernisation and rationalisation; and
- establishment of at least one end-of-drain wetland.

Southern Rural Water is seeking government contribution for the first phase of the MID2030 project, which would fully modernise 40 per cent of the district, provide some service benefits to a further 85 per cent of the district and create 28 GL of water savings for use back in the district. Over the second half of 2011, Southern Rural Water has been consulting extensively with its customer base to review and refine this proposal, and ensure the outcome is affordable for irrigators (see Action 6.12).

The Gippsland Region Sustainable Water Strategy Consultative Committee noted the potential regional economic benefits from the MID2030 project and encourages the Victorian Government's consideration of investment in the project.

Salinity, nutrient reduction and irrigation drainage

Since 1994 salinity management plans have included an irrigation implementation program to manage local salinity, and in more recent years, to reduce nutrient export to the Gippsland Lakes. The on-farm program provides financial incentives and extension support to irrigators to reduce waterlogging, land salinisation, improve water use efficiency and reduce nutrient loads from being discharged into rivers and the Gippsland Lakes. The West Gippsland Salinity Management Plan and the Macalister Land and Water Management Plan both support the implementation of irrigation programs by the West Gippsland Catchment Management Authority and the Department of Primary Industries.

The key regional natural resource management agencies – Southern Rural Water, the West Gippsland CMA and the Department of Primary Industries – have adopted a partnership approach to ensure that Macalister Land and Water Management Plan actions are integrated with any future programs in the Macalister Irrigation District. The West Gippsland CMA's new irrigation incentive program is an outcome of this approach, along with improved irrigation efficiency in the MID and the installation of groundwater pumps (see Action 6.13).

Salinity also poses a problem for the properties next to Lake Wellington because flooding events that can last several weeks have caused salty water from the lake to wash over the land, affecting vegetation and loading local water tables that may already be quite saline.

Surface and subsurface drainage are essential elements of sustainable irrigation. The Government's 2009 review of its irrigation drainage program[39] included a recommendation that regional planning documents be examined in light of water and land policy reforms, climate change predictions and rates of landholder adoption.

In recent years there has been some increase in vegetable production on river flats in the Macalister Irrigation District, as well as other areas in Gippsland. This can increase the amount of time that soils are exposed, increasing the risk of erosion and nutrient transport during floods.

Irrigators in the Thorpdale area

Thorpdale is an area of intensive horticultural production in the Latrobe catchment, with potatoes being the main crop grown. The area has the highest density of irrigation and commercial use farm dams in Gippsland.

An issue for a number of irrigators in this area is that some irrigation dams have licences with an annual extraction limit that is less than the capacity of their storage. Licences for many of these storages were issued about 30 years ago, when commercial waterway diverters throughout Victoria were required to licence their water use. At the time of licensing, the intention was to issue the licence with an annual extraction limit that matched the storage volume.

As part of the licence application process, irrigators were required to apply to the State Rivers and Water Supply Commission (SRWSC) specifying the volume that they were seeking for their licence. In the Thorpdale area, field staff from the SRWSC estimated the capacity of storages, and provided this advice to irrigators to assist with their licence applications. The estimates made by the licensing authority were not based on a detailed survey.

With the introduction of metering in the area between 2001 and 2004, a number of irrigators have found that their annual extraction limit is less than the volume held in their storage. This has required some irrigators to reduce production.

The total volume of licences and entitlements in the Latrobe system is capped, so no additional licences can be issued in the catchments of the Latrobe River. In the Draft Gippsland Region Sustainable Water Strategy, it was proposed (Proposal 8.5) that the rules governing where trades can occur between creeks in the Thorpdale area be relaxed in cases where the annual extraction limit was less than the storage volume. Feedback to this proposal from irrigators was that this would do little to assist them because there is very little permanent licence trade in the area.

Taking into account the feedback from the Draft Strategy in response to Proposal 8.5, trading opportunities will be expanded to include any trade from within the Latrobe catchment, as described in Action 6.14. There are still significant costs associated with obtaining the additional volume of entitlement under Action 6.14, but providing the opportunity to buy entitlements across the Latrobe catchment provides significantly more opportunity for purchasing permanent entitlement.

As part of Action 6.14, irrigators applying to transfer water to the Thorpdale area from the broader Latrobe catchment will be required to undertake a survey to demonstrate that the storage capacity is greater than the annual extraction limit of their licence. The depth/volume relationship developed as part of the survey provides an opportunity to improve the management of passing flows between on-stream storages in the area.

Irrigators in the Thorpdale area also raised concerns about the difficulty in gaining approval for temporary trades between creeks in the Thorpdale area, and the process for new storage construction applications.

Trade between creeks in the Thorpdale area are subject to trading rules that are currently described in the Narracan Creek local management rules. Changes to the rules for trading between the creeks in the Thorpdale area will be considered by Southern Rural Water as part of the development of the Latrobe basin Local Management Plan. The revised rules will be

Action 6.13 Promoting sustainable irrigation

Who: Department of Sustainability and Environment, Department of Primary Industries, West Gippsland Catchment Management Authority

Timeframe: Ongoing

The Government will continue to support and implement:

- recommendations from the review of Victoria's irrigation drainage program;
- recommendations from the Gippsland Lakes Rescue Package (Phase 3) audit; and
- the Gippsland Irrigation Development Guidelines; and
- approved actions under the Macalister Land and Management Plan, including managing salinity and nutrients in the Macalister Irrigation District.

developed by December 2012. The general process for developing local management plans is described in Section 3.2.2 (page 41). Broad actions in this Strategy to improve trading opportunities are also described in Table 4.1 (page 66).

There are limited opportunities for new storages to be constructed in the Thorpdale area, but some all-year direct stream diversion licences may be able to be converted to winter-fill licences if new storages can be constructed. In some cases this may improve downstream flows over summer, and also improve the reliability of supply to the irrigator. Improvements to the process for the construction of new storages are described in Section 4.1.3, page 69.

Other licensed surface water users

There are opportunities in some locations to obtain new winter-fill surface water licences (see Action 6.2) and where new licences are not available there may be opportunities to trade winter-fill or all year licences from existing licence-holders.

Where winter-fill licences are obtained, the water generally needs to be stored so that it is available when needed. If suitable sites are available off-stream storages can be constructed, however pumping and storage construction costs can be prohibitive for some users.

Licensed groundwater users

Most licensed groundwater use for rural and agricultural use occurs from the Rosedale and Moe groundwater management units in the Latrobe catchment. In the Thomson, Macalister, and Avon catchments most licensed groundwater use occurs from the Denison, Wa De Lock, Rosedale, Sale and Stratford GMUs. In the Mitchell, Nicholson and Tambo river catchments, most licensed groundwater use occurs from the Stratford and Wy Yung GMUs.

Threats to the availability of groundwater for agricultural and rural use in these areas includes the possibility of reductions in recharge under a drier climate, as well as impacts from other uses including mining. Actions to improve the management of the groundwater resource are presented in Chapter 3, page 33.

Domestic and stock water source, Latrobe catchment, DSE

Domestic and stock water users

Water for domestic and stock use is required where access to town supply systems is not available. Reliable water supplies are needed for domestic use, and supplies for stock watering are vital for the area's dryland farming enterprises.

Rainfall collected from roofing is the predominant source of water for rural domestic use, and stock watering is mostly supplied by small catchment dams. Landowners generally have the right to access these supplies for domestic and stock use, with this being an 'as of right' activity under Section 8 of the Victorian *Water Act 1989*.

Action 6.14 Thorpdale – opportunity to purchase additional entitlement in cases where storage capacity exceeds the annual extraction limit

Who: Southern Rural Water **Timeframe:** June 2013

In the Thorpdale area, where a survey demonstrates that the storage capacity is greater than the annual extraction limit, the difference will be able to be purchased by irrigators from existing licence-holders anywhere within the Latrobe catchment (upstream of the confluence with the Thomson River). This will be managed by Southern Rural Water, who will develop the process for application including any relevant conditions.

Subject to considerations under the *Water Act 1989*, where Southern Rural Water considers that the volume difference (between the storage capacity and the annual extraction limit of the licence) is a result of the accuracy of the estimate made at the time of licensing, the application would be approved.

Surveys undertaken as part of this process will need to:

- be carried out by a licensed surveyor;
- be paid for by the irrigator; and
- determine the full storage volume, and the storage volume at increments of one-metre depth.

Any entitlement transferred from the lower Latrobe system will include a component of annual headworks charges for Blue Rock Reservoir.

Applications will be able to be made through the process established by Southern Rural Water until this opportunity expires on 30 June 2013.

Depending on location, opportunities can exist to supplement domestic and stock water supplies with a groundwater supply or by pumping from waterways. The ability to access these supplies depends on the locations of aquifers and streams, the reliability of the supply, and in the cases where a licence is required, whether a licence can be obtained. Southern Rural Water is responsible for assessing licence applications throughout Gippsland.

Actions relating to domestic and stock use are presented in Section 3.3.1 (page 53) and Section 4.2.1 (page 77).

Actions and policies to improve agricultural and rural supply reliability

The main actions in this Strategy that will help protect the future water supply reliability of agriculture and rural water uses from groundwater and streams waterways are discussed in Section 4.2.1 (page 76).

Lindenow Valley Water Security Project

Potential growth in food production in the Lindenow Valley is constrained by limited water security in some dry summer months. In order to meet the water demands of irrigators during these periods, additional water that could be extracted over the wetter months would need to be stored for when it is required.

An investment of $1 million into Stage 1 of the Lindenow Valley Water Security Project was launched by the Minister for Water on 1 July 2011. This investment meets the Coalition Government's election commitment to investigate the best storage solution for the area's growing water needs. This first stage of the project will investigate whether an off-stream storage or managed aquifer recharge is the best storage solution to improve water security for irrigators in the Lindenow Valley.

A project steering committee consisting of community representatives and local agency staff, with the Department of Sustainability and Environment providing the secretariat, has been established to guide this stage of the project. The committee will advise the Government on the option or options to secure water supplies for the area's irrigators that will provide the best opportunities for regional and rural economic growth, while protecting the Mitchell River and the Gippsland Lakes environment.

The project will build on East Gippsland Water's experience in progressing its managed aquifer recharge project. The project is expected to take 18 months and is due to be completed before the end of 2012.

Lindenow Valley, DSE

6.2.4 Managing other pressures on future water availability

Land use change – managing significant impacts on water availability

Large scale changes in land use can affect water availability for other water users and the environment by taking more water that would otherwise reach streams and/or extracting more water directly from shallow aquifers. These impacts are felt most keenly during dry years and in summer, and where the available water is already fully committed.

During the development of the Western and Gippsland sustainable water strategies, the community expressed concerns about land use change impacts on the reliability of supply for water users especially in dry times. Concerns were greatest in the Western Victoria, where rapid plantation forestry development has occurred over the past 10 to 20 years. The community also expressed support for a sound policy to protect water resources from the impact of rapid expansion of water-intensive land uses in the future.

Forestry is an important economic activity in some catchments. While many of the early plantations replaced native forest (minimising any impact on the water balance), the more recent plantations have replaced cleared grazing land.

This Strategy includes the ability for targeted management of the impact of plantations in the future. This approach is described in Section 3.3.1 (page 51).

Managing the impact of mining and extractive industries on groundwater availability

A range of emerging technologies may have significant implications for groundwater, including geothermal, carbon capture and storage and coal seam methane extraction. Each of these technologies would raise new challenges for the licensing and management regime that applies to groundwater under the *Water Act 1989*.

As new technologies and industries emerge over time, their potential impact on the availability of groundwater must be considered. The Department of Sustainability and Environment and the Department of Primary Industries will identify any groundwater issues associated with new and emerging technologies, to ensure that any projects consider the impacts on the groundwater system and obtain appropriate licences (see Action 3.19, page 59).

In addition, the Strategy ensures that for any major new earth resource projects the proponents are aware of the potential impacts on water resources and the environment, and that these impacts are addressed through the approval processes. Where the water requirements of any major new earth resource projects cannot be met by obtaining a new or traded licence within the existing permissible consumptive volume (due to the size of the water demand), the project proponent will need to put in place appropriate measures to mitigate or offset this impact (see Policy 3.9, page 55). Environmental Effects Statements prepared for major new projects under the *Environment Effects Act 1978* need to adequately consider the impacts on other water users or water-dependent environmental values.

Better aligning groundwater management boundaries with aquifer systems

New groundwater management boundaries in Gippsland will be developed based on groundwater systems. This will ensure that all uses of the same groundwater system are subject to a consistent set of rules. Revised boundaries will be considered for all groundwater systems. The boundaries will be developed through the Secure Allocation, Future Entitlements (SAFE) project (see Action 3.15, page 55).

Considering water impacts when undertaking planned burning on forested crown land

Climate change predictions for the Gippsland Region indicate that more severe weather events such as floods and bushfires are likely to occur more frequently. Planned burning can reduce the risk posed by bushfires, and in some cases may help to reduce the risk of major bushfires on water quality and quantity by reducing the size, intensity and subsequent impact of bushfires. These positive impacts need to be weighed against the relatively minor impacts of planned burning on water quality and yield (see Action 3.20, page 59).

Other related actions and policies to manage pressures on future water availability

Other actions and policies contained in this Strategy to help manage the pressures on future water availability are presented in Chapter 3, page 33.

6.3 Managing waterways, aquifers, wetlands and estuaries

The major river systems that feed the Gippsland Lakes are the Latrobe, Thomson, Macalister, Avon, Mitchell, Nicholson and Tambo rivers. Within each of these river systems, there are many creeks and smaller tributaries. This Strategy aims to maintain and improve the health of these waterways, by continuing to work with landholders to improve the condition of the catchment, managing environmental flows in the Tambo, Nicholson, Mitchell and Avon river systems, and providing an additional share of flow for the environment in the Thomson, Macalister and Latrobe river systems.

All the waterways described in this chapter contribute freshwater flows to different parts of the Gippsland Lakes. The Gippsland Lakes are a system of lakes and wetlands that stretch from near Sale in the west to Bairnsdale and Lakes Entrance in the east. The permanent entrance constructed at Lakes Entrance in 1889 has influenced the environmental values of the lakes, which has resulted in a shift in the salinity regime to one where some parts of the main lakes are largely marine environments, while some of the river estuaries and fringing wetlands are still freshwater-dominated environments. The mixing of freshwater and seawater creates the system's unique character, and this Strategy identifies opportunities to improve the environmental benefits from freshwater flows into the estuaries and fringing wetlands of the Gippsland Lakes system.

In addition to the actions presented in this section, Section 4.4 (page 86) presents Gippsland wide actions for improving environmental health.

Lakes Entrance, DSE

6.3.1 Managing and improving waterways within the catchment areas of the Gippsland Lakes

This section sets out the actions and policies to protect the high environmental, social and economic values of the waterways within the catchments. The actions undertaken within these catchment will also provide benefit to the downstream Gippsland Lakes system.

The Latrobe, Thomson, Macalister and Avon catchments are the main catchments that feed Lake Wellington on the western side of the Gippsland Lakes system. At the eastern end, the Mitchell and Nicholson rivers flow into Jones Bay, and the Tambo river flows into Lake King.

Actions and policies are presented below for some of the main catchments of the Gippsland Lakes. These actions and policies aim to protect the environmental values by:

- managing and in some cases increasing the environment's share of water;
- carrying out complementary works and catchment management programs to maximise river health benefits (such as revegetation of waterways);
- making the best use of environmental water; and
- using an adaptive approach to manage environmental values as conditions change over time.

Latrobe catchment

Additional flows for the Latrobe River system

This Strategy provides the Latrobe River system with a permanent share in Blue Rock Reservoir equivalent to an annual high-reliability 10 GL entitlement. This entitlement will be used to provide environmental benefits in the lower Tanjil River, the Latrobe River downstream of the junction with the Tanjil River, and the fringing wetlands along the lower Latrobe River near Lake Wellington. Decisions on the use of this entitlement will be made by the Victorian Environmental Water Holder based on proposals provided by the West Gippsland Catchment Management Authority (WGCMA). The WGCMA will then implement those decisions, ordering and delivering the water as needed.

Under historical climate conditions, modelling indicates that the new 9 per cent share of Blue Rock Reservoir provides a high-reliability entitlement of 10 GL. The new share is additional to the existing passing flows from Blue Rock Reservoir.

The new environmental entitlement in Blue Rock Reservoir may also be used to provide additional flows to the lower Latrobe wetlands. The actions to improve the condition of the these wetlands is discussed as part of the Gippsland Lakes system in Section 6.3.2 (page 146).

The new environmental entitlement in Blue Rock Reservoir will be established in conjunction with the drought reserve described in Action 6.3 (page 126). Opportunities will also be explored to provide additional environmental benefits when operating rules for Blue Rock Reservoir are revised (for example on revision of the flood pre-release rules), where there are no impacts on the reliability of supply to existing users (see Section 6.2.1, page 123).

The effectiveness of environmental water management in delivering environmental outcomes, including an analysis of the potential need for more environmental flows or more investment in on-ground works, will be evaluated as part of the Strategy review in 10 years. This review will consider the likely costs and benefits of recovering more water for the environment or investing in more on-ground works (see Action 6.16).

Managing the impact of mining on the Latrobe tributaries

The lower reaches of the Morwell River and some other waterways near the Latrobe Valley coal mines are highly modified as a result of their proximity to the coal mines. As coal mining in the area expands, any overlying waterways will need to be relocated (that is diverted via man-made channels). Plans have been completed for commissioning the fourth and fifth river relocations with a likely sixth and seventh diversion within the next 20 to 30 years.

Each time the river is relocated, the mining industry invests in revegetation and bank works to ensure the river is reinstated in a condition similar or better than it was previously. With a prospect of future relocations and some revegetation works becoming obsolete, better environmental outcomes might be achieved by using the money spent reinstating the river to deliver other, longer-term environmental benefits in the same region. For example, rather than spend $7 million on reinstating a river that will be relocated in 20 years the funds could be put towards on-ground works that would deliver longer-term environmental benefits to the Latrobe River system.

The West Gippsland CMA has done some initial work on options for achieving better environmental outcomes from the investments made in relocating the Morwell River. This work will be progressed to identify opportunities to deliver improved environmental outcomes in the region (see Action 6.17).

The impacts of new mines on groundwater resources are discussed in Chapter 4 on page 80.

Action 6.15 Additional 10 GL environmental share for the Latrobe River system

Who: Department of Sustainability and Environment **Timeframe:** December 2012

A permanent high-reliability environmental entitlement will be created for a share of Blue Rock Reservoir equivalent to an annual 10 GL (a 9 per cent share of Blue Rock inflows and storage space). This will be allocated to the Victorian Environmental Water Holder. The share will come from the unallocated share of Blue Rock Reservoir currently held by Government.

Action 6.16 Managing the new environmental entitlement for the Latrobe River

Who: West Gippsland Catchment Management Authority, Department of Sustainability and Environment, Victorian Environmental Water Holder **Timeframe:** Ongoing

Building on research undertaken on the environmental needs of the Latrobe River, and in conjunction with the West Gippsland Catchment Management Authority, the Victorian Environmental Water Holder will;

- apply the seasonally adaptive approach to develop watering plans for the environmental entitlement in Blue Rock Reservoir; and
- monitor the effectiveness of environmental watering and on-ground works in delivering improved environmental outcomes.

Action 6.17 Maximising environmental benefits from investments made to manage the environmental impacts of coal mining on the Latrobe tributaries

Who: West Gippsland Catchment Management Authority **Timeframe:** Ongoing

The West Gippsland CMA will work with the coal mining industry to identify opportunities to maximise environmental outcomes for the Latrobe system when planning for and offsetting the impacts of relocating Latrobe tributaries such as Morwell River.

Thomson and Macalister catchments

Additional flows for the Thomson and Macalister river systems

An assessment of the environmental flow requirements of the Thomson and Macalister rivers was undertaken by the Thomson Macalister Environmental Flows Taskforce, which produced its final report in 2004[40]. The taskforce was informed by rigorous scientific information and community input, and recommended additional flows be returned to the Thomson and Macalister rivers. The taskforce also recognised that additional environmental water needed to be complemented by non flow-related river improvements.

In response to the findings of the taskforce, the previous Government committed to providing an additional environmental flow of 18 GL in the Thomson River, and 7 GL in the Macalister River (a total commitment of 25 GL). It was found that a cap on existing entitlements, combined with an additional 25 GL on average per year of environmental entitlement, would provide improved flows in most years and meet many of the taskforce recommendations.

In the Thomson River, 10 GL of environmental entitlement was returned to the river in 2005 (part of which was temporarily qualified from March 2007 until September 2010). In addition, the Thomson also receives an average annual volume of 28GL in passing flows. In the Macalister River, 8.1 GL has been returned, sourced from MID water-saving projects. Table 6.6 presents the savings made so far in these systems.

Consistent with the commitments made by the previous Government, an additional 8 GL will be returned to the Thomson River (Action 6.18).

The taskforce found that the additional environmental water needs of the Thomson River are the reaches downstream of the junction with the Aberfeldy River, because this section of the river allows for Australian grayling to move up into the heritage-listed Aberfeldy River.

The temporary qualification from 2007 to 2010 to the environment's water in Thomson Reservoir included a reduction in the passing flows downstream of the reservoir. With the lifting of the qualification last year there is an opportunity to provide greater flexibility in how this water is used to achieve environmental benefits in the Thomson River (Action 6.19).

In addition to the flows returned to the Macalister River, a further 5.5 GL will be returned in early 2012. This has been sourced from the Government investment made in water-savings projects in the MID, and will bring the total volume of environmental water recovered for the Macalister River to 13.5 GL. The objective of environmental releases in the Macalister River is to provide autumn flows critical for native fish life cycle cues, water quality improvements and vegetation succession.

Although the additional flows in the Thomson and Macalister rivers will not provide any significant environmental improvement in Lake Wellington, the additional flows in these rivers may improve the ability to manage conditions within the river estuary and the fringing wetlands along the lower Latrobe River (see page 148).

Table 6.6 Environmental water recovered for the Thomson and Macalister river systems

River	Environmental water recovered	Source
Thomson	10 GL	Water savings in Melbourne
Macalister	8.1 GL	MID water-saving projects

Action 6.18 Additional 8 GL environmental share for the Thomson River

Who: Department of Sustainability and Environment **Timeframe:** July 2012

A share of Thomson Reservoir equivalent to an annual 8 GL will be permanently assigned to the environmental water reserve.

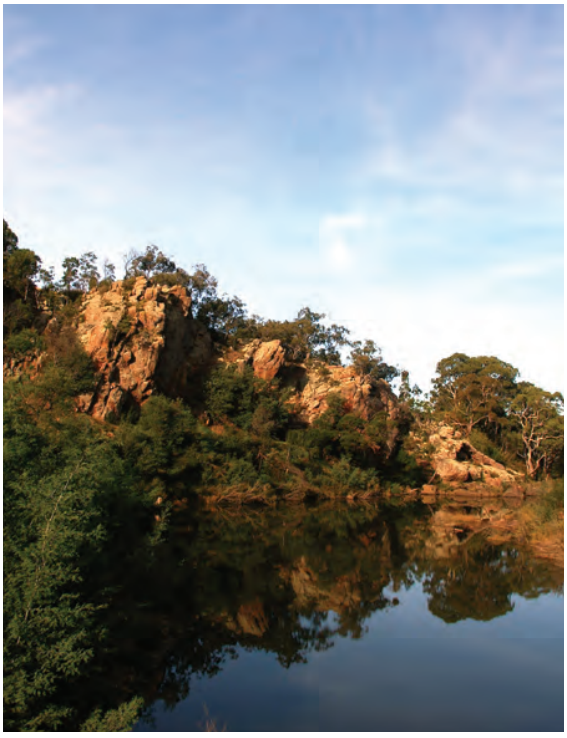
Action 6.19 More flexible environmental releases from the Thomson Reservoir

Who: Department of Sustainability and Environment **Timeframe:** July 2012

Subject to there being no impacts on downstream consumptive users, the passing flows above minimum flow recommendations of the Thomson-Macalister Environmental Flows Taskforce will become part of the environmental water account in Thomson Reservoir, which can be used more flexibly to provide more environmental benefit.

Restoration activities in the Thomson and Macalister river systems undertaken by the West Gippsland Catchment Management Authority

Guided by the Regional River Health Strategy, river restoration activities undertaken by the West Gippsland Catchment Management Authority aim to achieve connectivity from the Gippsland Lakes through to the Alpine Region, and across floodplains and wetlands. Complementary river restoration works will improve habitat connectivity through the removal and control of weeds in waterways, fencing of riparian zones, stabilisation of stream bank and beds and replanting with indigenous vegetation. The effects of restoration may take many years to become apparent so monitoring and evaluation programs are undertaken to identify ecological changes and to quantify changes. Monitoring allows for actions to be adjusted accordingly using an adaptive management approach, which complements the environmental flow regime and system objectives.



Macalister River, WGCMA

Avon River system

Groundwater and surface water interactions in the Avon River system

There is a high level of interaction between the shallow groundwater system near the Avon River and the Avon River itself. A revised local management plan will be prepared for the Avon catchment, which will consider these interactions and any opportunities to improve the management rules within this system (see Action 6.1, page 121). If a combined surface and groundwater management plan is considered for this system, further studies will be necessary to determine the ecological benefits that such a combined management plan would achieve and the resulting impacts on surface water and groundwater users including irrigators.

Mitchell, Nicholson and Tambo rivers

Improving habitat connectivity in the Nicholson River

The transfer of East Gippsland Water's bulk entitlement from the Nicholson River to the Mitchell River will make East Gippsland Water's storage on the Nicholson redundant. East Gippsland Water is considering options for decommissioning the Nicholson Dam, which could significantly improve the health of the river by removing the main barrier to fish migration, and return flows to the river.

Precautionary caps on any new diversions

Managing the high environmental values of the catchments of the Gippsland Lakes is an important aspect of this Strategy, with a balanced approach taken to issuing any new water entitlements for consumptive use that sets precautionary caps.

The Mitchell, Nicholson and Tambo rivers will be managed to protect these river systems as well as their estuaries. The precautionary water allocation caps set in this Strategy limits new winter-fill water entitlements to an additional 6 GL from the Mitchell catchment, 1.5 GL from the Tambo catchment, and no new water entitlements from the Nicholson catchment (see Section 6.2.1, page 123).

Managing the values of the Mitchell River and its tributaries

The heritage-listed Mitchell River, which has high environmental and recreational value, will continue to be protected from the development of dams on the Mitchell River or any of its major tributaries. The Government does not support constructing new storages on rivers or major tributaries within the Mitchell catchment.

Catchment goals for the Mitchell, Tambo and Nicholson rivers

The East Gippsland Catchment Management Authority is progressing well towards achieving its strategic catchment goals by 2012. These goals include:

- willow control along the waterways in the Mitchell catchment above Dargo and through the Mitchell National Park;
- fencing out stock-and revegetation of 50 km of river bank in the Mitchell catchment;
- fencing out stock along the entire Nicholson floodplain reach and willow control in the Nicholson catchment; and
- willow control in the Tambo River catchment down to the floodplain.

6.3.2 Managing and improving the health of the Gippsland Lakes

The Ramsar-listed Gippsland Lakes environment provides significant social and economic benefits to the region, including through tourism and recreation. Rising sea levels, increases in storm surges and any reductions in streamflow in response to climate change are likely to result in an increasingly marine environment in the Gippsland Lakes. The main objective of this Strategy is to better understand and protect the predominately estuarine environment of the Gippsland Lakes, while managing the likely continued transition to a more marine environment. The most vulnerable parts of the system to existing and potential future changes in freshwater inflows are the fringing wetlands (freshwater and variably saline), estuarine river reaches and Jones Bay.

The main components of the Strategy to protect the Gippsland Lakes are:

- actively managing the freshwater needs of the high value fringing wetlands and river estuaries and Jones Bay;
- limiting consumptive extractions from upstream catchments, and providing additional environmental flows in the Thomson, Macalister and Latrobe rivers to improve the condition of the river estuaries and fringing wetlands;
- continued investment in catchment management activities that have a significant impact on water quality within the Gippsland Lakes system; and
- monitoring and undertaking further research on the condition of the lakes.

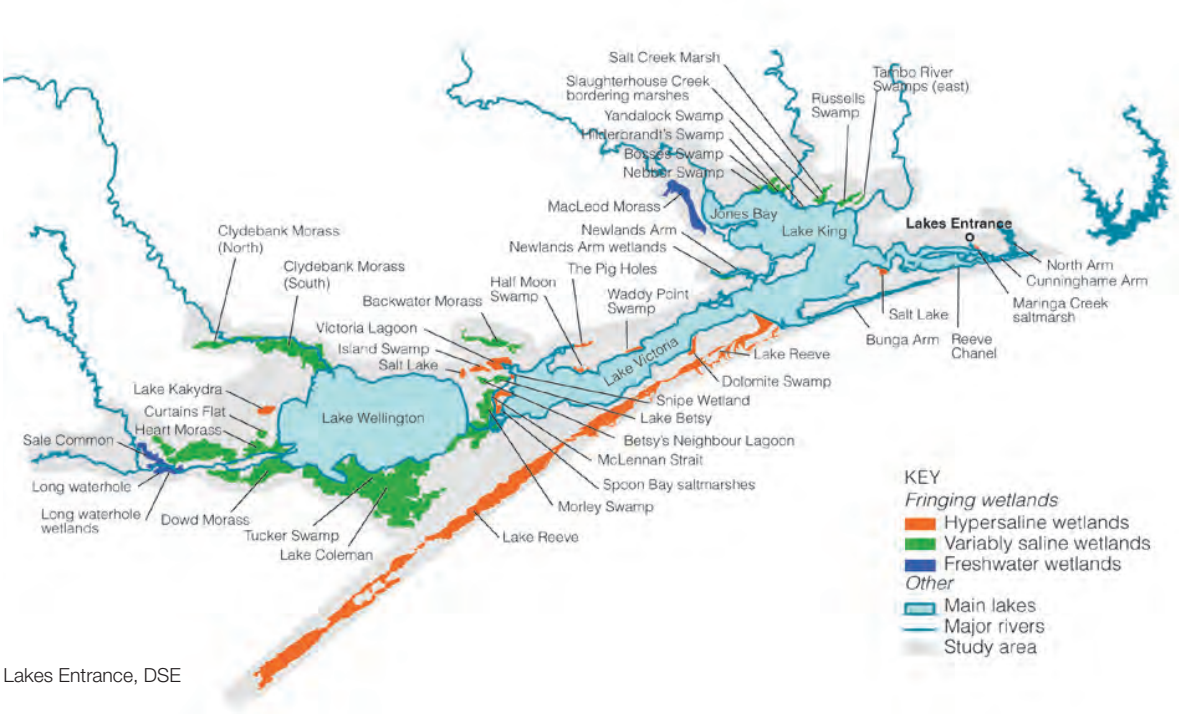
Several fish species use or inhabit the lakes and many form the basis of valuable recreational and commercial fisheries. Fish species migrate around the lakes system for spawning and to feed in different areas at different times of the year. They require variable salinity regimes for reproduction and survival.

The Gippsland Lakes is predominately an estuarine environment, meaning that its ecological functions are controlled by the mixing of seawater and freshwater. The complexity of freshwater flows and salinity over time and across different parts of the lakes system supports the diversity of habitats and ecological values. For example, freshwater flow pulses into the estuarine areas, where the seawater and freshwater mix (the 'salt wedge') are necessary for fish breeding and migration cues for species such as the black bream.

Before the establishment of the permanent marine entrance in 1889, the Gippsland Lakes was a predominantly brackish-freshwater system cut off from the Southern Ocean by coastal dunes. The lakes were an intermittently open-and-closed lagoon system in which the water was normally fresh or at times brackish. Floods would create a temporary opening to the ocean, allowing temporary incursion of seawater before sand accumulations resealed the opening.

Salinity levels across the lakes system vary in response to the influence of the permanent entrance, and the rate of freshwater inflow from catchments. During floods, the rate of inflow to the Gippsland Lakes can be many thousands of times larger than during times of low flow. Floods push salty water out through the entrance, increasing the freshwater content of the lakes. During periods of low flow, saline water can migrate up through the lakes system, into river reaches and the adjacent fringing wetlands.

It is important to continue to increase our knowledge of these complex ecological relationships and the role of freshwater in the lakes to help manage and preserve the values of the Gippsland Lakes system.



Lakes Entrance, DSE

Understanding the freshwater needs of the Gippsland Lakes system

The main habitat zones in the Gippsland Lakes, identified in a scoping study[31] prepared for the Strategy to better understand the freshwater needs of the lakes include:

- main lakes (deep and shallow);
- fringing wetlands (freshwater, variably saline and hypersaline); and
- estuarine reaches of the inflowing rivers.

The main lakes include the deep waterbodies of Lake King and Lake Victoria, and the shallow waterbodies of Jones Bay and Lake Wellington (see Figure 6.10).

Phytoplankton (also commonly referred to as algae) are most prominent in the main lakes where they occasionally reach bloom concentrations. The lakes are susceptible to algal blooms because:

- they experience episodic periods of high nutrient loads from catchment inflows
- differences in salt concentrations allow the water column to stratify vertically

Extensive fringing wetlands occur throughout the lakes system, often near river mouths. They include freshwater wetlands such as Sale Common and Macleod Morass, variably saline wetlands such as Heart Morass, Clydebank Morass and Dowd Morass, and hypersaline wetlands such as Lake Reeve and Victoria Lagoon. Some of the hypersaline wetlands, such as Lake Reeve, were naturally hypersaline before the artificial opening was constructed at Lakes Entrance.

Recent studies[31,32] undertaken to better understand the freshwater needs of the lakes identified the fringing wetlands (freshwater and variably saline), followed by the estuarine river reaches and Jones Bay, as the most vulnerable to existing and potential future changes in freshwater inflows. This does not imply freshwater needs are not important elsewhere in the system: rather that these parts of the lakes system are more vulnerable to changes in river flows than the parts of the system where the condition is predominantly controlled by other factors such as saltwater from the entrance.

The recent studies suggest that to protect the values of the whole lakes system, proposed water management decisions should be precautionary and based on flexible and adaptive management supported by a program of progressive knowledge-building and monitoring (see Action 6.20). Details of the linkage between a change in river flows and the ecological response is still poorly understood.

From the various studies on the health and freshwater needs of the Gippsland Lakes, several conclusions can be drawn:

- The priority habitat zones for further investigation of freshwater needs are those most sensitive to changes in freshwater and have high social, economic and environmental values[32]. The priority habitat zones are the river estuaries, particularly the freshwater-saltwater interface, and the freshwater and variably saline fringing wetlands, and Jones Bay.
- Increases in sea level and storm surges as a result of climate change are likely to result in the lakes becoming increasingly marine, with salinity levels rising in the fringing wetlands.
- The nature of the lakes system has and will continue to change over time.
- Water management activities cannot stop the main lakes from becoming more marine[41] but can manage the transition and protect the high environmental values in certain areas of the lakes system.
- Monitoring and continued research on the health of the entire lakes system will ensure management activities can be adapted to protect the high environmental and social values supported by the lakes system as knowledge improves over time.

Action 6.20 Managing the Gippsland Lakes

Who: Catchment management authorities, Department of Sustainability and Environment, Gippsland Lakes Taskforce

Timeframe: Ongoing

The Government will manage and protect the Gippsland Lakes by:

- Managing the freshwater needs of the high value fringing wetlands and river estuaries and Jones Bay by:
  - placing precautionary caps on winter diversions from the Mitchell, Tambo and Nicholson rivers (see page 123);
  - identifying opportunities for improved environmental outcomes where revised local management plans are developed within these catchment areas (see page 121); and
  - actively managing the environmental water needs of fringing wetlands along the lower Latrobe, including Sale Common, Dowd and Heart Morass (see page 149).
- Continuing to invest in catchment management activities that have a significant impact on water quality within the lakes system.
- Monitoring and undertaking further research on the condition of the lakes, including their ecological response to changes in river flows, to ensure management activities continue to be effective in protecting the lakes' high environmental and social values.
- Reviewing the priority areas for freshwater based on any improved knowledge and understanding when the strategy is reviewed in 10 years.

Catchments of the Gippsland Lakes

- Nutrient run-off will continue to be a major threat to the health of the lakes, even as they become more marine.
- Catchment management activities that improve downstream water quality benefit the health of the lakes system and should continue.
- Significant nutrient loads generated by ash and soil movement in response to bushfires and major floods are unavoidable and likely to occur in the future.

The additional environmental flows provided to the Latrobe, Thomson and Macalister rivers will improve the condition of the river estuary and fringing wetlands in the Gippsland Lakes system, but will have little impact on the main lakes.

Additional funding to improve the condition of the Gippsland Lakes system

The Victorian Government has committed to supporting long-term, strategic management of the Gippsland Lakes system. Over the next four years, $10 million has been committed to improving the health of the Gippsland Lakes. The Government is seeking to secure an additional $5 million from the Federal Government, to bring the total to $15 million. The Government aims to ensure the environmental significance of the Gippsland Lakes is maintained as well as providing for the tourism, recreational and business needs in the area.

Options to install structures to manage salinity and freshwater flows

Some of the submissions to the Draft Strategy suggested using engineering options to reduce or manage increasing salinity in the Gippsland Lakes. Suggestions included building a lock system at Lakes Entrance, a barrier in Lake Wellington, an underwater structure at Metung, closing the entrance, creating a second entrance, and structural improvements to water the lower Latrobe wetlands. Previous studies[42] have shown it is not viable to close the entrance or create a second entrance because this would impact on the ecology of the lakes system[43]. An underwater structure at Metung would prevent the most valuable recreational and commercial fish species from being able to move within the lakes system and would not prevent sedimentation in times of flood.

A preliminary investigation[41] was made into the construction of a barrier across McLennan Strait to reduce salinity in Lake Wellington. The study found that reduced freshwater flows and likely sea level rise and storm surges associated with climate change made construction of a partial or full barrier across McLennan Strait a high cost investment for a relatively short period of benefit. The study did not recommend building a full or partial barrier, but it did suggest the construction of several small barriers and a specific watering regime for the fringing wetlands to maintain freshwater flows into these wetlands. The use of structural works for the lower Latrobe wetlands is discussed in the next section.

Metung, Tourism Victoria

Freshwater needs of the lower Latrobe wetlands

The lower reaches of the Latrobe River near Lake Wellington are fringed by extensive high value wetlands including Sale Common, Heart and Dowd Morass. These fringing wetlands form part of the Gippsland Lakes system.

The study undertaken to determine the freshwater needs of the fringing wetlands and estuarine river reaches[32] found that an annual volume of at least 43 GL would be required in the lower Latrobe River to meet the environmental water needs of the estuary and fringing wetlands. Existing Government commitments to return environmental water to the Thomson and Macalister rivers, together with the share in Blue Rock Reservoir equivalent to an annual 10 GL and additional savings from the Macalister Channel Automation Project, match the additional volume found to be required for the lower Latrobe estuary and wetlands.

In order to formalise the environmental water manager's right to access unregulated flows in the lower Latrobe River for use in watering the wetlands, an environmental entitlement was created in 2010[44]. This entitlement allows water to be diverted into Dowd Morass, Sale Common and Heart Morass to meet critical environmental objectives when there are high flows in the Latrobe River. The environmental entitlement includes all water in the waterway below the last extraction point for consumptive use, consistent with Policy 4.2.

This environmental entitlement allows the choice between diverting water to the wetlands or allowing it to flush the estuary to manage salinity, depending on the priority of environmental water needs at the time.

Watering of the lower Latrobe wetlands has been undertaken for more than 20 years by Parks Victoria, using water control structures connecting the wetlands to the lower Latrobe River. The existing water control structures for Sale Common, Dowd Morass and Heart Morass involve drop-board structures and gated culverts, which are relatively inefficient ways to deliver water to these wetlands.

The West Gippsland CMA is undertaking a study to determine how the water committed by the Government can be best used to meet the needs of the wetlands and estuary. The next stage of the study is to determine how to align the water available with the water requirements of the lower Latrobe wetlands and estuary, and undertake concept designs for water management structures, including upgrading or replacing the existing water diversion structures (see Action 6.21).

The effectiveness of water commitments to meeting the needs of the Latrobe estuary and fringing wetlands will be evaluated in the Strategy review in 10 years.

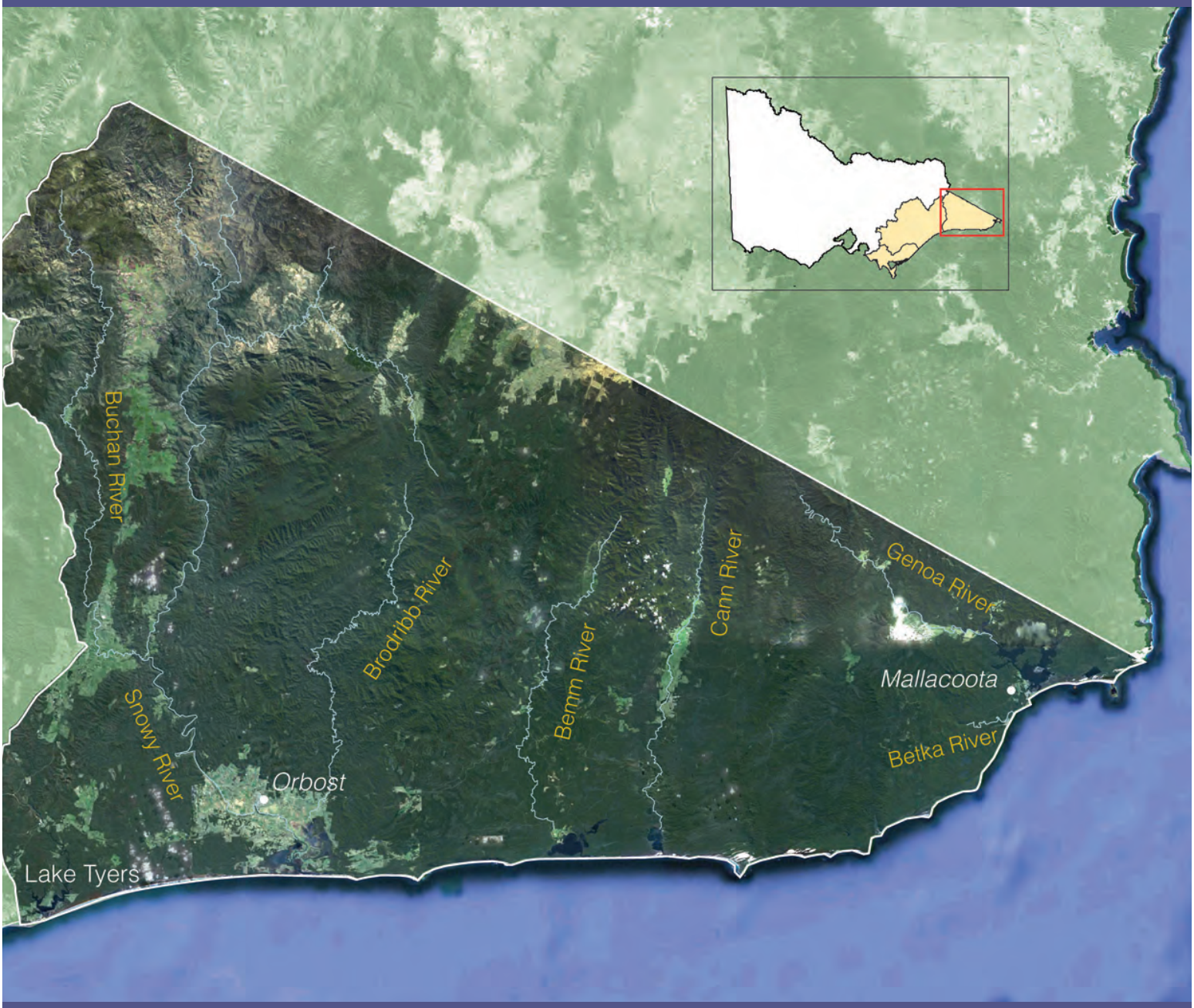
Action 6.21 Providing water to the fringing wetlands of the lower Latrobe River

Who: West Gippsland Catchment Management Authority, Victorian Environmental Water Holder

Timeframe: December 2012

To improve the health of the lower Latrobe wetlands and estuary, the West Gippsland Catchment Management Authority in conjunction with the Victorian Environmental Water Holder will:

- determine how the water currently committed by the Government can be used to best meet the needs of the wetlands; and
- investigate the design and costs of upgrades to infrastructure to actively manage water diversion to the wetlands.



This chapter contains actions and policies specific to Far East Gippsland. The chapter also describes how some of the actions and policies presented in chapters 3 and 4 will apply in these catchments.

Far East Gippsland

Guide to this chapter

7.1 Water availability and use

- Surface water availability and use
- Groundwater availability and use
- Environmental and cultural values
- Pressures on future water availability

7.2 Promoting sustainable use of water

- Providing certainty and improved flexibility for water users
- Improving reliability of supply for urban and industrial water users
- Improving reliability of supply for agriculture and rural water users
- Managing other pressures on future water availability

7.3 Protecting waterways, aquifers, wetlands and estuaries

- Complementary works and programs
- Protecting the environment's share of water
- Adapting to a changing environment
- Improving the environmental values of the Snowy River

Far East Gippsland

Introduction

The actions and policies presented in this chapter aim to meet the water needs within Far East Gippsland. They focus on protecting the reliability of supply for existing and future consumptive water users and protecting the high environmental values. Together with region-wide actions, this Strategy aims to provide a flexible framework that is able to respond to the existing and potential pressures within Far East Gippsland. This chapter presents information on how these actions will be delivered, the responsible organisation(s), timelines for completion and the benefit of each action.

Far East Gippsland spans from east of Lake Tyers to Mallacoota and extends up to the New South Wales border. It consists largely of forested public land, which includes many relatively undisturbed waterways in excellent condition. Far East Gippsland encompasses the towns of Bemm River, Genoa, Mallacoota, Cann River, Marlo and Orbost, and contains the Snowy River, Cape Conran, Errinundra, Croajingolong and Coopracambra national parks. Large areas of public land support tourism and recreation, with some timber harvesting. The land owned privately is used for dryland grazing, with some dairy supplemented by irrigation around Orbost.

Far East Gippsland includes the heritage-listed Snowy, Bemm, Genoa, Buchan, Errinundra and Goolengook rivers, as well as some remote coastal waterways. These waterways are among Victoria's most valuable environmental assets.

The river systems flow to the Southern Ocean through some extensive estuarine systems, including the estuaries of the Snowy and Bemm rivers, and Sydenham, Tamboon and Mallacoota inlets.

The main sources of water for urban, rural and industrial users are the Bemm River (supplying the township of Bemm River), Cann River (Cann River), Buchan River (Buchan), Brodribb and Rocky rivers (Orbost), Snowy River providing irrigation (Orbost) and the Betka River (Mallacoota, supported by groundwater). There are a small number of urban water supply systems and rural water users but no significant pressures for increased water use in most rivers.

7.1 Water availability and use

Average annual rainfall varies across Far East Gippsland and is relatively high compared with the rest of Victoria. The annual average rainfall in some areas is less than 700 mm per year, while in others it is more than 1,100 mm.

During the recent drought, rainfall declined by about 13 per cent across Far East Gippsland, which is less than the decline experienced across much of Victoria.

While our understanding of the potential impacts of climate change on future water availability will continue to improve over time, the uncertainty about future rainfall means that we need to be prepared for a range of future climate conditions.

7.1.1 Surface water availability and use

Annual average streamflow for the Snowy and East Gippsland catchments is about 2,876 GL, but this varies greatly from year to year. Figure 7.1 shows how this annual average volume is divided into water available for consumptive use and water that remains for the environment.

The recent drought saw in significant reductions in streamflows in Far East Gippsland, with autumn months experiencing the greatest reductions. The disproportionate impact on autumn streamflows was common to most waterways in Victoria.

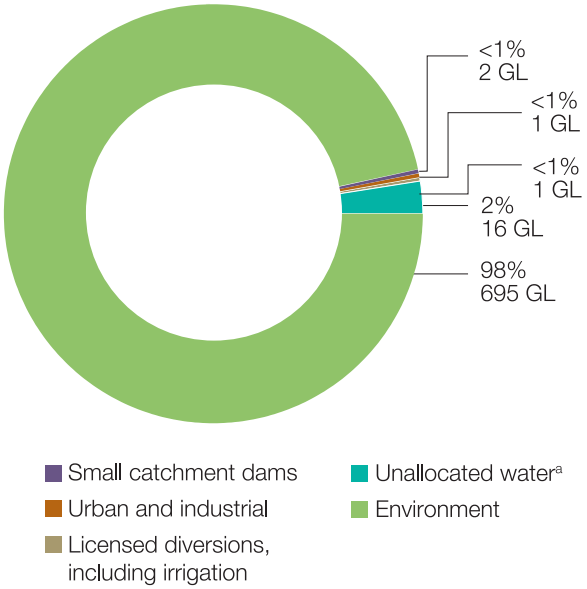
Softwood plantations are located in the north of the area extending across the New South Wales border. Small areas of irrigation along the fertile flats of the Cann and Snowy rivers support agricultural activities including dairying, beef cattle production and some cropping and horticulture.

The Cann and Genoa rivers begin in New South Wales, as does the Snowy River.

Figure 7.2 (page 154) provides an overview of the key features of the larger tributaries within the Far East Gippsland river systems. It shows that most urban demands are met from several small supply systems within the catchments. These small supply systems meet urban and industrial demands which are less than 1 per cent of total average streamflows (see Figure 7.1). The systems supply permanent residents in towns and provide for peak demands during holiday periods.

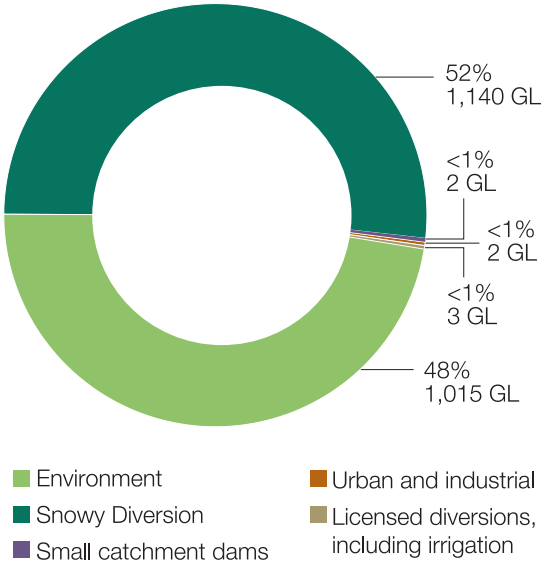
Figure 7.1 Surface water available for different uses (average annual)

a) Far East Gippsland catchments, excluding the Snowy River (total average annual flow of about 714 GL)



Note:
a See Action 7.2, page 156.

b) Snowy River catchment, including diversions from the Snowy Mountains Hydro-electric Scheme in NSW (average annual flow of about 2,162 GL)[a]



Note:
a Based on long-term streamflow records.

Table 7.1 Groundwater management units

Groundwater management unit	PCV (ML)	Licensed entitlement[a] (ML)	Metered use[a] (ML)	Unallocated water[ab]	Groundwater availability
Orbost GMA	1,201	1,201	333	0	Water available through trade, as the licensed entitlement has reached the permissible consumptive volume
Total	**1,201**	**1,201**	**333**	**0**	

Notes:
a These amounts are taken from the 2009/10 Victorian Water Accounts.
b Although water is available under the PCV in some GMUs, Southern Rural Water may not issue licences due to considerations under Section 40 of the *Water Act 1989*.

7.1.2 Groundwater availability and use

Groundwater is a minor source of water in Far East Gippsland with only about 150 groundwater bores used for domestic and stock purposes. The main source of groundwater used in the area is from the Orbost Groundwater Management Unit, which is a confined aquifer made up of sands and gravels. It has a permissible consumptive volume of 1,200 ML, which has been fully allocated (see Table 7.1).

There are only small volumes of groundwater used across the rest of the area. Groundwater is used to supplement the Mallacoota supply system during low-flow periods in the Betka River. The groundwater supply was added to the Mallacoota town supply in response to the dry conditions experienced during the recent drought.

7.1.3 Environmental and cultural values

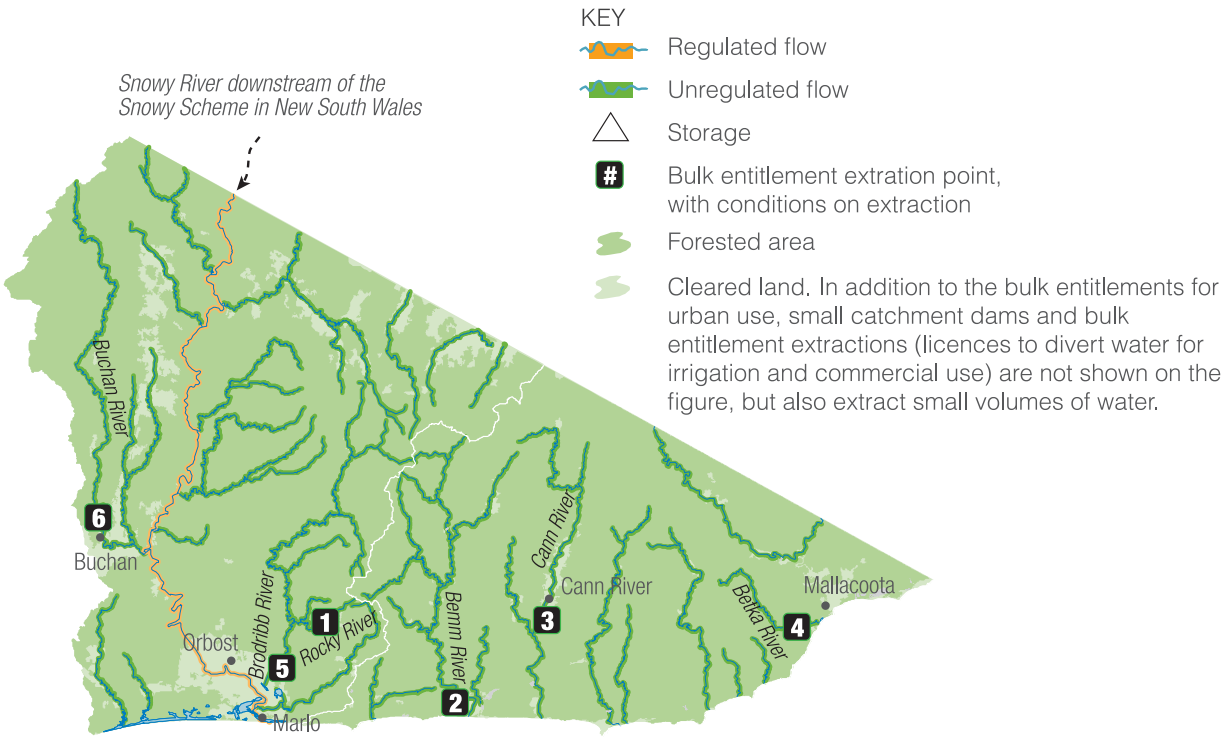
The environment of Far East Gippsland has a rich and diverse cultural heritage including Traditional Country for the Bidwell and Nindi-Ngujarn Ngarigo Monero Indigenous people.

Through their cultural traditions, the Bidwell and Nindi-Ngujarn Ngarigo Monero identify areas such as Coopracambra National Park, Bemm River Scenic Reserve and the Snowy River National Park as their Traditional Country.

Many rivers and catchments in Far East Gippsland are in excellent condition. Aside from the main stem of the Snowy River, no waterways have any significant flow regulation and there are very low level of diversions from waterways apart from those for the Snowy Mountains Hydro-electric Scheme.

Far East Gippsland

Figure 7.2 Overview of some key features of the larger tributaries within the Far East Gippsland river systems[a]



1	**Rocky River diversion weir, Rocky River**	• East Gippsland Water may take water at a maximum rate of 1.56 ML/day • East Gippsland Water must allow a minimum flow of 1 ML/day, or the natural flow, to pass
2	**Bemm River pump station, Bemm River**	• East Gippsland Water may take up to 100 ML/year at a maximum rate of 1.47 ML/day • No passing flow requirement
3	**Cann River pump station, Cann River**	• East Gippsland Water may take up to 192 ML/year at a maximum rate of 1.04 ML/day • No passing flow requirement
4	**Mallacoota diversion weir, Betka River**	• East Gippsland Water may take up to 330 ML/year at a maximum rate of 1.55 ML/day • East Gippsland Water must allow half of the flow to pass when flow is 3.1 ML/day or less
5	**Brodribb River pumping station, Brodribb River**	• East Gippsland Water may take water at a maximum rate of 5.74 ML/day • No passing flow requirement
6	**Buchan pump station, Buchan River**	• East Gippsland Water may take up to 170 ML/year at a maximum rate of 1.05 ML/day • No passing flow requirement

Note:
a East Gippsland Water may take up to 2,031 ML/year from its offtakes on the Brodribb and Rocky rivers.

The well preserved landscape and forests are popular for recreational activities, and support the local tourism industry.

Estuaries are recognised by Traditional Owners as sites of great significance and form part of the heritage and rich cultural history of Aboriginal communities. Sites of importance to Traditional Owners extend from the coastal fringes upstream into the catchments.

7.1.4 Pressures on future water availability

Many waterways and estuaries may experience pressure from changing demands for water use, or from a changing climate. Other non flow-related pressures include continued siltation of waterways caused by past land clearing, and the introduction of pest plants and animals. Managing the Snowy scheme may lead to additional challenges if drier climatic conditions are experienced in the future. The following sections of this chapter present the Strategy actions and policies that respond to these pressures in Far East Gippsland.

7.2 Promoting sustainable use of water

7.2.1 Providing certainty and improved flexibility for water users

Aside from the main stem of the Snowy River, waterways in Far East Gippsland have no significant flow regulation. In these unregulated flow catchments, water is allocated to:

- individuals with private rights under Section 51 of the *Water Act 1989* to take and use surface water or groundwater for domestic and stock purposes;
- individuals with a take and use licence under Section 51 of the *Water Act 1989* to take and use surface water or groundwater; and
- water corporations with bulk water entitlements to access surface water.

If water is available, it can be taken and used in accordance with the licence or bulk water entitlement conditions.

If there is not enough water available for all needs, water use is restricted to share the available water between consumptive users and to protect the environment, domestic and stock water users and the long-term use of the resource.

Local management plans[45]

In many areas, management of licensed use needs to be more responsive and adaptable to local conditions and the characteristics of each groundwater or unregulated river system. Triggers for applying and removing restrictions on using water need to:

- closely match the characteristics of each system, with every opportunity explored to apply them in a way that best meets the needs of users and the environment; and
- be clearly documented and well understood by users, with any proposed changes subject to appropriate consultation with users and environmental managers.

Local management plans will be used across the catchments and groundwater systems of Far East Gippsland to clearly define the rules to manage section 51 take and use licences. They will include rules and triggers for imposing restrictions during times of shortage as well as local water trading rules where needed (see Action 7.1).

More information on the basis for developing local management plans is described in Chapter 3 (Section 3.2.2, page 41).

In some systems increased groundwater extraction can reduce streamflow and therefore impact on groundwater dependent ecosystems and the reliability of existing surface water users. The *Water Act 1989* enables groundwater and surface water interconnections to be managed, while resource assessments can provide an opportunity to learn more about these interconnections and where they are, to refine our current management. Local management plans will consider these interactions to ensure the interests of existing surface water and groundwater users and the environment are protected.

Local management rules are already in place for the following catchments in Far East Gippsland: East Gippsland Basin and the Snowy River. For these catchments, the rules specify arrangements for introducing rosters, restrictions and bans. In the first instance, these rules will simply be converted to management plans. This will not require significant resources or be costly. Over time these plans may be revised to incorporate more detailed management arrangements to meet local needs (see Table 7.2). For example, more detailed water trading rules may be required in the future. Local Management Plans will be developed for groundwater management areas as described in Table 7.3.

Action 7.1 Local management plans for the main river systems in Far East Gippsland.

Who: Southern Rural Water, East Gippsland Catchment Management Authority

Timeframe: as needed

Existing operating arrangements for Gippsland's surface water and groundwater systems will be formalised as local management plans.

Local management plans will be developed and reviewed in accordance with the Minister's *Policies for Managing Section 51 Take and Use Licences.*

Rural water corporations will consult stakeholders during the development and amendment of local management plans, particularly when the proposed plan will affect the issue, renewal or transfer of licences and groundwater carryover.

In developing local management plans, water corporations in close consultation with water users and catchment management authorities, will seek to explore opportunities to develop operating rules that, where practical, deliver multiple benefits to consumptive users and the environment.

When revised local management plans are prepared, interactions between surface and groundwater resources will be considered.

Far East Gippsland

Water for new entitlements

Many waterways in Far East Gippsland are in near pristine condition, and some are heritage rivers under the *Heritage Rivers Act 1992*. It is important that the waterways in near pristine condition are protected.

The demand for significant volumes of new water extractions is relatively low. Some catchments, such as the Bemm River, are almost fully covered by forested public land which limits the potential for any significant new consumptive water demands. Although actions are needed in some locations to secure urban water supplies, most towns have fairly reliable water supplies and relatively stable populations.

Sharing water between consumptive use and the environment is a key issue for this Strategy. Water that is not extracted for consumptive use provides environmental, recreational and cultural benefits to the community.

Chapter 3 (Section 3.1.1, page 34) presents principles for how new water licences can be issued in a balanced way that protects environmental values and the reliability of existing water users. This approach has been used to determine the amount of additional water set out in Action 7.2 that can be licensed for consumptive use in Far East Gippsland.

The amount of unallocated surface water available for winter diversion was determined having regard to the:

- environmental, economic and social values supported by the catchment and costs associated with maintaining and improving those values;
- need to protect the reliability of supply to existing water users and the environment;
- existing and projected availability of water in the river basin, including the reliability of supply during dry years;
- economic benefit of allocating more water for economic development; and
- need for a precautionary approach to promote intergenerational equity and sustainable water resource management.

Table 7.2 Local management plans for surface water[a]

Action	River basin	Unregulated river system	Timeframe
Areas where existing rules will be documented as local management plans	East Gippsland	East Gippsland Basin	End 2012
		Snowy River	

Note:
a A local management plan will be developed for each unregulated river basin. Where needed, plans for specific unregulated rivers within each basin will be developed and attached as a schedule to the local management plan for the basin.

Table 7.3 Local management plans for groundwater

Action	Management Area	Timeframe
Areas where existing rules will be documented as local management plans	Orbost GMA	End 2012
	Unincorporated areas	End 2012

Note:
a Areas that are not included in either a GMA or WSPA are called unincorporated areas.

Action 7.2 Revised cap on the amount of unallocated surface water available for winter-fill (July to October) diversions in Far East Gippsland's catchments

Who: Department of Sustainability and Environment, Southern Rural Water, East Gippsland Catchment Management Authority **Timeframe:** End 2012

Consistent with the principles outlined in Chapter 3, the following caps will be placed on the amount of unallocated surface water that remains available for new uses:

- 500 ML across each of the Genoa and Cann river catchments; and
- 500 ML in total across other catchments in Far East Gippsland where water is still available under the SDL.

A staged approach will be taken to allocate this water, with Southern Rural Water determining how this water will be allocated in each catchment – which may occur initially through expressions of interest, auctions or allocations based on a reserve price.

Licences to unallocated water will only be made available at or above a reserve price. Allocations may be made through an auction process in some catchments and in accordance with the *Water Act 1989*, which includes the need to demonstrate that the purchase is for a genuine water demand.

The amounts of water available for new entitlements in Far East Gippsland will be reviewed as part of the Strategy review in 10 years.

This balanced approach will help to protect the near pristine condition of the rivers and protect the reliability of supply to existing users. It will also enable new allocations to be made as knowledge of the resource improves over time. By applying the principles outlined above, this Strategy provides the flexibility to adapt over time, with volumes to be evaluated again in 10 years as part of the Strategy review.

Where new groundwater entitlements are not available, water entitlements for new users need to be bought (traded) from an existing entitlement-holder. In recent years only a relatively small proportion of the annual licensed entitlement in the Orbost GMA has been used in any one year.

The Government supports additional water being made available through trade where a resource appraisal shows this can be done sustainably.

Water trading

In Far East Gippsland where no new water entitlements are available, the only way to obtain more water is to buy it from another water user unless an alternative source (such as recycled water) is available.

Very little water has been traded in Far East Gippsland to date, as a result of the small number of licence-holders and because new allocations are available in some catchments.

An investigation[46] into water demands in unregulated catchments including those in Far East Gippsland was undertaken as part of this Strategy. The conclusions and actions to improve the ability to trade surface and groundwater entitlements across Gippsland are presented in Chapter 4, Section 4.1.2 (page 63). Actions include:

- market development and education;
- better water trading information;
- improving trading rules in unregulated river systems; and
- better information about groundwater trading.

Other actions and policies to improve flexibility and provide certainty.

Other actions and policies in this Strategy to help improve flexibility and provide certainty for water users in Far East Gippsland are presented in Section 3.2, page 41).

7.2.2 Improving reliability of supply for urban and industrial water users

Towns with reticulated supplies across Far East Gippsland are serviced by East Gippsland Water. About 3,550 people are supplied from these reticulated systems. The water supply systems service some smaller towns in Far East Gippsland and also cater for peak demands experienced in some of these towns during holiday periods. Most industrial water use occurs from within the reticulated supply systems, with the largest industrial water user, a dairy farm at Newmerella (Orbost), using about 19 ML a year.

The water supply systems are shown in Figure 7.3, page 158). Many of these towns (except Newmerella, Buchan and Nowa Nowa) are also provided with a wastewater removal and treatment service. East Gippsland Water is considering options to construct a new sewerage system at Bemm River.

Balancing supply and demand for towns

The potential impact of future climate on run-off, an increase in floods and bushfires, and the increase in water demands in Far East Gippsland are considered as part of the long-term planning developed through the water supply-demand strategies that have been prepared by East Gippsland Water. All urban water corporations in Victoria are required to develop water supply-demand strategies to ensure that there is adequate supply reliability in the future.

Actions considered as part of East Gippsland Water's water supply-demand strategy[47] to improve the reliability of supply include:

- water conservation;
- undertaking capital works to reduce losses within the water distribution system;
- accessing groundwater reserves and high winter streamflows; and
- using alternative water sources.

The latest version of East Gippsland Water's water supply-demand strategy, finalised in 2011, consists of individual strategies for each of East Gippsland Water's urban supply systems (see Action 7.3). These are available from East Gippsland Water and a summary is presented in Appendix 5.

The water supply-demand strategy presents the projected supply and demand for all the urban water supply systems in Far East Gippsland. An example for Mallacoota is shown in Figure 7.4, page 159.

In finalising the water supply-demand strategy, the target level of reliability for each supply system has been determined by East Gippsland Water, in consideration of its customer's views. The target level of reliability for each system is clearly defined in the strategies, consistent with the requirements of Action 4.8 (page 78).

Far East Gippsland

Responding to increasing extreme events

A key challenge for this area is to maintain reliability of urban supplies when recovering from bushfires and floods. Climate change predictions for Gippsland indicate that floods and bushfires are likely to occur more frequently. This means that resilience of the system to the impact of such extreme weather and other emergencies is an important priority for East Gippsland Water.

East Gippsland Water has management plans in place for periods when bushfires cause serious water quality problems in waterways used for urban supply. The bushfires that threatened Cann River in early 2010 prompted East Gippsland Water to refurbish and donate one of its unused water bores and pump station to the people of Cann River. The bore will be available for use by fire crews to help strengthen the town against future threats from bushfires.

Improving reliability of urban supplies through capital works

A priority for East Gippsland Water is to ensure that its customers have secure, consistently high quality drinking water supplies, and are protected against the impact of extreme weather and climate change.

East Gippsland Water is investing in its supply systems to improve water quality, reduce leaks and increase security. For example, the installation of covers over water storages at Mallacoota, Bemm River and Cann River and water storage tanks at Buchan will reduce evaporation losses and improve water quality.

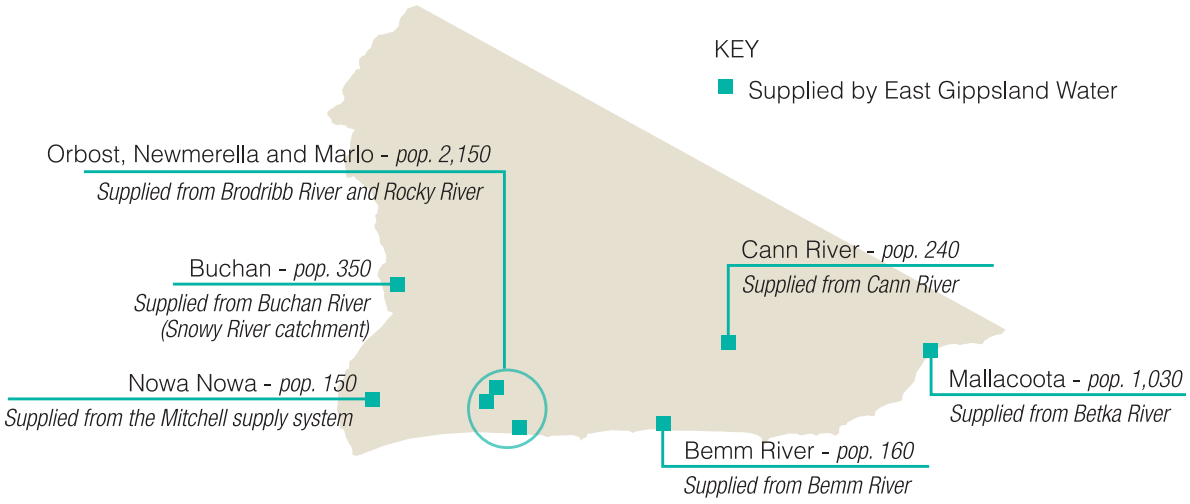
Accessing groundwater reserves

In the Mallacoota system, actions are needed to balance supply and demand with a decreasing reliability of supply of streamflows in the Betka River. This is an ephemeral coastal stream and estuary system that enters the ocean west of Mallacoota. The Betka River has been the main supply of drinking water for Mallacoota over many years and, until recently, has always experienced reliable flows. But in the past three years there has been a significant reduction in flow. In response, East Gippsland Water has increased the use of groundwater for drinking water supplies to Mallacoota.

Storage options and accessing winter streamflows

Although water is available for new surface water licences in some locations, it is available only in wetter periods, and can be extracted only under rules that share the resource between different users and minimise the risk to environmental health. To meet water needs during summer, additional water that can be extracted over the wetter months needs to be stored.

Figure 7.3 Map of urban supply systems and population served[a]



Note:
a Population figures are estimates supplied by East Gippsland Water.

Action 7.3 Water Supply Demand Strategy – East Gippsland Water

Who: East Gippsland Water **Timeframe:** by March 2012

East Gippsland Water has developed its final water supply-demand strategy with individual strategies for each of the urban supply systems in far East Gippsland. These strategies detail how water supplies and water demands will be balanced over the long term. East Gippsland Water has considered the views of its customers in completing its water supply-demand strategy. East Gippsland Water will implement the actions in its water supply-demand strategy as demand requires.

Review of drought response plans

In addition to the planning undertaken through its water supply-demand strategies, East Gippsland Water uses drought response plans to manage temporary water shortages. These plans outline a staged approach to managing temporary water shortages, which can include measures to progressively reduce demand by introducing water restrictions.

The water corporation has updated its plans to take into account the lessons from recent experience, which was completed in parallel with the review of its water supply-demand strategies. For more information on the review of drought response plans, see Action 4.9 (page 79).

7.2.3 Improving reliability of supply for agriculture and rural water users

Most freehold land in Far East Gippsland is used for dryland grazing. Figure 7.5 shows the broad distribution of agriculture across the area. In addition to grazing, there are some dairy farms along the lower Snowy River near Orbost. Water is used for domestic and stock purposes throughout the area.

There are opportunities to improve the reliability of supply for agricultural and rural water users across Far East Gippsland, depending on the location and water requirements of the activity. Opportunities for the main user groups are described below.

Domestic and stock water users

Water for domestic and stock water use is required in Far East Gippsland where access to town supply systems is not available. Reliable water supplies are needed for domestic use, and supplies for stock watering are vital for the area's dryland farming enterprises.

Rainfall collected from roofing is the main source for rural domestic use, and stock watering is mostly supplied by small catchment dams. Landowners generally have the right to access these supplies for domestic and stock use, with this being an 'as of right' activity under Section 8 of the *Water Act 1989*.

Depending on the location, opportunities can exist to supplement domestic and stock water supplies with groundwater or by pumping from waterways. The ability to access these supplies depends on where aquifers and waterways are located, the reliability of the supply, and in cases where a licence is required, whether a licence can be obtained. Southern Rural Water is responsible for assessing licence applications throughout Gippsland.

Actions relating to domestic and stock use are presented in Section 3.3.1 (page 53) and Section 4.2.1 (page 74).

Licensed surface water users

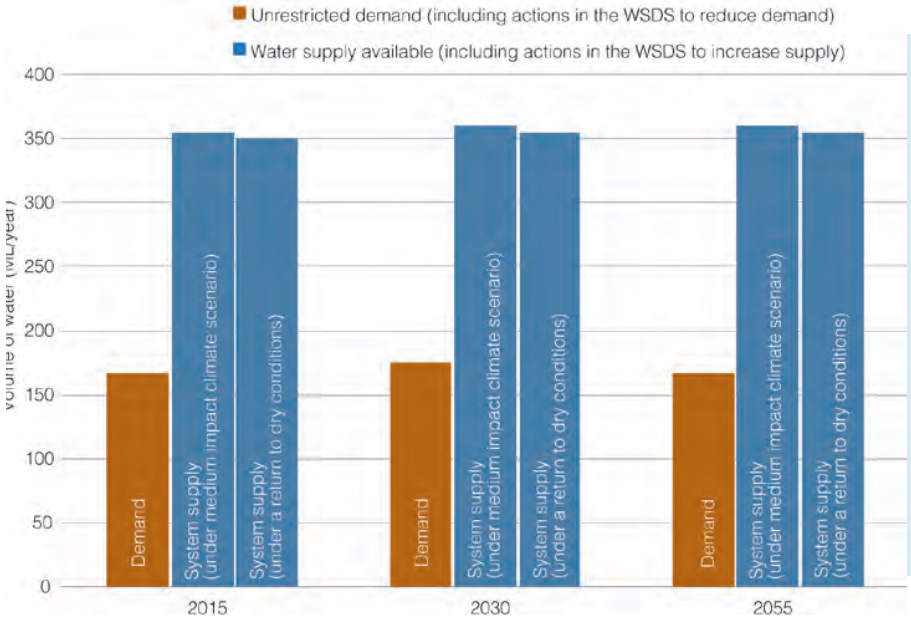
There is a relatively small number of licensed diverters, with average annual diversions less than 1 per cent of run-off. Diverters from unregulated catchments who manage their own supply needs will need to understand the potential impact of climate change and climate variability on the reliability of supply and the options available for managing the risks associated with less or more variable inflows including:

- greater opportunities for trade on unregulated systems;
- diversifying supply sources;
- exploring opportunities to use groundwater; and
- any opportunities to access water for winter-fill extraction.

Licensed groundwater users

There is only a small number of licensed groundwater extractors, mainly within the Orbost GMA. Threats to the availability of groundwater for agricultural and rural use include the possibility of reductions in recharge under a drier climate future.

Figure 7.4 Future water demand and availability projections for Mallacoota



Assumptions

- This figure is based on East Gippsland Water's long-term draft water supply-demand strategy.
- The graph shows the average system supply available, catering for a range of scenarios into the future.
- System supply in Mallacoota uses surface water, groundwater or a combination of both depending on the circumstances at any one time.
- Demand has been determined using Victoria in Future population growth estimates.

Far East Gippsland

Other actions and policies to improve agricultural and rural supply reliability

The main actions in this Strategy that will help protect the future water supply reliability of agriculture and rural water uses from groundwater and waterways in Far East Gippsland are discussed in Section 4.2.1 (page 76).

7.2.4 Managing other pressures on future water availability

Considering water impacts when undertaking planned burning on forested Crown land

Climate change predictions for Gippsland indicate that floods and bushfires are likely to occur more frequently. Planned burning can reduce the risk posed by bushfires, and in some cases may help to reduce the risk of major bushfires on water quality and quantity by reducing the size, intensity and subsequent impact of bushfires. These positive impacts need to be weighed against the relatively minor impacts of planned burning on water quality and yield (see Action 3.20, page 59).

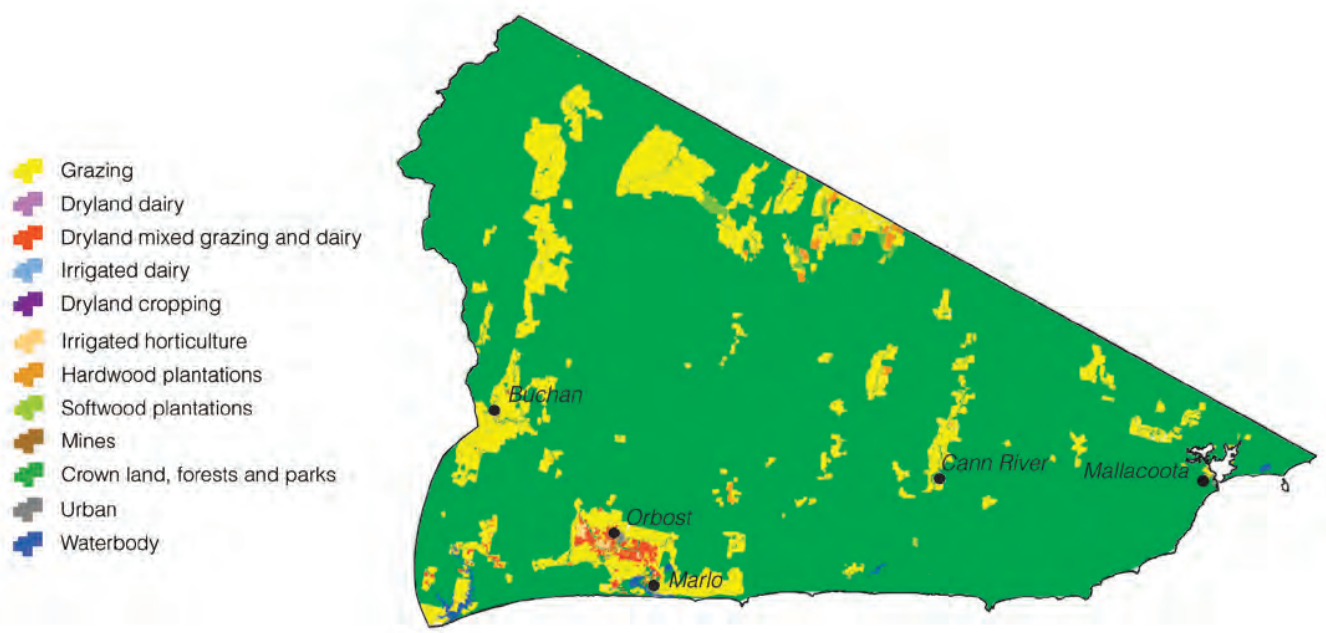
Better aligning groundwater management boundaries with aquifer systems

New groundwater management boundaries in Far East Gippsland will be developed based on groundwater systems. This will ensure that all uses of the same groundwater system are subject to consistent rules. Revised boundaries will be considered for the Orbost GMA, and will also be developed for the rest of Far East Gippsland. The boundaries will be developed through the Secure Allocation, Future Entitlements (SAFE) project (see Action 3.15, page 55).

Other actions and policies to manage pressures on future water availability

Other actions and policies in this Strategy to help manage the pressures on future water availability in Far East Gippsland are presented in Chapter 3, page 33.

Figure 7.5 Agricultural and rural water uses



7.3 Protecting waterways, aquifers, wetlands and estuaries

Many of Far East Gippsland's waterways are in near pristine condition because most of the area is covered in native forest. Far East Gippsland includes highly valued, near pristine estuaries and wetlands including the lower Snowy River wetland system, the Betka, and Yeerung river estuaries, and the Sydenham, Tamboon and Mallacoota inlets.

The area supports the heritage-listed Snowy, Suggan Buggan, Berrima, Genoa rivers and the Bemm River with its tributaries, the Goolengook, Errinundra and Arte rivers.

The rivers and estuaries in Far East Gippsland support a diversity of native fish species, including the threatened Australian grayling, that rely on healthy streamflows with variable flow regimes.

Far East Gippsland rivers have high tourism and recreational values including fishing opportunities, nature-based pursuits, white water rafting in the Snowy and low impact recreation activities on picturesque rivers.

The Cann, Thurra, Wingan and Betka rivers are listed within the UNESCO Biosphere Reserve area in the Croajingolong National Park.

Tourism generates significant economic benefit that the local community relies on. Popular holiday destinations include Buchan River, Snowy River, Mallacoota Inlet, and many waterways and estuaries including those in the Croajingolong National Park.

7.3.1 Complementary works and programs

Complementary works and measures such as revegetation and streamside fencing are particularly important in Far East Gippsland. Aside from the Snowy River, there is little need to provide additional environmental flows because there is no flow regulation and only a very small volume of water diverted for consumptive use.

An important focus is to improve the water quality by continuing to build on the work undertaken with landholders to improve catchment management (see Action 7.4). This includes investing in fencing to keep stock off stream banks and out of waterways, removing weeds and revegetating with indigenous plants.

The East Gippsland Catchment Management Authority will continue to implement complementary in-stream and streamside works consistent with the priorities in the Victorian and East Gippsland Regional Strategy for Healthy Rivers, Estuaries and Wetlands (see Appendix 6).

Before: View from West Cann Bridge, April 1969, EGCMA

After: View from West Cann Bridge, July 2008, EGCMA

Action 7.4 Protecting Far East Gippsland's high value rivers through a continued focus on catchment management

Who: East Gippsland Catchment Management Authority **Timeframe:** Ongoing

Catchment management will continue to be a focus of the work of the East Gippsland CMA in Far East Gippsland, through on-ground actions including revegetation of the riparian zone, removal of willows and fencing. Improvements in catchment management will help to improve the water quality entering the near pristine river systems in Far East Gippsland.

7.3.2 Protecting the environment's share of water

Protecting Far East Gippsland's high value catchments is an important aspect of this Strategy, with a balanced approach taken to issuing any new water entitlements for consumptive use. This approach will help to ensure that new water allocations occur only where there is a relatively low risk to environmental values (see Action 7.2, page 156 and Section 3.1.1, page 34).

7.3.3 Adapting to a changing environment

Over the long term, sea level rises and increases in storm surges are likely to affect all the estuaries and inlets in Far East Gippsland, with impacts including an increase in coastal erosion and flooding. Climate variability is also likely to impact on the amount of streamflow entering the wetlands and estuaries, altering the location of the freshwater-saltwater interface in the estuaries.

Adapting to a changing environment may mean that in the future some environmental objectives cannot be met. If environmental objectives can no longer be met as a result of long-term changes in climate and water availability, they will be formally amended as part of the development of *Regional Strategies for Healthy Rivers and Wetlands* (see Action 4.16, page 90.

7.3.4 Improving the environmental values of the Snowy River

The heritage-listed Snowy River originates on the high plateaus of Mt Kosciusko in the Snowy Mountains, New South Wales, flowing through pristine areas of forest wilderness and into Bass Strait on the mid-East Gippsland coast at Marlo (see Figure 7.6).

Until the mid-20th century, the river was notable for its high volume of freshwater, many wide reaches of river and large rapids. The environmental condition of the Snowy River is now rated very poor in NSW and poor to moderate further downstream in Victoria. This is primarily due to the major impacts of damming its headwaters to construct the Snowy Mountains Hydro-electric Scheme (Snowy Scheme). The most dramatic change to the Snowy River system has been the loss of high spring flows driven by snowmelt.

Significant tributaries of the Snowy River include the Buchan, Yalmy, Murrindal, Suggan Buggan, Deddick and Delegate rivers. Most of the Snowy's tributaries downstream of the Snowy Scheme are in good environmental condition due to these being largely forested tributaries with little or no flow regulation. Some reaches of the Snowy River also contain high silt levels mainly due to land clearing practices last century and reduced river flows since the construction of the Snowy Scheme's Jindabyne Dam. A subsequent reduction of environmental flows due to the Snowy Scheme has contributed to sand deposits in the Snowy River estuary.

The Snowy Mountains Hydro-electric Scheme

The Snowy Mountains Hydro-electric Scheme (Snowy Scheme) is a water storage and hydroelectric power facility located in Kosciusko National Park, NSW. The Snowy Scheme was designed after the 1936 to 1945 drought to expand inland irrigation and generate hydroelectricity to meet critical demands. The 3,800 MW scheme has seven major power stations (two underground), 16 major dams, 80 km of aqueducts, 145 km of interconnected tunnels and a large pumping station. The scheme was built by the NSW, Victorian and Commonwealth governments between 1949 and 1974.

The Snowy Mountains Hydro-electric Authority was corporatised by complementary legislation passed by the NSW, Victorian and Commonwealth governments. The *Snowy Hydro Corporatisation Act 1997* (the Act) provided for the establishment of Snowy Hydro Limited (Snowy Hydro), a corporate entity able to participate in the National Electricity Market. Snowy Hydro is jointly owned by the NSW (58 per cent), Victorian (29 per cent) and Commonwealth (13 per cent) governments.

Snowmelt from the Snowy Mountains in the Great Dividing Range is captured and diverted westward through trans-mountain tunnels to the Murray and Murrumbidgee rivers. Snowy Hydro manages the release of water from the Snowy Scheme in accordance with the Snowy Water Licence which sets out obligations for the release of water to the River Murray and the Murrumbidgee River. The obligations require Snowy Hydro to release environmental flows into the Snowy and Montane[48] rivers.

Snowy Hydro's main obligation under the Snowy Water Licence is to release nominal annual volumes, known as 'required annual releases', of 1,062 GL to the River Murray and 1,026 GL to the Murrumbidgee River. These volumes were set on the basis that the scheme would be capable of releasing the required annual releases each year through the driest inflow sequence on record (1936-1945) at that time.

All water released from the scheme to the western rivers is captured in downstream storages at the Hume Dam on the River Murray and Blowering Dam on the Murrumbidgee River for future release to water users in the respective irrigation areas.

In 2000, the NSW, Victoria and the Commonwealth governments agreed to return environmental flows to the Snowy River, setting out commitments in the Snowy Water Licence and Snowy Water Inquiry Outcomes Implementation Deed (SWIOID)[49]. The targets set out in the SWIOID are shown in Table 7.3 (page 164).

The SWIOID also established the requirement to create and fund a joint government enterprise, trading as Water for Rivers, to pursue water efficiency and savings measures in the western rivers to achieve the water recovery targets for the Snowy and Murray rivers. By 2007, the then Victorian, NSW, and Commonwealth governments had jointly committed $425 million to fund the return of environmental flows to the Snowy.

Figure 7.6 Snowy River catchment and Snowy Mountains Hydro-electric Scheme

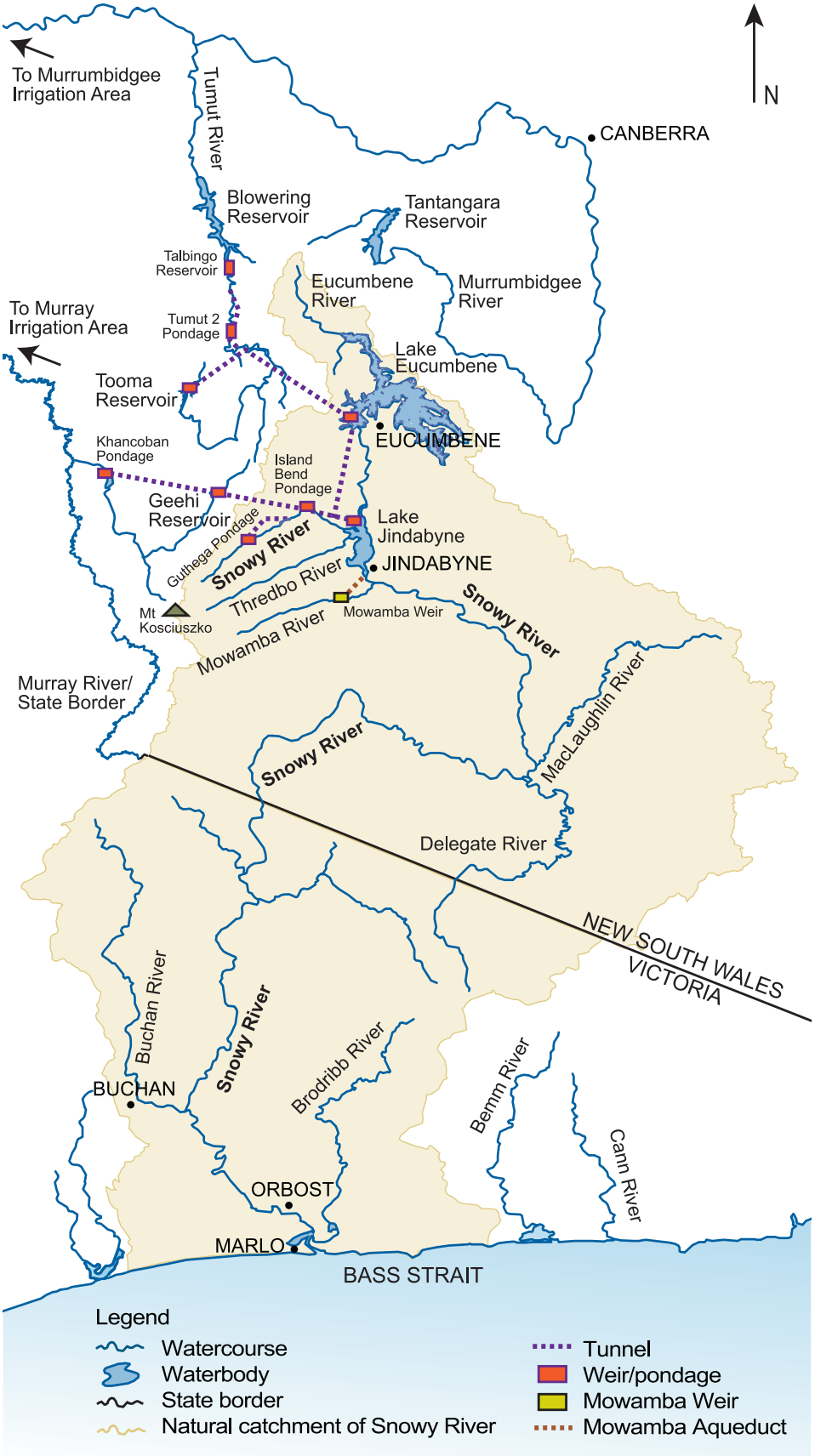


Table 7.3 Snowy water recovery targets

Timing	Target Volume[a]
By 2002 (first year of corporatisation)	Return up to a maximum of 38 GL or 4% of mean average natural flows to the Snowy
By 2009	Return 142 GL or 15% of average natural flows to the Snowy (and 70 GL to the Murray)
By 2012	Return 212 GL or 21% of average natural flows (and 70 GL to the Murray)
After 2012 (unfunded, to be achieved through public private partnerships)	Return between 212 GL and 294 GL or 28% of average natural flows

Note:
a Base passing flows of 9 GL per year are included in percentage calculations

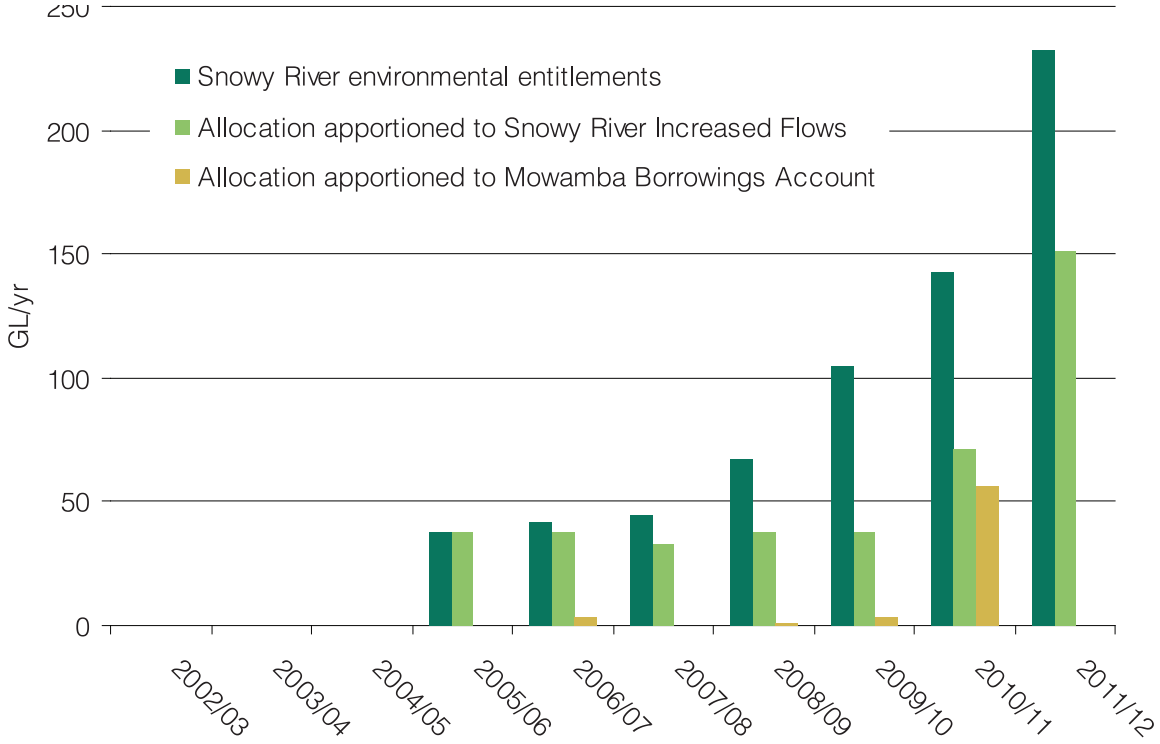
Water for Rivers has been successful in recovering water through investment in water-efficiency infrastructure projects, innovation and technology and where appropriate, by acquisition of water entitlements. The water recovery projects have been located in the Murray, Goulburn and Murrumbidgee river systems, upstream of the South Australian border. The main Victorian projects returning flows to the Snowy include:

- decommissioning of Lake Mokoan;
- channel automation in the Central Goulburn Irrigation Area;
- Woorinen piping of domestic and stock water supplies; and
- Normanville pipeline project.

The 2012 target of obtaining 212 GL and 70 GL long-term average flows for the Snowy River and the River Murray respectively (see Figure 7.7) is expected to be achieved. At the completion of the Water for Rivers project, a minimum of 311 GL of water entitlements is expected to be recovered for these rivers. This will be a mix of high, general and low-reliability water entitlements which are expected to deliver about 96 to 98 per cent of the 2012 flow targets as an average compared to the long-term period of record.

Technical Paper 7 provides additional information on the management of the Snowy Scheme, the impact of the recent drought, environmental water recovery, and how environmental releases are made.

Figure 7.7 Summary of Snowy environmental entitlements and releases[50]



Impact of the drought on environmental releases for the Snowy River

Since the start of the water recovery program, actual environmental releases have been much lower than the entitlement volumes recovered due to the impact of the recent drought and the repayment of the Mowamba borrow.

The Mowamba borrow is water that was borrowed from the Snowy Scheme to allow the initial environmental releases to be made to the Snowy after the SWIOID came into effect. This was achieved by not diverting Mowamba River water to Lake Jindabyne from 2002 to 2005 and allowing it to flow directly into the Snowy River. This effectively created a 'borrow' of 65 GL of water from the Scheme. An intergovernmental deal[51] was made in 2010 to recover additional water in that year to pay back the remainder of the 'borrow' and provide additional flows to the Snowy River in 2010/11.

During the recent drought, the seasonal allocations made against the Snowy entitlements that were being progressively recovered by Water for Rivers were low. The allocation is a reflection of the river system from where the water savings were sourced. For example if the savings were made on the Murray system which received a 30 per cent annual allocation, the environmental entitlement would also receive a 30 per cent allocation.

Unprecedented low water allocations have been experienced in the Murray, Goulburn and Murrumbidgee rivers in recent years due to the drought, and so the volumes allocated to the Snowy River have been substantially less than the entitlement volume. With the recent increase in rainfall and improved seasonal allocations against the Snowy entitlements recovered to date, the volumes allocated to Snowy River environmental flows have significantly increased and will be 152 GL in 2011/12[7].

Five-year Snowy Water Licence Review – November 2009

The Snowy Water Licence sets out the arrangements under which the NSW Government must review the licence provisions relating to the Snowy River Increased Flows on the fifth anniversary of the corporatisation date and the licence obligations every 10 years thereafter. The licence may be varied on agreement between the three partner governments, and with community consultation, to give effect to outcomes from a licence review or in relation to national reform of water entitlements.

The first five-year Snowy Water Licence Review began in 2007 and was released in November 2009[53]. The outcome of the review did not propose significant changes to the licence conditions. The only change was to clarify the daily water releases from Tantangara Dam.

Since then, the unprecedented drought conditions over the last decade, and the return to wetter conditions provided the impetus to initiate a more recent suite of changes to the current water-sharing arrangements in the licence to improve management of releases from the Scheme to the western river systems.

These changes to the Snowy Water Licence will:

- Remove the requirement to release additional volumes of water following a recovery from extreme drought to immediately make good any shortfalls to the required annual releases, and retain that volume of water for future years.
- Provide for a drought reserve in the Snowy Scheme that can be accessed to support critical human needs in the Murray and Murrumbidgee systems. This will allow drought reserves currently kept in Murray storages to be held in the Snowy instead, freeing up storage capacity for irrigators in the Murray system.
- Provide more certainty around the timing of environmental releases from water savings held for the River Murray. Up to 70 GL is accumulated each year for River Murray Increased Flows and was previously released at the discretion of Snowy Hydro.
- Allow Snowy Hydro to increase releases in excess of the required annual releases and have these releases treated as an advance against the following year's required annual release.

The details of these changes were agreed between Snowy Hydro, the three shareholder governments and the Murray-Darling Basin Authority, and have also been through a formal NSW Government community consultation process.

Changes to the Snowy Water Licence took effect on 4 October 2011, however these changes also need to be incorporated in the Murray-Darling Basin Agreement to ensure appropriate water accounting of releases to the Murray River. This process should be completed shortly.

Snowy River, Graeme Dear

Challenges for future water recovery

The Victorian Government remains committed to improving the environmental flows and environmental outcomes on the Snowy River. With the recent increase in efforts to restore environmental flows to the River Murray, it will be important for all jurisdictions to maintain their efforts in delivering environmental flow commitments to the Snowy.

During the recent drought, *Water for Rivers* was operating in a much more competitive market for pursuing water savings or purchasing entitlements than was the case before the drought. The $425 million spent on water recovery for the Snowy is much less than the amount being spent on water recovery for the River Murray, and the increased competition for water savings raised the cost of achieving targeted savings. It also presents challenges in terms of pursuing the additional 7 per cent of average natural flow some time after 2012.

Much has changed in water management since the original agreements were made for sharing water from the scheme and recovering water for the Snowy River was experienced. The worst drought period on record (1997-2009) and the institutional settings have changed. The Commonwealth is playing a greater role through the introduction of the Commonwealth *Water Act 2007* and the development of a Murray-Darling Basin Plan, which will set new sustainable diversion limits for the Murray-Darling system. Although the Snowy River is not within the Murray-Darling Basin, the Murray-Darling Basin Plan will be consistent with the Snowy Water Licence. The high priority placed on returning flows to the River Murray will make it more difficult to get additional water entitlements for the Snowy River.

The greater competition for generating water savings and higher costs will need to be considered by the NSW, Victorian and Commonwealth governments as they deliver on their 2012 commitments and consider the next steps to improve environmental outcomes on the Snowy River.

Improved transparency and reporting of environmental watering

The recent experience of low allocations to the Goulburn and Murray entitlements resulting in reduced environmental flows to the Snowy has highlighted the need to improve reporting of environmental watering events on the Snowy River. As a result of the complexity of the Snowy Agreements, it has been very difficult for the community to understand how the water entitlements recovered for the Snowy are allocated and distributed to the environment. There is a need for more transparency around the release of environmental flows to ensure they are being managed to the best effect.

The introduction of the independent Victorian Environmental Water Holder (VEWH) in July 2011 has meant the Snowy Environmental Entitlements have been transferred to the VEWH. Decisions about the preferred environmental water releases for the Snowy are made by the NSW Ministerial Corporation, on recommendation of the Snowy Scientific Committee. The committee includes two Victorian representatives and makes recommendations on the appropriate release pattern to maximise environmental benefits. The VEWH does not have a direct role in planning for or delivering this water. In its annual report, the VEWH will publish the amount of water made available under the environmental water entitlements held for the Snowy River.

This will ensure transparent accounts are published annually showing the water allocations against Snowy entitlements (see Action 7.5).

Victorian reaches of the Snowy River, estuary and wetlands

The Snowy River flows out to the coast at Marlo passing through a complex wetland system containing a diversity of estuaries and wetlands. The estuarine reaches and wetlands of the lower Snowy are a priority area for rehabilitation in the East Gippsland Regional River Health Strategy.

The estuary of the lower Snowy has high sediment trapping efficiency, naturally low turbidity, and a salt wedge that extends about 20 km upstream to Orbost. Over time, the estuary naturally goes through a cycle of closing and opening to the sea, depending on the build-up of sand and volume of river flows. The build-up is a result of low streamflows and wind and tides. Diversions on the Snowy River due to the Snowy Scheme have increased the frequency and duration of estuary closure. This has had an impact on salinity levels and water quality for landholders on the downstream areas of the floodplains.

Reduced environmental flows and the recent dry conditions have meant that the Snowy wetlands have become increasingly salt affected as less freshwater is reaching the mouth of the Snowy. The existing salt wedge can at times move further up the river in response to low freshwater flows, or closure of the estuary mouth. These two factors have resulted in salinisation and waterlogging of significant areas of floodplain next to the Snowy estuary.

Action 7.5 Greater transparency in environmental water accounts and reporting for the Snowy River

Who: Victorian Environmental Water Holder **Timeframe:** ongoing

The Victorian Environmental Water holder will provide transparent accounts for the environmental entitlements available to the Snowy River, and publish the allocations and accounts annually.

Snowy estuary and wetlands, Graeme Dear

To date, management of the environmental flow releases to the Snowy River has largely focussed on the reaches immediately below the Snowy Scheme in New South Wales, as these are most impacted by the scheme. It is these reaches that are likely to receive the greatest benefit from the increased environmental flows.

Recent measurement and modelling by the East Gippsland Catchment Management Authority on the effect of river flows on salinity, water levels and mouth conditions in the Snowy estuary established that active releases to the Snowy River can have a measurable effect as far downstream as the estuary. Environmental releases from Snowy Hydro could therefore play a future role in the management of the Victorian reaches of the Snowy River, including the estuary and its associated wetland complex. The end-of-system environmental flows to the Snowy need to be recognised as a management tool and adequately considered in operational decision making (see Action 7.6).

This area is at risk from sea level rises and storms, which are likely to inundate low-lying floodplains. East Gippsland CMA has undertaken hydrodynamic modelling of the Snowy estuary to increase its understanding of the likely future impacts of rising sea levels on the estuaries and wetlands.

Action 7.6 Environmental flows for the Victorian reaches of the Snowy River, estuary and wetlands

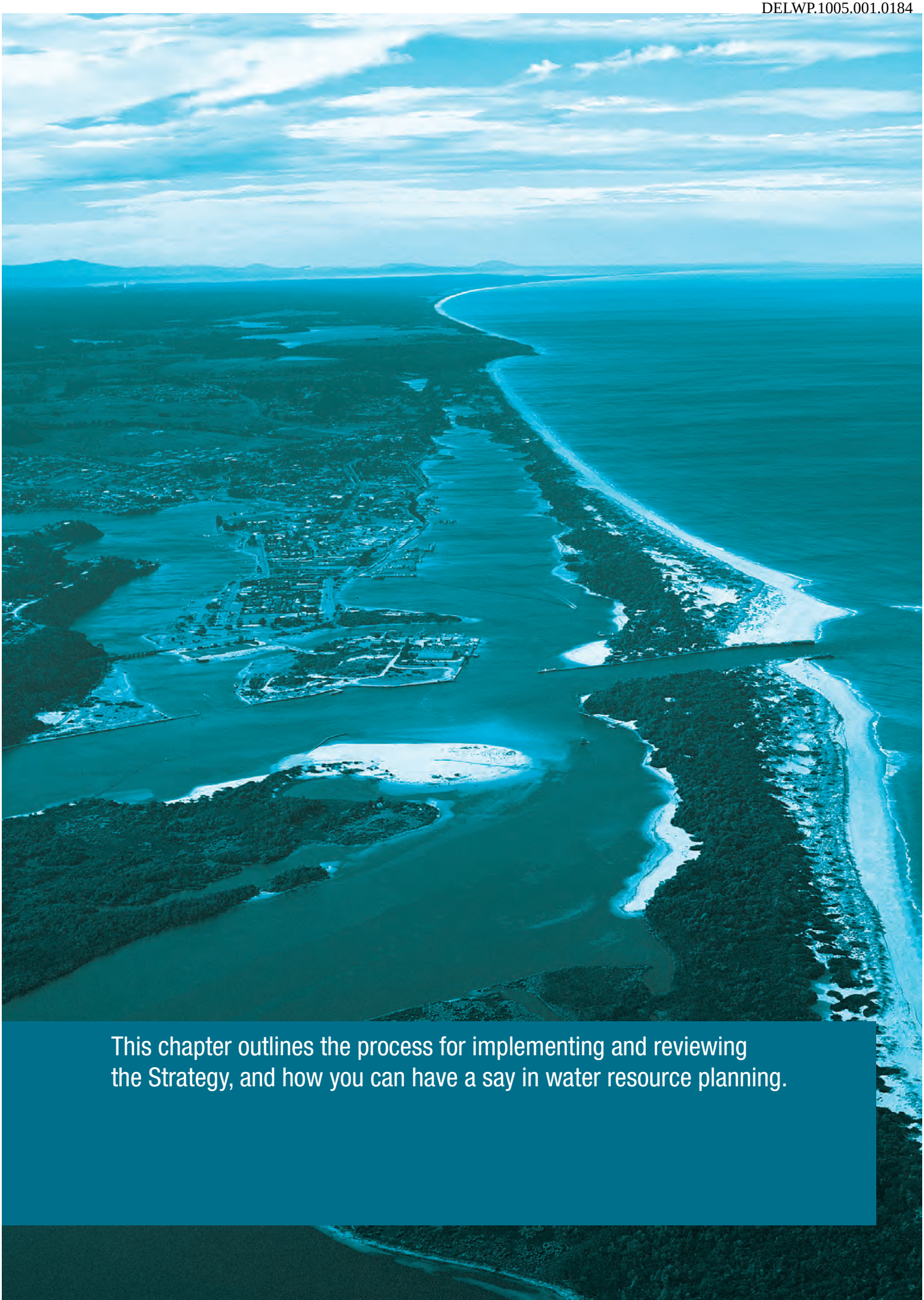
Who: East Gippsland CMA and Victorian Environmental Water Holder (VEWH)

Timeframe: Ongoing

The VEWH will work closely with the Snowy Scientific Committee to negotiate a flow regime to benefit the lower Snowy River, estuary and wetlands.

East Gippsland CMA will evaluate the effects of environmental flow releases from the Snowy Mountains Hydro-electric Scheme to the Snowy River on the Victorian reaches of the river and its estuary.

East Gippsland CMA will ensure that the Snowy Scientific Committee are informed about the effects of environmental flow releases in Victoria and opportunities to maximise outcomes from future releases by considering the environmental water needs of the Victorian river reaches and estuary.



This chapter outlines the process for implementing and reviewing the Strategy, and how you can have a say in water resource planning.

Delivering the Strategy

Guide to this chapter

8.1 Implementation responsibilities

- Paying for the Strategy
- Impacts on water pricing

8.2 Reviewing the Strategy

8.3 Community involvement in water resource planning

- Volunteering

8.1 Implementation responsibilities

Many organisations are involved in water management in Gippsland (Figure 8.1) and all have a part to play in implementing this Strategy. Key responsibilities rest with the Department of Sustainability and Environment, Southern Rural Water, urban water corporations and catchment management authorities. Responsibilities and timing for implementation are outlined with each of the specific actions in Chapters 3 to 7.

Water corporations and catchment management authorities will incorporate these actions into their water supply-demand strategies and regional strategies for healthy rivers estuaries and wetlands (formerly river health strategies), which were being reviewed and updated when the Gippsland Region Sustainable Water Strategy was released.

The Department of Sustainability and Environment has a statutory requirement to report on the implementation of this Strategy in its annual report, which is tabled in Parliament.

8.1.1 Paying for the Strategy

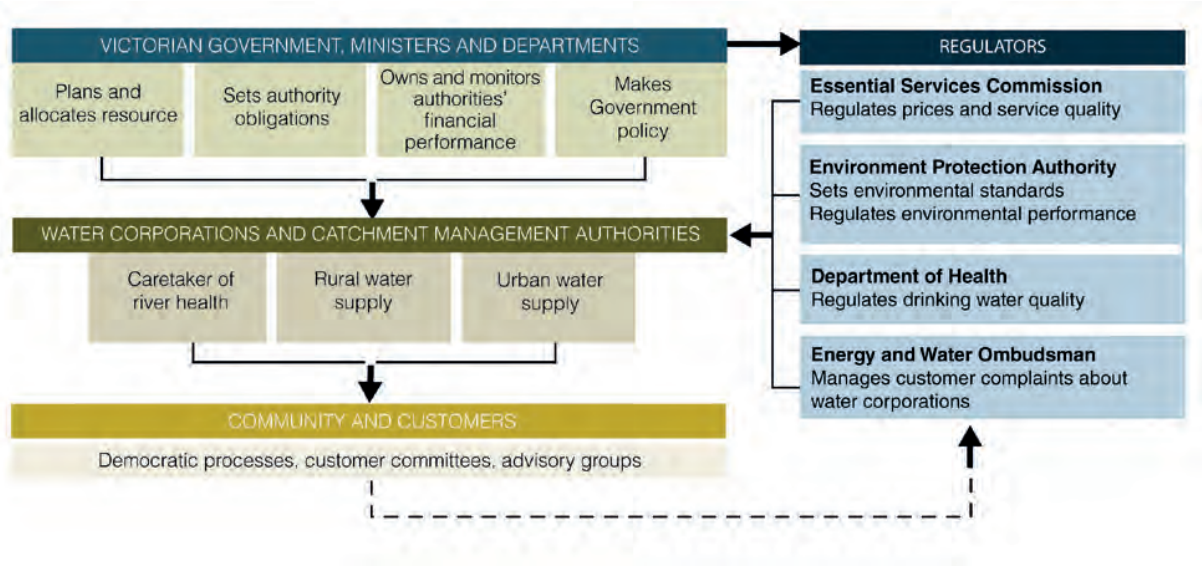
No Strategy actions will require large capital investment; rather, the Strategy establishes or improves water policy and regulatory arrangements. As such, many actions will align with existing responsibilities within the Department of Sustainability and Environment. Actions of a strategic nature, such as the maintenance and renewal of the groundwater monitoring network, may need additional investment, including through the Environment Contribution Levy. Actions involving catchment management authorities will be implemented through existing funding arrangements, or with the assistance of the Department, negotiated on a case-by-case basis. Where actions are delegated to water corporations, costs may be recovered through water pricing arrangements.

8.1.2 Impact on water pricing

Water prices must be fair and independently managed. The Essential Services Commission (ESC), as the independent economic regulator of the water industry, is responsible for protecting the interests of customers. Every five years, each water corporation must submit a water plan to the ESC. These water plans describe how each water corporation will deliver projects and service standards and the revenue required to do this, and outline proposed customer charges. The ESC publicly reviews these plans and then approves a package of prices and services the businesses must provide. The next review process will begin in mid-2012 to set prices for the period beginning 1 July 2013.

Water corporations in Gippsland will need to review the implementation actions assigned to them in this Strategy and ensure their water plans identify the costs so they can be considered by the ESC as part of the next price review process.

Figure 8.1 Roles and responsibilities in water resource management



8.2 Reviewing the Strategy

Under the *Water Act 1989*, the Minister for Water may review the Strategy at any stage, but it must be reviewed at least every 10 years. The first review will be completed by 2021 and will be informed by the long-term resource assessment due in 2019 (see Section 3.1.3, page 39).

An adaptive approach is critical to managing future uncertainties about water availability. Ongoing monitoring and evaluation of the region's water resources and implementation of this Strategy's actions will contribute to the 2021 Strategy review. This will allow the approach to implementing this Strategy to be reviewed and amended to suit changing circumstances. This information, together with the review, will give the community the opportunity to consider future water management needs with increased capacity and knowledge.

8.3 Community involvement in water resource planning

Water affects almost every aspect of our lives; it underpins our health, regional economies and amenity, and the environment. Decisions about its management can affect the very fabric of our communities, and therefore it is critical that community members are involved in water resource management. Community involvement ensures decisions about water resource management reflect community views, which may change over time, and support the values communities deem most important.

There are several processes where community members can contribute to water planning in their area (see Figure 8.1). These processes cover:

- all aspects of water resource management (including rural and urban supplies and the environment);
- a range of timeframes (from one to 50 years); and
- a variety of geographic scales (from specific waterways and groundwater management units to catchment-wide arrangements).

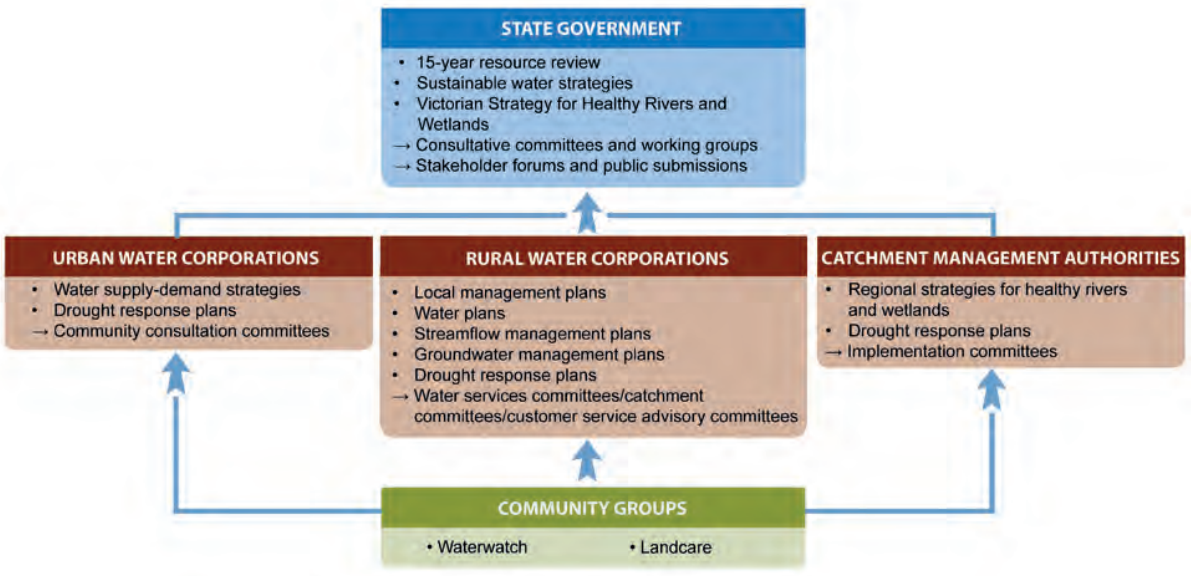
To find out how you can get involved, contact your local water corporation, catchment management authority or other relevant organisation. See page 193 for contact details.

8.3.1 Volunteering

The community can contribute to water management and on-ground activities through volunteering in a range of ways including:

- Waterwatch Victoria encourages and trains community volunteers to monitor and care for their local waterways, wetlands, estuaries and groundwater. Contact the Department of Sustainability and Environment on (03) 9637 9768 or vic.waterwatch@dse.vic.gov.au, or check the Waterwatch website for local contacts (www.vic.waterwatch.org.au/contact).
- Landcare is a local volunteer movement to protect and repair the land, biodiversity and waterways. Since beginning in Victoria in 1986, it has grown to involve thousands of Victorians and more than 700 groups. See www.landcarevic.net.au.
- Parks Victoria organises volunteers in national and state parks. Contact 13 1963 or see www.parkweb.vic.gov.au/1volunteers.cfm.
- GoVolunteer is a volunteer recruitment website providing free advertising for not-for-profit community organisations looking for volunteers. See www.govolunteer.com.au.

Figure 8.2 Community involvement in water resource management – key planning and consultation processes



Appendix 1: Independent Panel report on the Draft Strategy

The Independent Panel

As outlined in Chapter 1, an Independent Panel considered public submissions and other feedback from the consultation program for the development of the Gippsland Region Sustainable Water Strategy. The Panel was appointed by the then Minister for Water on 19 August 2009 under Section 22F(1) of the *Water Act 1989*. Panel members and their credentials are listed opposite.

Under the *Water Act 1989*, the Panel reports to the Minister and may include in its report any recommendations that it thinks fit. The Panel reviewed all of the public submissions to the Draft Strategy. The Panel's final report on the submissions and the key issues arising from the Draft Strategy was submitted to the Minister on 16 March 2011. A copy of the Panel's report, along with all the public submissions, is available from www.water.vic.gov.au/programs/sws/gippsland.

Table A1.1 summarises the recommendations made by the Independent Panel and provides the Strategy's response to these recommendations, including cross references to relevant sections in the Strategy.

Christine Forster (Chair), AM

Ms Forster became a Member of the Order of Australia in 2006 in recognition of her service to the environment in the area of water resource management. She is also a wool producer in western Victoria and has been actively involved with rural adjustment and regional development issues.

Professor John Langford, AM

Professor John Langford has unique system-wide perspective on water management in Australia from 38 years experience in water policy, management, strategic research and reform, including 15 years in chief executive positions.

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Sally Farrier

Ms Farrier is Director of Farrier Swier Consulting, a Director of Hydro Tasmania, and a National Water Commissioner. She was a Director of Western Power between 2006 and 2009.

Table A1.1 Government response to Draft Strategy Independent Panel report

	Panel recommendation	Strategy response	Strategy reference
1	**State-wide principles for local decisions** To ensure that there is a transparent and consistent approach to dealing with these issues the Panel recommends that State-wide principles be established and promulgated. These principles may be published or given effect through guidelines if appropriate.	Chapter 3 sets out a number of policies and principles to guide local decision making. These are consistent with state-wide policies and principles.	Examples include Policy 3.2 and Policy 3.5
2	**Snowy River** The Panel recommends that, as part of preparing for the 2012 licence review, water accounts be prepared for all water transactions involved in the 212 GL of Snowy environmental flows up to 31 December 2010, and for each subsequent year. There may be benefits in having these accounts independently audited. The Panel also recommends that the governance and accountability for managing the Snowy environmental flows be reviewed as part of the 2012 Licence review.	The Strategy includes an action that requires the holder of the Snowy environmental entitlement to publish transparent annual accounts of the environmental entitlements and allocations available to the Snowy River. The Strategy also includes an action to ensure that Victorian reaches of the Snowy River are considered in the management of the Snowy environmental flow entitlements.	Section 7.3.4 Action 7.5 Action 7.6
3	**Capacity Sharing Pilot** The Panel proposes the Government further develop the concept of capacity shares through a pilot program for the Thomson Reservoir.	The Strategy includes an action to permanently assign an additional share of Thomson Reservoir (equivalent to an annual 8 GL) to the environmental water reserve.	Action 6.18 Action 6.19
4	**Groundwater** The Panel recommends the application of the beneficiary pays principle for groundwater monitoring. This requires differentiating between monitoring which is primarily carried out to manage and protect State water resources and monitoring designed to ensure the security of users' groundwater entitlements.	The Strategy includes a policy clarifying responsibilities for groundwater monitoring, and actions outlining how the State Observation Bore Network will be upgraded and refined.	Policy 3.7 Action 3.8 Action 3.9
5	**Local Management Plans** The Panel recommends that Ministerial Guidelines currently being developed address: the scope of issues suitable for local management plans, the process for developing the plans, and the powers needed to support their implementation and compliance. A schedule for preparing local management plans in the Gippsland region should be prepared identifying the technical and financial resources required to prepare and implement them.	The Strategy includes a policy and action that sets out the scope of issues suitable for Local Management Plans, and the process for developing the plans. A proposed timetable for developing Local Management Plans is also presented in the Strategy.	Policy 3.5 Action 3.4 Table 3.2 Table 3.3

	Panel reccommendation	Strategy response	Strategy reference
6	**Consultation with Indigenous Communities** The Panel recommends that the final SWS outline how ongoing indigenous community input will be secured and how their contribution to the implementation of the SWS will be managed.	Consultation with Traditional Owners, through the Strategy process, found that Indigenous people in the Gippsland Region want to be more involved in water resource decisions. The Strategy presents an action to facilitate Indigenous involvement in water management by inviting Traditional Owners to nominate young leaders to be involved in cadetship, traineeship and scholarship programs. The strategy presents an action to better coordinate regional Indigenous reference groups.	Action 4.12 Action 4.13
7	**Standardising Power Generators Water Entitlements** The Panel recommends that a strategy defining how best to evolve the current arrangements into water entitlements compatible with those held by other water users should be developed ahead of the 2019 water resources review. This process may require independent expert involvement.	The Strategy notes the uncertainties around future water demands for power generation, and takes a flexible approach to meeting future demands that includes using trade.	Section 4.2.2 Section 6.2.2
8	**Sharing Blue Rock water** The Panel welcomes the Government proposal to keep the unallocated water in Blue Rock in public ownership and to use it to establish a drought reserve.	The Strategy includes an action to establish a drought reserve, which maintains public ownership over this portion of the unallocated share in Blue Rock Reservoir.	Action 6.3, Policy 6.2
9	**Accounting for all water users including interception activities** The Panel recommends that the Water Act be reviewed to accommodate the expansion of the water accounting system over the next decade to include all interception activities, and inclusion of volumetric allocations for stock and domestic supplies.	The Strategy includes an action to amend the *Water Act 1989* so that intensive management areas can be declared to control water intensive land use changes.The Strategy also includes an action to record water use by land use changes in the Victorian Water Accounts. The Strategy does not propose volumetric allocations for stock and domestic supplies.	Policy 3.8 Action 3.10 Action 3.11 Action 3.14
10	**Investment in Water Literacy** The Panel recommends that the Government invest in building community understanding of the water cycle, water trading and groundwater management.	The Strategy describes how water resources are managed in Gippsland, including information on the water cycle, and actions for water trading and groundwater management.	Reference guide 1 Reference guide 2 Strategy chapters
11	**Climate Change and the 2019 Resource Review** The Panel draws attention to the 2019 water resource review that has the potential to change water entitlements, noting that it is important that Government and the community start planning for that review.	The Strategy describes the current understanding of climate, and the long-term processes for reviewing entitlements such as the 15-year review of water resources. The Strategy includes a policy to promote more flexible and adaptive management arrangements that allow water managers to work with the community to respond at the local level, potentially avoiding the need for once-off centralised rebalancing.	Section 2.2 Section 3.1.3 Policy 3.2

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Appendix 3: Surface water and groundwater availability and use

Surface water

The nine areas used to summarise surface water information across Gippsland are shown in Figure A3.1. The Latrobe, Thomson, Macalister, Avon, Mitchell and Snowy basins contain the larger river systems, while the East Gippsland and South Gippsland basins consist of numerous small rivers with separate outlets to the sea. About 40 per cent of the Snowy River catchment lies in Victoria, with the rest in New South Wales.

Table A3.1 shows the annual average volume of surface water available for consumptive use and water that remains in each basin for the environment. It is based on long-term annual averages of about 50 years. It is important to note that because these are annual average estimates, the volume of use or streamflow in any one year is unlikely to match the annual average. Actual use and streamflow will vary from year to year with climatic variability and the historical take-up of entitlements. The estimates in the table reflect an upper limit that could be taken under the entitlements, rather than historical use.

Groundwater

Types of aquifers

Aquifers may be unconfined or confined (see Figure A3.2).

The water level in an **unconfined aquifer** forms the water table below the soil surface. It behaves like a bucket with the water level varying with recharge and the rate of water use.

In a **confined aquifer**, the groundwater is capped by a layer of rock or soil that does not easily allow the water to move through it. A confined aquifer behaves more like a pipe than a bucket with the groundwater often being under pressure. When a bore is drilled into a confined aquifer, the water pressure within the aquifer can push the water up the bore, to a level above the top of the aquifer. Where the pressure is high enough, the groundwater rises above the ground. This is commonly called a 'free flowing' or artesian bore.

An unconfined aquifer may have one or more confined aquifers beneath it. This is a **multiple aquifer system**. The groundwater in each of these aquifers may have different water levels and water quality (ie. salinity levels).

Aquifers in Gippsland

The largest aquifer system in Gippsland is referred to as the Gippsland Basin, which is a large sedimentary basin under parts of Gippsland which also extends offshore. The Gippsland Basin includes systems under the Latrobe Valley and South Gippsland. By volume, more than 90 per cent of the basin is offshore. The parts of the aquifer that are beneath Gippsland generally contain fresh water, but as the system extends under Bass Strait the salinity concentration increases – oil and gas are also present.

Around the Strzelecki Ranges and the Great Dividing Range, the sands, gravels, silts and coal seams that make up the aquifer system can be very near the surface, receiving recharge from rain and waterways.

Figure A3.1 Areas used to summarise surface water information in Gippsland

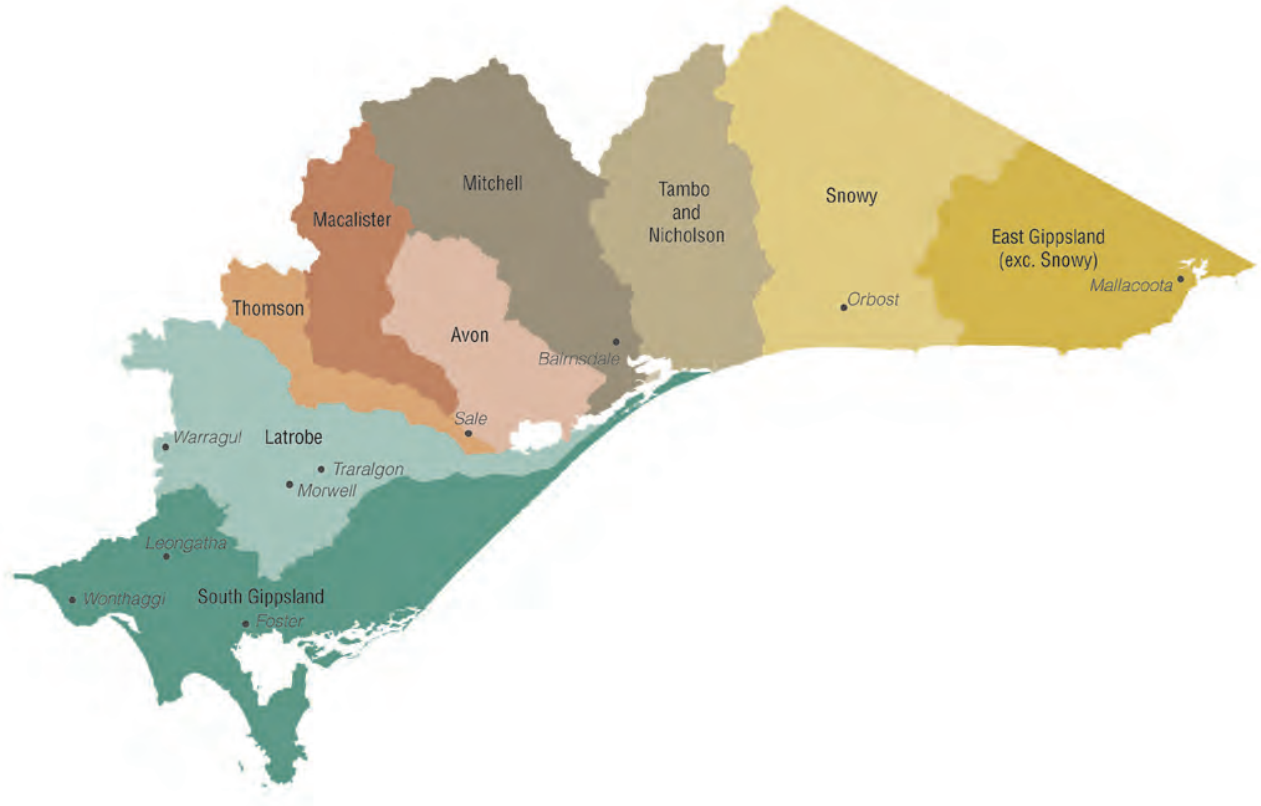


Table A3.1 Surface water availability and use

	Total resource	Water that could be taken under entitlements (B – E)							Average environmental flows
	A	B	C	D	E	F	G	H	I
Basin	Average annual streamflows (ML/year)	Bulk entitlements		Licensed diversions on unregulated streams (ML/year)	Small catchment dams (ML/year)	Unallocated water (ML/year)	Environmental entitlement (ML/year)	Total (ML/year)	Average flows at basin outlets (ML/year)
		Urban & Industrial (ML/year)	Irrigation (ML/year)						
South Gippsland[a]	911,500[bcd]	9,550[ce]	-	10,500f	32,200b	38,000b	-	90,250	821,250
Latrobe[g]	847,400[c]	156,700[ch]	4,600[c]	16,300c	24,200c	26,100ci	-	227,900	610,500
Thomson[g]	365,760[c]	168,130[cj]	23,820[c]	-	920b	-	10,000	202,870	138,440
Macalister[g]	496,400[c]	1,510[c]	199,860[c]	5,680	1,670b	-	8,100[o]	208,710	280,410
Avon	239,600[c]	40[c]	-	8,300c	7,200c	-[k]	-	15,540	223,900
Mitchell	884,500[c]	5,900[c]	-	18,200f	6,100c	-[k]	-	30,200	853,900
Tambo and Nicholson	297,800[cd]	3,300[e]	-	3,200f	4,100b	-[k]	-	10,600	285,900
Snowy[l]	2,162,100[d]	2,000[e]	1,140,000[m]	3,100f	2,000b	-	46,606[n]	1,193,706	1,015,600[d]
East Gippsland[a] (excluding Snowy)	714,000[bcd]	600[e]	-	600f	1,600b	16,000b	-	18,800	695,200
Total	**6,919,100**	**347,730**	**1,368,280**	**65,900**	**79,990**	**80,100**	**64,706**	**1,998,576**	**4,925,100**

Notes:
a South and East Gippsland figures include all small coastal systems, excluding those that fall within Wilsons Promontory National Park.
b Data sourced (fully or in part) from Sustainable Diversion Limits project data.
c Calculated from water system modelling.
d Calculated from gauging station data.
e Assumed 0.9 x entitlement volume.
f Assumed 0.8 x licensed volume reported in Victorian Water Accounts 2006/07.
g In addition to the uses shown in Table A5.1, there are distribution losses in the Latrobe, Macalister and Thomson systems, which are respectively about 10 GL, 7 GL and 24.5 GL on average.
h Includes the unused State Electricity Commission of Victoria (SECV) share of Blue Rock Reservoir and Lake Narracan.
i Volume supplied from the unallocated portion of Blue Rock Reservoir.
j Primarily diverted to Melbourne.
k Temporary cap on new diversions (2,000 ML) from rivers entering the Gippsland Lakes until freshwater requirements of Gippsland Lakes are assessed.
l Streamflows calculated as gauged inflows from NSW plus Snowy Scheme diversions, plus inflows produced within Victoria.
m Water diverted by Snowy Scheme into Murray and Murrumbidgee basins each year on average[54]
n The volume has increased from the Discussion Paper due to the further conversions of environmental entitlements from water recovery projects and additional water savings from the decommissioning of Lake Mokoan.
o The Macalister environmental entitlement was created in 2010 from water savings in the Macalister Irrigation District.

As the mainly confined aquifer extends further beneath the surface and offshore, it can be kilometres under the ground. Significant irrigation supplies are pumped from this aquifer in the Yarram area. Offshore oil and gas are extracted from the same aquifer.

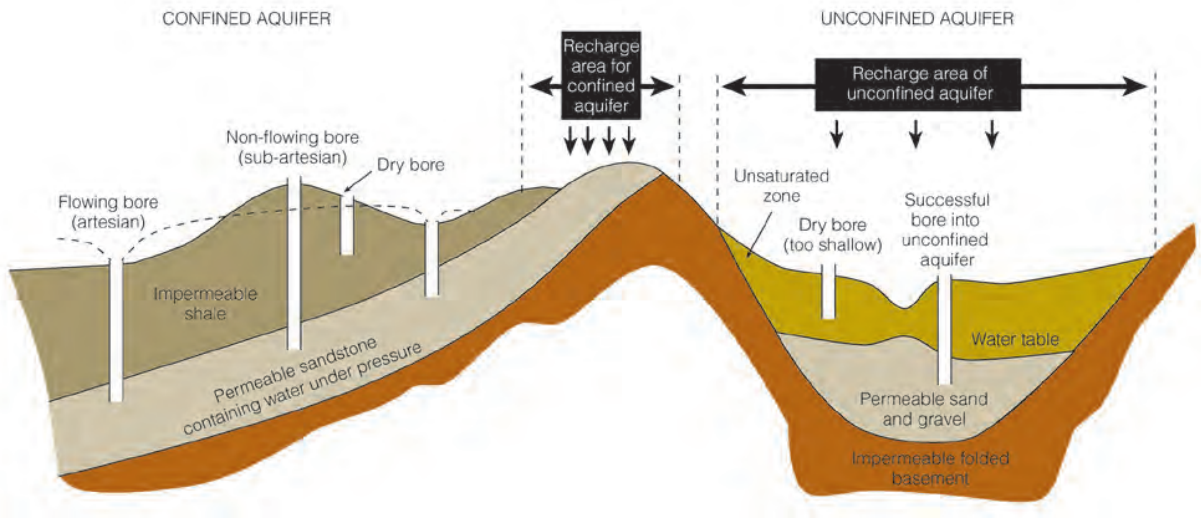
The major aquifers that supply groundwater in the basin are the sands and gravels of the Latrobe Group and Boisdale Formation. The Boisdale Formation is a shallow sand and gravel layer deposited by rivers. It forms a significant source of shallow groundwater across much of Gippsland. Other aquifers in the Gippsland Basin include the Childers Formation, Thorpdale Volcanics, Balook Formation (often linked to the Latrobe Group aquifer) and the Haunted Hills Gravels. Locally each of these aquifers can provide important groundwater resources.

Groundwater availability and use

Groundwater Management Areas (GMAs) and Water Supply Protection Areas (WSPAs) have been established to help manage the groundwater resource (see Figure A3.3). The total volume of licences that can be issued for each area has been capped. Table A3.2 shows: the current water level status, the amount that has been allocated through licences, estimated groundwater use and an indication of whether additional groundwater is available for each area in Gippsland.

Some of the areas have stable water levels. The levels of others are declining due to pressures such as intensive groundwater extractions, changes in land use or the impacts from the recent drought. Falling water levels in the Latrobe Group aquifer have been well documented, as well as the Latrobe Valley.

Figure A3.2 How aquifer systems work[55]



Areas that are not included within either a GMA or WSPA are called unincorporated areas. The potential for groundwater use in these areas is limited due to poor water quality or because the flow rates and volumes that can be pumped out are too low for commercial use. However, groundwater in unincorporated areas may be an important resource for domestic and stock supplies. There are no caps in unincorporated areas; instead licence applications are treated on a case by case basis in accordance with the requirements of the *Water Act 1989*. This strategy introduces changes to how groundwater will be managed in these areas in the future (Section 3.3.2).

Where required, Southern Rural Water is responsible for issuing licences to take and use groundwater in Gippsland. Table A3.2 shows that some GMUs are not fully allocated. Issuing new entitlements requires consideration of matters other than just the PCV, which may further limit the ability for new groundwater licences to be issued in these areas. Any allocations are subject to considerations under Section 40 of the *Water Act 1989* by Southern Rural Water. In the six areas that are fully allocated, groundwater is available only by trade. In some areas, water is available only via temporary trade because a groundwater management plan has not been established.

Figure A3.3 Groundwater Management Areas and Water Supply Protection Areas for groundwater in Gippsland

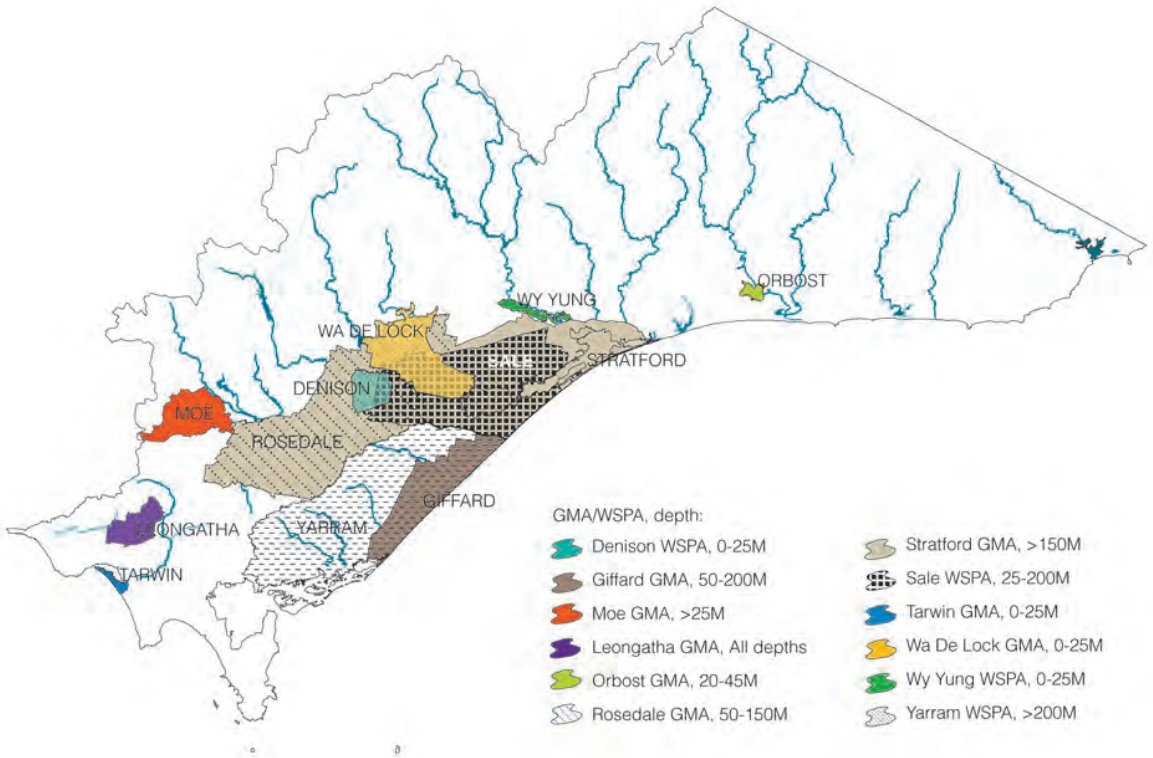


Table A3.2 Groundwater level status and availability in Gippsland[ab]

Groundwater management unit[c]	Depth (m) from the ground surface	Aquifer type	Water level status (September 2011)	PCV[d] (ML)	Licensed entitlement (ML)[ef]	Metered use[g] (ML)	Unallocated water (ML)	Groundwater availability
Denison WSPA	< 25m	Unconfined	Stable	17,743	17,441	7,987	302	Allocation or Temporary trade only
Giffard GMA	50-200m	Confined	Stable	5,670	5,670	1,717	0	Only by trade, as the licensed entitlement has reached the permissible consumptive volume
Leongatha GMA	All formations	Unconfined	Stable	6,500	1,693	158	4,807	By allocation or by trade
Moe GMA	> 25m	Confined	Declining	8,200	3,803	1,095	4,397	By allocation or by trade
Orbost GMA	20-45m	Confined	Stable	1,201	1,201	333	0	Only by trade, as the licensed entitlement has reached the permissible consumptive volume
Rosedale GMA	Zone 1: 50-150m Zone 2: 25-350m Zone 3: 200-300m	Confined	Declining (over a period of decades)[h]	22,313	22,257	11,009[i]	56	By allocation or by trade
Sale WSPA	25-200 m	Confined	Local areas of decline	21,212	21,107	11,094	105	Permanent and Temporary Trade allowed
Stratford GMA	Zone 2: > 350m Zone 1: > 150m	Confined	Declining (over a period of decades)[h]	27,645	27,645	27,896[i]	0	Only by trade, as the licensed entitlement has reached the permissible consumptive volume
Tarwin GMA	< 25m	Unconfined	Stable	1,300	38	6	1,262	By allocation or by trade
Wa De Lock GMA	< 25m	Unconfined	Increasing	30,172	28,805	10,386	1,367	By allocation or by trade
Wy Yung WSPA	< 25m	Unconfined	Stable	7,463	7,462	798	1	Temporary trade only
Yarram WSPA	Zone 1: > 200m Zone 2: All formations	Confined	Declining (over a period of decades)[h]	25,317	25,317	11,778	0	Temporary trade only
Gippsland TOTAL	**NA**	**NA**	**NA**	**174,736**	**162,439**	**111,959**	**12,296**	

Notes:

a Extractions for offshore oil and gas from the Latrobe group aquifer are not shown in the table, but are discussed in Section 3.3.3. Total extraction is almost 100 GL per annum, which occurs up to 100 kilometres offshore.

b Although there is water available under the PCV in some GMUs, SRW may not issue licenses due to considerations under Section 40 of the *Water Act 1989*.

c Zones are sub-areas within the GMU. In some cases to best manage the resource, the characteristics of different geographic areas in one GMU are defined differently. This is usually to reflect variability in the aquifer, variability in usage pattern or variability in quality.

d Changes from the Discussion Paper to the PCV column are updated PCVs gazetted in 29 June 2009 (this includes Giffard, Orbost, Stratford, Wa De Lock and Wy Yung).

e Volumes reported for the licensed entitlement and licensed use are those numbers reported in the 2009/10 Victorian Water Accounts.

f Licensed entitlement column is from Victorian Water Accounts 2009/10.

g The licensed metered and estimated use reported in the Draft Strategy table included domestic and stock. The PCV only includes licensed use and therefore the total use reported for each GMU should not have included D&S.

h Groundwater in Rosedale and Stratford GMAs are declining due to pumping to ensure mine stability for coal production. Declining levels in Yarram are primarily due to offshore oil and gas operations.

i This includes estimated use of 4,460 ML in the Rosedale GMA and 27,796 ML in the Stratford GMA used for dewatering mines in the Latrobe Valley. These estimations are based on flow rate and pump operation data from free draining (artesian) or batter drain bores that are not pumped and do not have meters.

Appendix 4: Key influences on Victoria's climate

The major influences on Australia's climate are shown in Figure A4.1. These influences have varying levels of impact in different regions at different times of the year. Details of the various influences, including the spatial extent and timing of their impacts, can be found on the Bureau of Meteorology website[56]. The descriptions of the sub-tropical ridge and the Southern Annular Mode below are taken largely from this source.

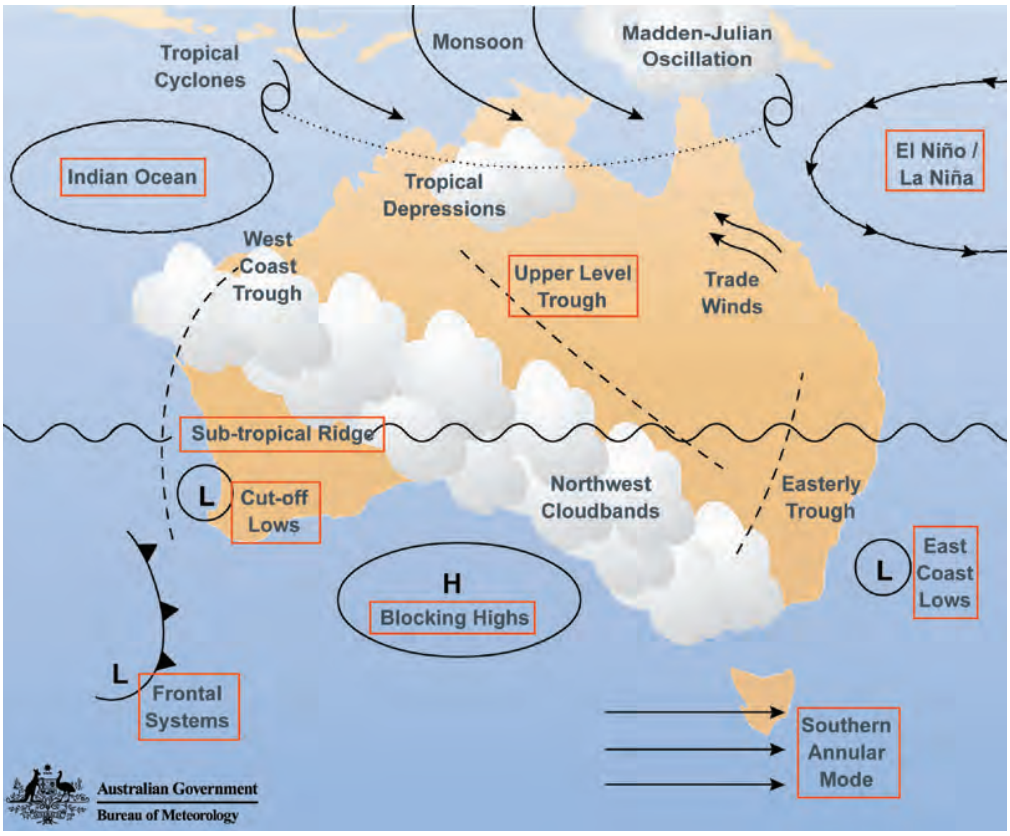
Of these influences, those most important for Victoria's climate are highlighted in red boxes in Figure A4.1. Larger-scale influences that research has shown to have an impact, but which are not shown in this figure, include global warming of the atmosphere and oceans due to the enhanced greenhouse effect[57,58,59,60,61,62,63,64] ozone depletion at the South Pole[65,66,67] and the impact of Northern Hemisphere aerosol pollution (via impacts transmitted southwards through the Indian Ocean)[68]. Ocean currents are also important influences – both the surface currents within and linking the major ocean basins and the deeper ocean currents that form the 'global conveyor belt' linking the Pacific, Indian, Atlantic and Southern oceans.

Changes in rainfall patterns over south-east Australia during the recent drought (1997-2009) have been linked primarily to increases in mean sea level pressure over southern Australia that, in turn, are linked to the increasing intensity of the **sub-tropical ridge**[69]. This is a belt of high pressure about 30° south (and north). It is part of the global circulation of the atmosphere (see Figure A4.2). High pressure systems, which are associated with stable and dry conditions, move east along the ridge.

The position of this ridge has a seasonal cycle, being furthest north in early spring and furthest south in late summer. During the warmer half of the year (November to April), the sub-tropical ridge is generally located south of Australia. In autumn, the sub-tropical ridge moves north and remains over the continent for most of the colder half of the year (May to October).

The position of the mid-latitude westerly wind belt (and its embedded rain-bearing low pressure and frontal systems) to the south of the ridge also reflect this seasonal cycle. Changes in the intensity of the sub-tropical ridge have been shown to account for around 80 per cent of the observed decline in rainfall during the recent drought, and there also have been changes in its seasonal cycle, with the ridge moving northwards later in autumn[69,70]. As a consequence of these changes, Victoria has been less exposed to the influence of the mid-latitude westerlies and the associated embedded frontal systems and low pressure systems that typically used to bring regular rainfall over the period from around March to October. Research has shown that the changes in the intensity of the sub-tropical ridge are at least partly linked to global warming[64].

Figure A4.1 Australian climate influences[56]



The changes in mean sea level pressure may also partly reflect an increasing trend in the Southern Annular Mode (SAM)[71]. The SAM is a relatively short-term mode of climate variability (10+ days) characterised by a 'flip-flopping' of pressures and associated changes in storms and winds between mid (about 45°S) and higher (about 65°S) latitudes. During a 'positive' SAM event, the belt of strong westerly winds contracts towards the South Pole. Conversely, during a 'negative' SAM event the belt of westerly winds moves towards the equator. The effect of fluctuations in SAM on Victoria's climate depends on the season. During winter, a positive SAM results in weaker than normal westerly winds, higher pressures, and more stable conditions over southern Australia, with associated reductions in rainfall. A negative SAM in winter results in lower pressures and more storm systems over southern Australia with associated increases in rainfall. During spring and summer, a positive SAM results in a stronger than normal easterly component to the winds, increasing the likelihood of warm moist air moving into eastern Victoria and enhancing rainfall in the eastern half of the State. While there has been a generally increasing trend in 'positive' SAM over recent decades, the magnitude of the trend varies between seasons (as does the strength and direction of the association between SAM and Victorian rainfall). Overall, SAM appears to be an important factor in contributing to the observed decreases in rainfall in winter[71], and its influence is an ongoing area of research.

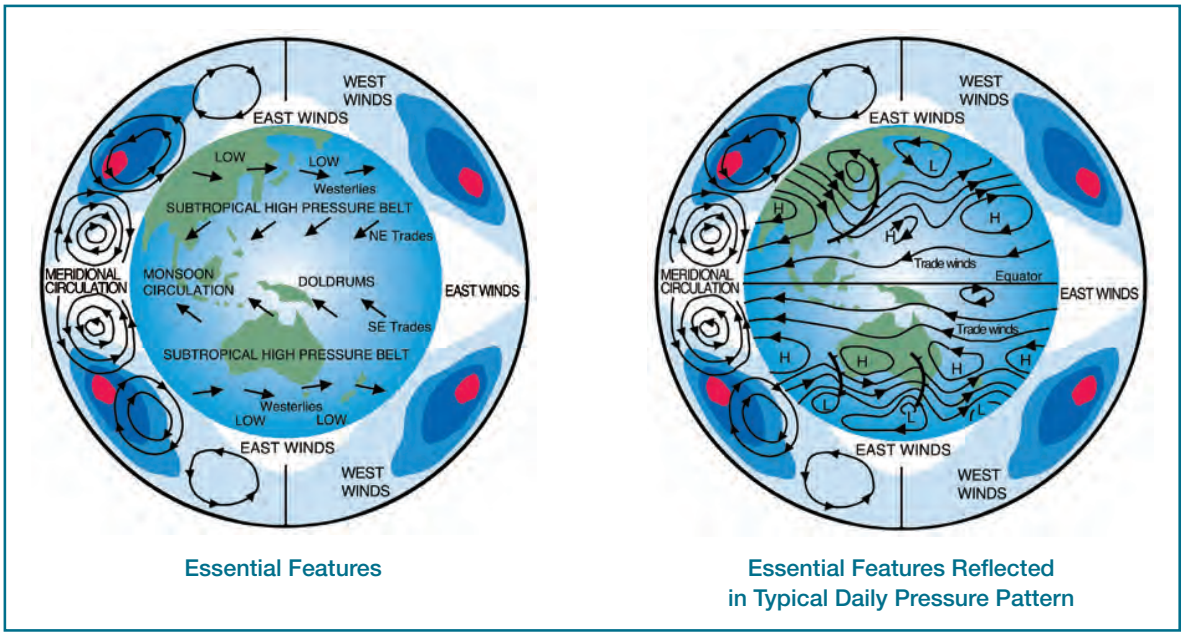
As described in Section 2.2 (page 21), the very wet conditions experienced in Victoria (and across much of Australia) from late 2010 to early 2011 were largely due to the influence of one of the strongest La Niña episodes on record[72]. The impact of this strong La Niña was exacerbated by the SAM (which reached positive record values in late spring and early summer of 2010). In addition, one of the largest negative Indian Ocean Dipole events of the past 50 years was recorded in 2010, which contributed to the enhanced spring rainfall.

Despite this high spring/summer rainfall, it is of note that average to below average rainfall was recorded across much of the State for May to July in 2010, and (with the exception of Gippsland) from April to August 2011. This generally reflects the pattern established during the recent drought of below average rainfall during the autumn/winter months. This is consistent with research indicating that continuing reductions in winter storminess and further intensification of the sub-tropical ridge are expected into the future due to the enhanced greenhouse effect.

Victoria's future climate can be expected to reflect both the influence of these longer-term trends and the large year to year variability that results in particular from the climate influences operating (singly and in combination) in the Pacific (El Niño/La Niña), Indian (the Indian Ocean Dipole) and Southern (SAM) Oceans[69,73,74].

Further information about climate change and climate variability across south-eastern Australia can be accessed from the South Eastern Australian Climate Initiative (SEACI) website: http://www.seaci.org/index.html

Figure A4.2 Essential features of the general circulation of the atmosphere



Appendix 5: Summary of water supply-demand strategies

Introduction

This appendix presents an overview of the water supply-demand strategies of each of the three urban water corporations across Gippsland. The information presented supplements the information contained in Section 4.2.2 and Chapters 5 to 7 by providing more information on:

- water surplus or deficit for cities and towns; and
- options for improving the reliability of supply.

Water supply-demand strategies (WSDS) are prepared by South Gippsland Water, Gippsland Water (Central Gippsland Water) and East Gippsland Water for each of their supply systems. The WSDSs consider the reliability of water supplies based on two future climate variability scenarios: (Scenario B); and (Scenario D). They also identify potential actions to ensure supply needs are met in the future, including demand reduction options and supply enhancement options. They also consider the range of social, environmental and economic costs and benefits.

WSDSs are reviewed on a minimum 5 year basis. The water corporations have or are in the process of updating their 2007 WSDSs with the new strategies due for release by early 2012. South Gippsland Water and East Gippsland Water have updated their strategies in advance and their draft and final 2011 WSDS are summarised below. Gippsland Water is yet to update its WSDS.

Drought Response Plans are also developed for each supply system. Drought Response Plans contain trigger points and operational actions in the event of drought or water shortages that compromise the service level objectives.

South Gippsland Water Corporation

Profile

Approximately 50 per cent of South Gippsland Water's customers live in the Wonthaggi/Cape Paterson/Inverloch area which is served by the Lance Creek Reservoir. The remainder are supplied by nine separate small systems, some of which rely directly on river flows or have small supplementary reservoirs. A small amount of groundwater is utilised. South Gippsland Water's service area covers some 21 towns and 4,000 square kilometres and includes coastal resorts such as Inverloch and Port Albert.

The latest version of South Gippsland Water's Water Supply Demand Strategy (WSDS) is in draft form and currently the Corporation is undertaking community consultation. The construction of the desalination plant in Wonthaggi and the approval to connect a pipeline to the Lance Creek water supply system prompted South Gippsland Water to consider the possibility of connecting additional supplies to the Melbourne supply system.

Water Demand Projections in the draft 2011 WSDS

The growth in water demand projections for the nine small systems due to population growth over a 50 year planning horizon has been based on *Victoria in Future* population projections. A high population growth rate in South Gippsland is expected due to the proximity to the Melbourne fringe and is evidenced along the coastal strip near Inverloch.

The total water demand from South Gippsland's water supply systems is expected to increase by at least one third over the next 50 years and could potentially double over this time. Demand reduction targets have been set for all South Gippsland supply systems.

There could be an increase in the number of industrial customers who require water supply and produce saline wastewater as they move from Melbourne to take advantage of South Gippsland's saline outfall transfer system.

Industrial consumers in South Gippsland have reduced consumption or maintained historical water demands while expanding operations. The area's major water user, Murray Goulburn, which consumes up to 70 per cent of the supply to Leongatha, has a 10 year water recycling plan which when completed would result in the factory reducing its reliance on town water.

South Gippsland Water's major sewerage scheme for the townships of Poowong, Loch and Nyora is progressing satisfactorily with the site for the treatment plant purchased and the design and approval phases underway.

Work on sewerage schemes for the towns of Alberton and Meeniyan is underway. The preliminary investigations and community consultation are underway for Alberton. The Meeniyan scheme is about to become operational, although some final lagoon work remains to be done, subject to weather conditions. These schemes may increase demand in these areas. At this stage there are no immediate plans to service the coastal towns of Venus Bay and Sandy Point with a reticulated water supply system.

The WSDS has highlighted the uncertainties concerning future demand projections. There are demand reduction targets and initiatives outlined in the WSDS that will assist to reduce future demand requirements however it is clear that there will be only marginal benefits associated with demand management.

There is recognition that if a severe drought is experienced similar to 2006/07 then there will be increased water demand, despite permanent water saving guidelines being in place.

Water Supply Projections in the draft 2011 WSDS

South Gippsland has been significantly impacted by drought in the last decade. The modelling of yield for each of the systems has been based on two scenarios, as well as historical data that has been modified to reflect ongoing low flow conditions both with a 15 per cent (medium) climate change allowance. Results of recent CSIRO modelling highlights the future variability and emphasises the need to identify and evaluate alternative sources of water, including a connection to the Melbourne water supply system at Wonthaggi to meet additional future demand requirements.

The construction of the desalination plant at Wonthaggi and its connection to the Melbourne water supply system provides an opportunity for South Gippsland Water to increase the future reliability of some of its supply systems. A 10.4 km pipeline connecting the Lance Creek system to Melbourne's supply system from the desalination plant was constructed in 2010 to provide a water supply to the construction site. Additional works are currently being completed to extend this pipeline to enable a future direct connection from the Melbourne supply system to the Lance Creek reservoir and water treatment plant site. In the future when demand requires it, water will be able to be supplied from the Melbourne water supply system to the towns serviced by the Lance Creek system (Wonthaggi, Cape Paterson and Inverloch). When the desalination plant is not operating, any backup supply required by the Lance Creek system would be able to be supplied from Melbourne's other water sources through the interconnection.

The Lance Creek Reservoir pipeline also provides an opportunity to potentially connect to the three smaller systems currently supplying Leongatha, Korumburra, Poowong, Loch and Nyora, which will require supply enhancement over the next few years. Future supply requirements for Leongatha are dependent on the proposed water savings at the Murray Goulburn Co-op dairy plant. A South Gippsland Water business case concluded that for these three systems the most cost effective water supply option over the long term is to create a linked hybrid system using Lance Creek reservoir as the primary source of water with the Melbourne supply system as a backup.

Supply enhancement for Fish Creek and towns supplied by the Agnes River is required in the next few years. System modelling and financial analyses are being undertaken to assess the merits of separate system upgrades, connection to the Melbourne supply system, as well as options of interlinking Foster, Fish Creek and Toora and/or providing additional storage volumes. Initial indications are that the estimated costs of connecting Fish Creek, Foster and Toora to the Melbourne supply system are well in excess of those associated separate system upgrades, interlinking the towns, and/or providing additional storage volume.

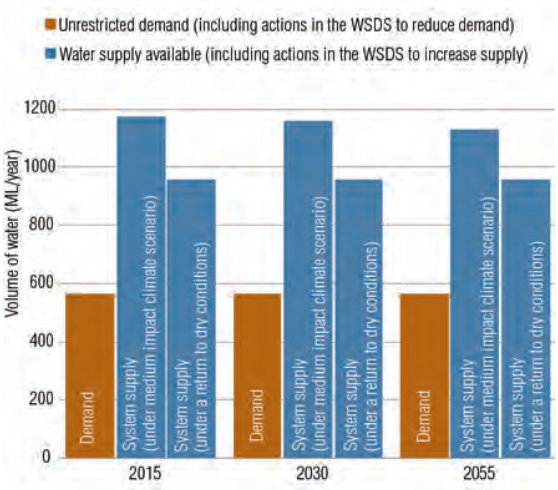
It was seen as not feasible for the water supply system of Yarram, Port Albert, Devon North and Alberton to take advantage of the connection to the Melbourne supply system. Augmentation to this system will instead utilise local groundwater and surface water. Yarram's available water yield will be increased though the purchase of groundwater licences for use at its newly constructed bore and should provide a high level of security for Yarram over the 50 year planning horizon.

Figure A5.1 shows the modelled yeilds and demands for South Gippsland Water's supply system.

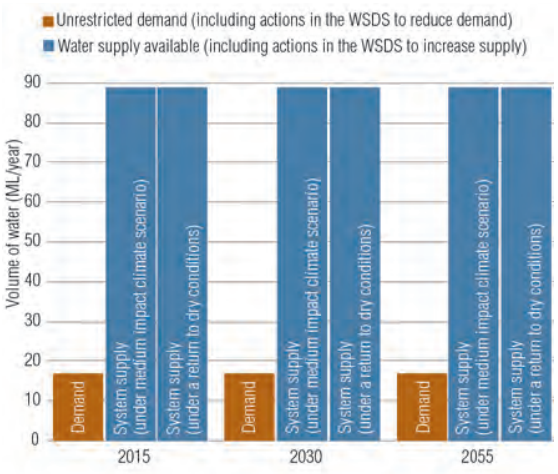
Inverloch, SGW

Figure A5.1 Future water supply and demand for South Gippsland's water supply systems

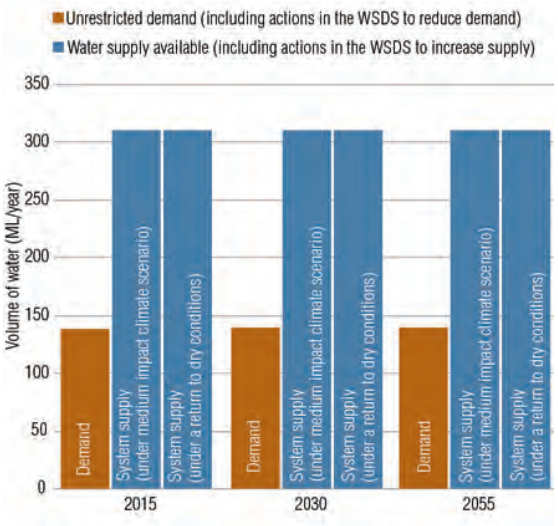
a) Yarram Supply System



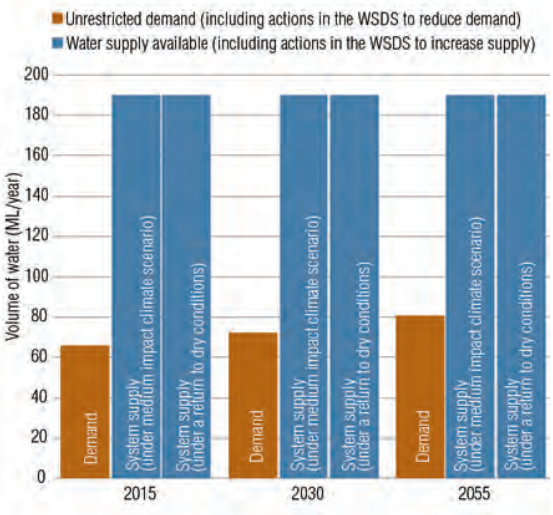
b) Dumbulk Supply system



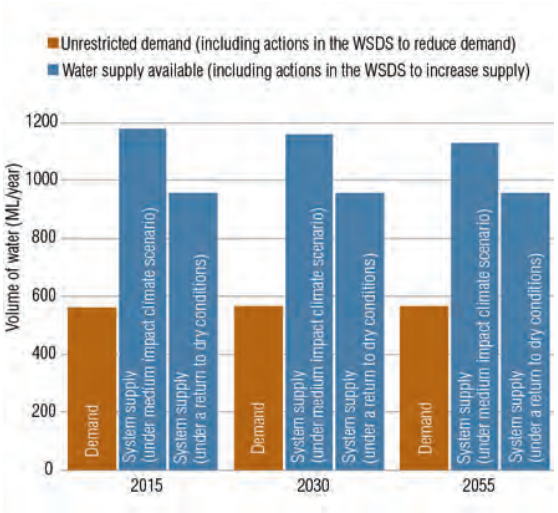
c) Foster Supply System



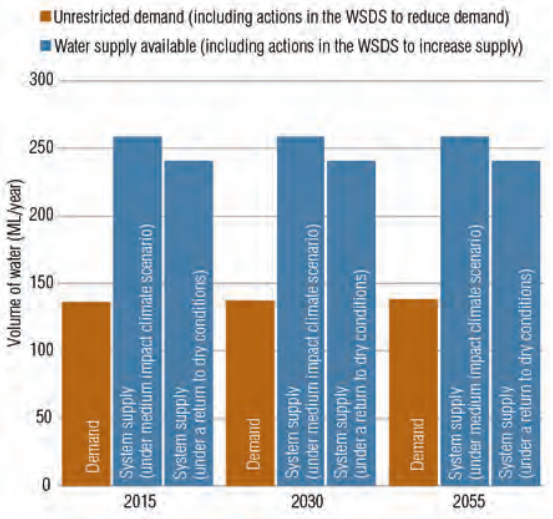
d) Meeniyan Supply system



e) Toora Supply system



f) Fish Creek Supply system



Gippsland Water Corporation

Profile

Gippsland Water provides water and wastewater services to 61,000 customers, including industries of state and national significance. Gippsland Water's geographic region stretches from Drouin in the west to Loch Sport in the east and from Mirboo North in the south to Rawson and Briagolong in the north.

This water supply-demand strategy (WSDS) presents a series of actions to sustainably manage and meet the water needs of the region serviced by Gippsland Water.

Gippsland Water's supply systems can currently supply a total of 68,000 ML a year assuming long-term average inflows and 57,000 ML a year assuming continued low inflows to supply systems. Current demand without restrictions in place is estimated to be 66,000 ML a year. Modelling used in developing the WSDS does not infer that a shortage will occur every year, but instead it means the systems do not provide 100 per cent reliability.

Water Demand Projections in the current WSDS

Demand forecasts in the WSDS are based on a range of assumptions including projected industrial water demands and changes in population. Gippsland Water supplies a number of major industries including power generation, paper manufacture and large dairies. These industries consume more than 70 per cent of the water supplied by Gippsland Water and require a high security of supply. The WSDS bases demand forecasts for the Moondarra System on the total contracted demand (contracted demand is the amount of water some major industrial clients have access to under contract, which can be well above current levels of consumption), which is significantly higher than the level of demand experienced over recent years.

Water Supply Projections in the current WSDS

Supply forecasts in the WSDS consider long-term averages of resource availability, with a gradual annual reduction as a result of climate change. Also considered is the continuation of low inflow conditions experienced since 1997. The continuation of low inflow conditions was adopted in the WSDS for planning purposes.

Shortfalls and reliability of supply

Based on long-term average conditions, Gippsland Water could currently meet its 95 per cent annual target reliability for all its systems, except the major Moondarra system. However, if low river inflows continue, then Gippsland Water would be unable to meet its annual target reliability of 95 per cent for seven of its water supply systems, including the major Moondarra, Moe and Tarago systems.

Under low inflow conditions, modelling by Gippsland Water indicates that an additional 23,700 ML of water will be required immediately (assuming the total contract demand for the Moondarra system), decreasing to 22,100 ML in 2015 as a result of a yield increase associated with the commissioning of Stage 1 of the Gippsland Water Factory, and water conservation measures currently being implemented by two of Gippsland Water's major customers. It should be noted that current shortfalls assume uptake of the total contracted demand.

If we consider excluding systems with a surplus of water where interconnection with other systems is not considered to be feasible (including Sale, Erica Rawson and 3 other minor towns), then an additional 1,300 ML of water (bringing the total to 25,000 ML) would be required immediately. In comparison, under long-term average inflows, the region has a current shortfall of 12,800 ML.

Current system adjustments

Moondarra system

Baseline demand is forecast to exceed supply in the Moondarra system by 2029 under long-term average conditions. There is a current shortfall of 8,242 ML under continuing low inflow conditions, reducing to a shortfall of 2,449 ML in 2015 due to commissioning of Stage 1 of the Gippsland Water Factory and implementation of major industry water conservation measures.

A review of all major client contracts has confirmed a gap of approximately 14,600 ML between contracted volumes and historical demand on the Moondarra system. The WSDS bases actions for the Moondarra system on meeting shortfalls associated with the total contracted demand forecast.

Actions identified in Gippsland Water's 2007 WSDS to meet projected shortfalls – Moondarra system:

- seek additional 17 GL of water from Blue Rock Dam on a permanent basis, to address risks in shortfall associated with contracted demand;
- purchase temporary water on an 'as-required' basis; and
- optimise Gippsland Water's Blue Rock Dam pumping operations.

At the time Gippsland water was developing its WSDS, it was anticipated that new industries with an estimated demand of 8,000 ML may be established within the region over the next 10 years. In the context of ongoing commitment to existing customers and apparent supply shortfalls, Gippsland Water is not in a position to provide assurances for major new customers as to reliable water supply. Therefore, the growth assumptions used in the Water Supply Demand Strategy do not account for the introduction of any new or additional major industry.

Actions are identified in the WSDS to provide over 7,500 ML of water for systems other than Moondarra by 2015, which is enough to meet the low river inflow shortfalls and provide an adequate buffer supply of water. The actions identified for these systems cover conservation and efficiency measures, system interconnection, recycling and reuse, and supply augmentation.

Updates to current WSDS

Gippsland Water has undertaken a review of the June 2007 WSDS modelling for all water supply systems annually. While supply-demand balances for all systems changed marginally, the key shortages identified in the June 2007 WSDS (particularly the Moondarra system) were confirmed. As such, Gippsland Water continues to pursue and refine key actions as it updates its WSDS by March 2012.

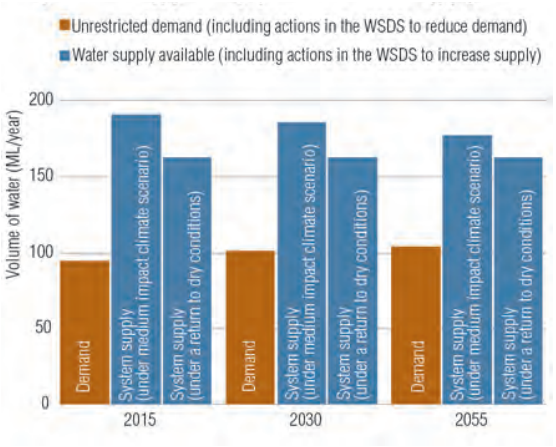
East Gippsland Water Corporation

Profile

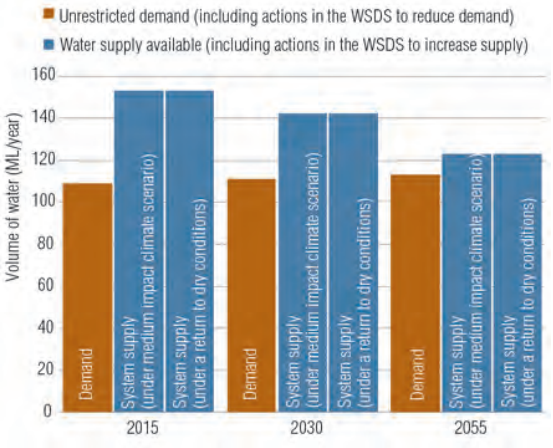
East Gippsland Water serves an area of 21,000 square kilometres in the Far East of Victoria. East Gippsland Water's service area extends east from Lindenow, through to the region's capital Bairnsdale, the holiday centres of Paynesville and Lakes Entrance, and on to the wilderness coast and Mallacoota near the New South Wales border. The Corporation also serves as far north as Dinner Plain in the High Country of the Victorian Alps. Water services are provided to more than 23,000 customers and wastewater services to over 19,500, spread across some 30 separate communities.

Figure A5.2 Future water supply and demand for Gippsland Water's water supply systems[a]

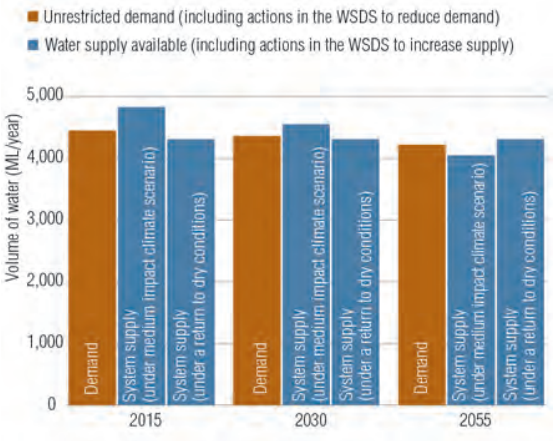
a) Boolarra Supply System



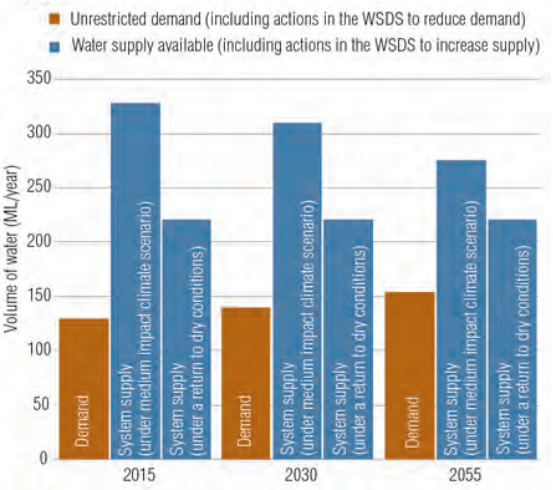
b) Briagalong Supply System



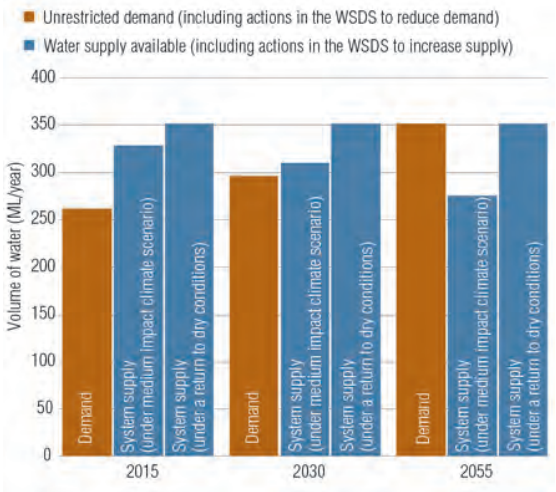
c) Moe Supply System



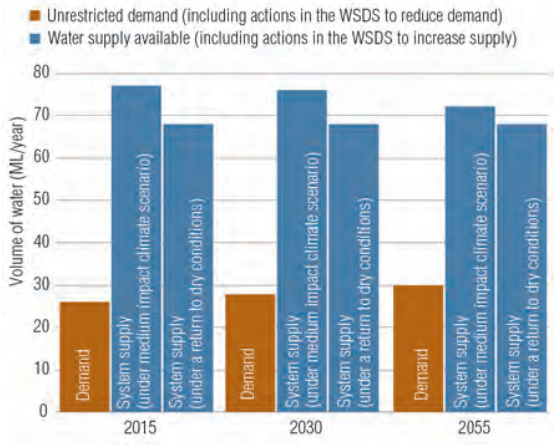
d) Erica-Rawson Supply System



e) Mirboo North Supply System



f) Thorpdale Supply System



Note:

a The numbers shown in the figures above are based on Central Gippsland Water's 2007 Water Supply and Demand Strategy and will be updated by 2012. The graph for the Moondarra system is shown in Chapter 6 (Figure 6.5)

Water Demand Projections in the 2011 WSDSs

East Gippsland Water (EGW) has prepared individual Water Supply Demand Strategy's (WSDSs) for each of its water supply systems that will form East Gippsland Waters WSDS.

The growth in water demand projections for the nine small systems due to population growth over a 50 year planning horizon has been based on *Victoria in Future* population projections.

The WSDS has highlighted the uncertainties concerning future demand projections. There are demand reduction targets and initiatives outlined in the WSDS that will assist to reduce future demand requirements however it is clear that there will be only marginal benefits associated with demand management.

There is recognition that under climate change there will be increased water demand despite permanent water saving guidelines being in place.

Water Supply Projections in the 2011 WSDS

Water supply-demand strategies (WSDSs) are based upon a level of service being maintained or achieved. In the case of EGW those service objectives are as follows:

- Moderate restrictions (stages 1 and 2) are not desired more frequently on average than 1 year in 10; and
- More severe restrictions (stages 3 and 4) are not desired more frequently than 1 year in 15.

The Board of EGW has recently re-affirmed that this level of service is still appropriate for its customer base.

Through the WSDS EGW assesses each system to identify the ability of that system to achieve the service outcome, capital works and operational improvements to achieve the service outcomes.

The new WSDS's identify some relatively small augmentations in a couple of the systems to ensure or maintain service standards in the future. Some of the strategies to maintain service standards are as follows:

- utilise the Corporation's Managed Aquifer Recharge scheme to augment storage availability to meet projected demand;
- increasing groundwater use in some systems where surface water is less reliable (such as the reduced reliability in the Betka River);
- covering Raw Water Storages to reduce evaporation;
- investigating alternative water sources (such as for the large caravan park currently relying on the Mallacoota Supply System); and
- water carting from other systems as required in less populated areas where interconnections are not as viable (such as water carting from the Mitta Mitta River or another system if required for the Swifts Creek Water Supply System).

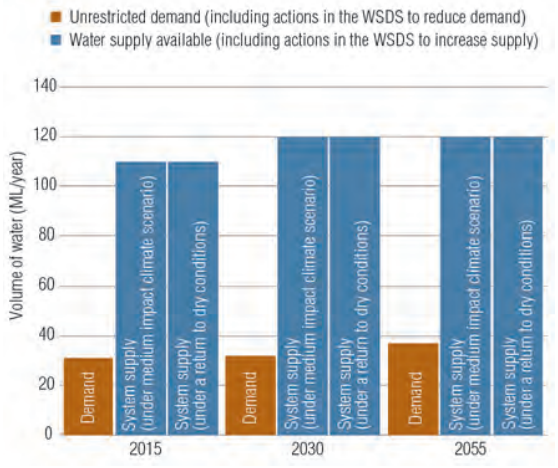
It can be seen from the strategies above that a range of different outcomes can be implemented to meet service standards; it is not always about building new or more infrastructure.

Drought Response Plans have been developed for all systems. What has been identified is that the previous Drought Response plans have a range of trigger points that lack flexibility. The trigger points were in many cases too severe and too rigid.

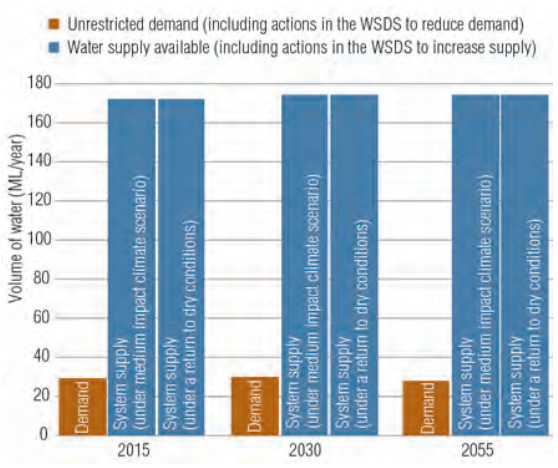
Figure A5.3 shows the modelled yields and demands for East Gippsland Water's supply systems.

Figure A5.3 shows the modelled yields and demands for East Gippsland Water's supply systems[a]

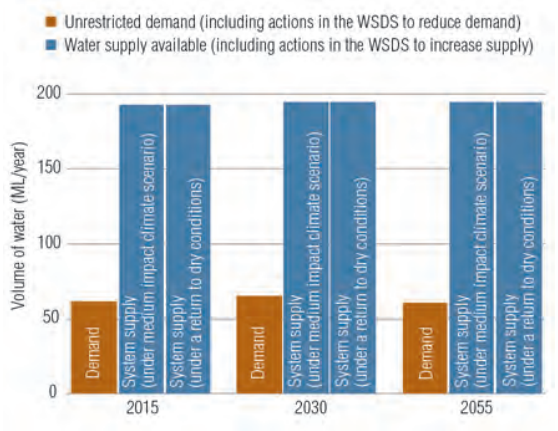
a) Bemm Supply System



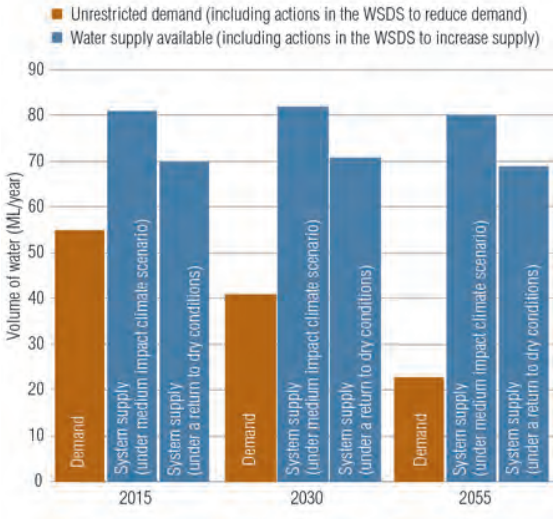
b) Buchan Supply System



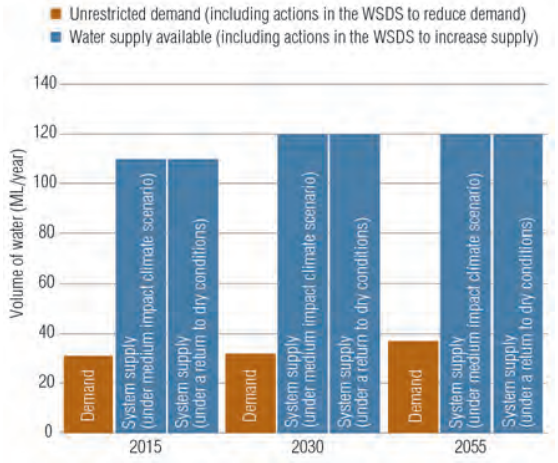
c) Cann River Supply System



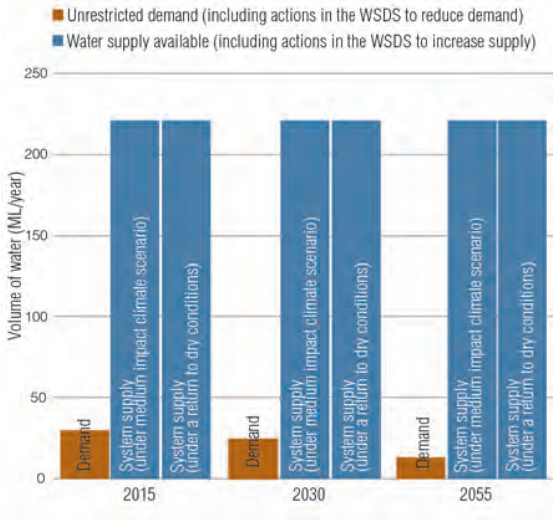
d) Omeo supply system



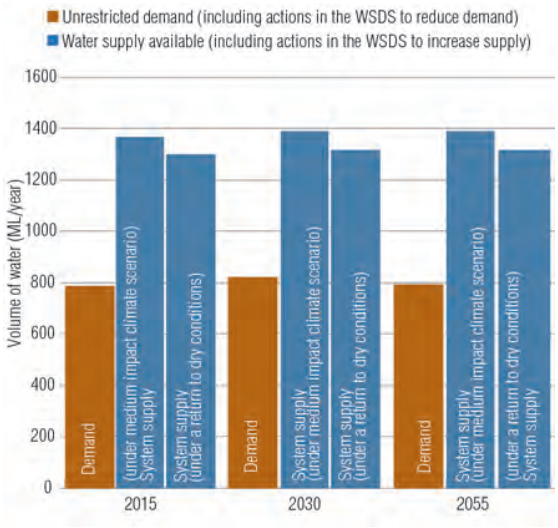
e) Dinner Plain Supply System



f) Swifts Creek Supply system



g) Orbost Supply System



Note:
a The Mallacoota supply systmes is shown in Chapter 7 (Figure 7.4).
The Mitchell supply system is shown in Chapter 6 (Figure 6.7)

Appendix 6: Summary of Regional River Health strategies

This appendix supplements information in Section 4.4 on the Victorian Government integrated river health framework, which is also set out in the *Victorian River Health Strategy 2002* and *Our Water Our Future 2004*. This framework aims to:

- Protect priority areas of the highest community values from any decline in condition (considering environmental, social and economic values).
- Maintain the condition of ecologically healthy rivers
- Achieve an overall improvement in the condition of the remaining rivers.
- Prevent damage from future management activities.

The *Regional River Health Strategies* (RRHS) are prepared by each regional catchment management Authority (see Figure A6.1) in its role as the caretaker of river health in the region, in conjunction with the community and other government agencies.

All RRHS have a term of five years and are in the process of being updated. The RRHS for both West Gippsland and East Gippsland were prepared under the guidance of two key documents: the *Victorian River Health Strategy* (VRHS) and either the West or East Gippsland Regional Catchment Strategy.

A second generation VRHS is currently being developed and will be delivered as the *Victorian Strategy for Healthy Rivers, Estuaries and Wetlands (VSHREW)*, to be completed by 2012. As part of this process a review of the RRHS has been undertaken and new guidelines will be prepared to assist all CMAs in developing their second generation RRHS.

West Gippsland Catchment Management Authority

The West Gippsland RRHS was released in 2005 by the West Gippsland Catchment Management Authority (WGCMA). The Strategy can be found at: http://www.wgcma.vic.gov.au/publications/regional-menu.html.

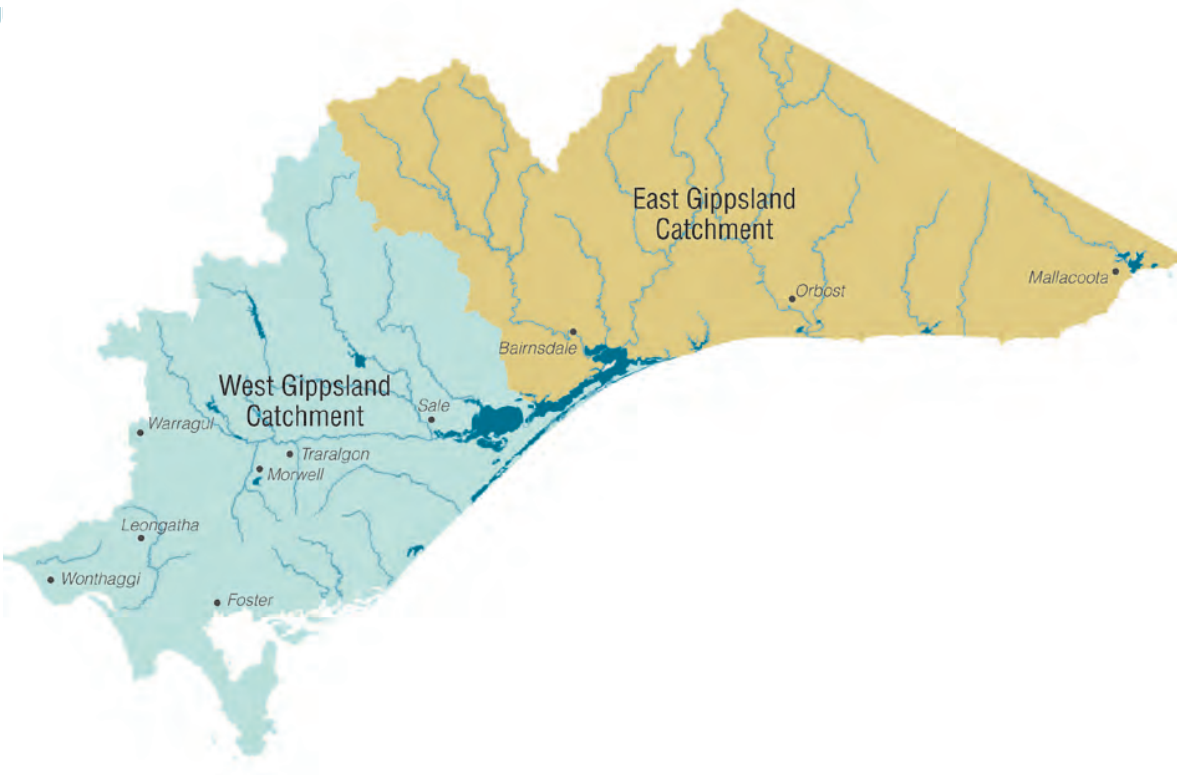
The West Gippsland RRHS is a five year strategy to protect areas of high value, to maintain the condition of rivers that are presently in ecologically healthy condition and to work towards an overall improvement in the environmental condition of all rivers across the region.

The purpose of the RRHS is to find a balance between protection, maintenance and enhancement of the environmental values of natural river systems and the processes required to sustain river health, while protecting, maintaining or enhancing additional social and economic values important to the local community.

Three management programs across 40 priority river reaches will allow the WGCMA to fulfil the objectives defined for the Thomson, Latrobe and South Gippsland river basins. These include:

- *For the Thomson basin*, to improve the ecological health of the Thomson and Macalister River systems and manage them into the future as representative systems which maintain a sustainable balance between the commercial uses of water, environmental flows and the enhancement of the high value Ramsar-listed Gippsland Lakes with which they interact

Fig



- *For the Latrobe basin*, to improve environmental flow regimes to reduce the effects of upstream impacts on the Gippsland Lakes while supporting the nationally significant industries which rely upon water provided from the Latrobe River and its tributaries
- *For the South Gippsland basin*, to protect, and improve the condition of, the nationally significant marine and coastal environments through improved catchment management practices tailored to protect the values of the unique river systems.

Management Action Plans for priority reaches have been developed as part of the RRHS aiming to address the three most common threats to river health across West Gippsland, including stock access to waterways, poor water quality and degraded riparian vegetation. The intent of the Management Action Plans is to give direction to landholders, community groups, agencies, industry and other stakeholders for river management activities, research and monitoring over the life of the West Gippsland RRHS. While Management Action Plans are specific to priority areas, actions identified within them present common themes to give guidance for community driven projects that may occur outside these areas.

In the interim period between now and the completion of the second generation West Gippsland RRHS, the priority management actions outlined in the original RRHS requires revision to ensure optimal investment and river health outcomes across West Gippsland. Additionally, changes in the regional environment resulting from drought, bushfire, and floods as well as the completion of new policies including regional sustainable water strategies have altered priorities across West Gippsland.

As a result the WGCMA has developed a short-term, contemporary addendum to the RRHS to ensure that there is adequate direction of investment up until 2012 when the second generation RRHSs are finalised.

The Addendum will act as an interim guide to priorities and actions until the completion of VSHREW and the second generation RRHSs.

The intent of the Addendum to the West Gippsland River Health Strategy is to:

- identify and interpret the regional implications of new policy, changes in the local environment or new knowledge that might affect delivery of river health outcomes from the existing RRHSs;
- identify priority actions from the original RRHS that are still valid and still to be completed; and
- identify new priority actions or reaches that were not included in the RRHS.

East Gippsland Regional River Health Strategy

The East Gippsland RRHS was released in 2006 by the East Gippsland Catchment Management Authority (EGCMA). The Strategy can be found at: http://www.egcma.com.au/topic.php?a=8&b=276

The catchment goals of the East Gippsland RRHS are to protect and improve the high value natural assets associated with the rivers of East Gippsland, and to support a sustainable regional economy for the current community and future generations.

The East Gippsland RRHS proposed delivery through five major programs:

Program A: Protecting rivers that are of highest community value from any decline in condition, and maintaining the condition of our ecologically healthy rivers.

Program B: Protecting rivers that do not have current impacts from widespread and invasive threats, but would decline if these threats were to appear.

Program C: Achieving targeted improvements in the environmental condition of some of the other rivers in the region.

Program D: Preventing damage from future activities.

Program E: A community and agency education, consultation and involvement program.

The East Gippsland RRHS contained numerous detailed action targets, many of which were set at the level of individual river reaches. To support the effective implementation of the strategy, the EGCMA Board set 'Catchment Goals' for the region through its Corporate Plan. These are a simplified set of river health targets, scaled up to catchment scale, which are more easily understood and communicated. They are regularly reviewed to maintain their currency and relevance. The importance of having an effective strategy in place was demonstrated during the major bushfire and flooding events in 2006/07. The directions, principles and priorities of the East Gippsland RRHS enabled effective river health management to continue through these difficult events.

Implementation of the East Gippsland RHS was evaluated in 2008. The evaluation supported the adoption of the Catchment Goals, and found that they:

- reflect the threat analysis in the East Gippsland RRHS;
- address the high priority catchment threats in the region, particularly willows; and
- provide an appropriate focus for achievement of good river health outcomes in the region, at a catchment scale.

The evaluation also provided guidance on issues including:

- increasing the focus on landholder relationships;
- supporting the use of natural regeneration instead of revegetation; and,
- the critical nature of flood recovery activities.

Following on from this evaluation and extensive community engagement activity by the EGCMA, including the 2009 release of *'Improving East Gippsland's Rivers – Priorities for River Health 2007 – 2009'*, the East Gippsland CMA has set out specific catchment goals that it is on target to achieve by 2012 as follows:

- The willow control works completed in the **Mitchell River** by June 2009, will be consolidated as free of willows. An additional 50km above the Glenaladale off-take will be fenced from grazing stock and revegetated.
- The **Tambo** and feeder streams will be free of willows above Ramrod Creek.
- The **Nicholson** and feeder streams will be free of willows and have a continuous riparian zone between the Princes Highway Bridge and the Great Alpine Road fenced from grazing stock.
- The **Snowy catchment** will be free of willows from the Victorian headwaters to the Jarrahmond Gauge. The floodplain reach will have a continuous riparian zone from the Jarrahmond gauge to the estuary fenced from grazing stock.
- The **Bemm River** will be free of willows and fenced from grazing stock.
- The **Cann River** channel will be stabilised in the floodplain reach. All reaches above Weeragua and below the Princes Highway Bridge will be free of willows.
- All rivers **east of the Cann** will be free of willows and fenced from grazing stock.
- Environmental Water Reserves will be established for all waterways in East Gippsland.

The VSHREW is currently under development. Once this is in place, the East Gippsland RRHS will be updated with a regional Strategy for Healthy Rivers, Estuaries and Wetlands.

Lower Bemm River, EGCMA

Further information

Department of Sustainability and Environment (DSE)
136 186
www.water.vic.gov.au/programs/sws/gippsland

Information regarding local water resource planning:

Southern Rural Water
1300 139 510
www.srw.com.au

South Gippsland Water
(03) 5682 0444
www.sgwater.com.au

Gippsland Water
1800 066 401
www.gippswater.com.au

East Gippsland Water
1300 720 700
www.egwater.vic.gov.au

Information regarding Government options to reduce greenhouse gas emissions and tackle climate change:

www.climatechange.vic.gov.au
www.seaci.org

Information regarding regional river and catchment health is available from catchment management authorities:

West Gippsland Catchment Management Authority
1300 094 262
www.wgcma.vic.gov.au

East Gippsland Catchment Management Authority
(03) 5152 0600
www.egcma.com.au

Technical Papers available online:

Technical Paper 1 – Indigenous engagment summary

Technical Paper 2 – Development of actions and policies in the Strategy

Technical Paper 3 – Bushfire impacts on water quality and quantity

Technical Paper 4 – RMCG water demand study[22]

Technical Paper 5 – SKM water availability study[23]

Technical Paper 6 – Development of options for unallocated water in Blue Rock Reservoir

Technical Paper 7 – Management of the Snowy Scheme

Technical Paper 8 – Undeclaring Water Supply Protection Areas

These papers can be accessed at:
www.water.vic.gov.au/programs/sws/gippsland
or by contacting DSE on 136 186.

State-wide Policy Papers available online:

- Managing adverse water resource impacts from land use change.
- Improving management of Victoria's groundwater resources.

These papers can be accessed at:
www.water.vic.gov.au/programs/sws
or by contacting DSE on 136 186.

Acronyms

BE	Bulk Entitlement
BSMS	Basin Salinity Management Strategy
CASS	Coastal Acid Sulfate Soils
CCS	Carbon Capture and Storage
COAG	Council of Australian Governments
CMA	catchment management authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
D&S	Domestic and stock
DSE	Department of Sustainability and Environment
DPI	Department of Primary Industries
EC	electrical conductivity units (salinity)
EEA	*Environmental Effects Act 1978*
EES	Environmental Effects Statement
EGCMA	East Gippsland Catchment Management Authority
ESC	Essential Services Commission
EPA	Environment Protection Authority Victoria
EWR	environmental water reserve
GDE	groundwater dependent ecosystem
GL	gigalitre
GMA	groundwater management area
GMU	groundwater management unit
IPCC	Intergovernmental Panel on Climate Change
IVT	inter-valley transfer
HRWS	high-reliability water share
LRWS	low-reliability water share
MAR	Managed Aquifer Recharge
MDB	Murray-Darling Basin
ML	megalitre
N/A	not applicable
NRM	natural resource management
NWI	National Water Initiative
NWC	National Water Commission
PCV	permissible consumptive volume
SDL	sustainable diversion limit
SAM	Southern Annular Mode
SEACI	South East Australia Climate Initiative
SEBAL	Surface Energy Balance Algorithm for Land
SECV	State Electricity Commission of Victoria (former)
SFMP	Stream Flow Management Plan
SWIOID	Snowy Water Inquiry Outcomes Implementation Deed
VCS	Victorian Coastal Strategy
VEAC	Victorian Environment Assessment Council
VSHREW	Victorian Strategy for Healthy Rivers, Estuaries and Wetlands
WaterMAP	Water Management Action Plan
WGCMA	West Gippsland Catchment Management Authority
WSPA	water supply protection area

Glossary

Adaptive management	Changing management policies and processes to meet/adapt to changing circumstances
Afforestation	The establishment of a forest by artificial methods, such as planting and direct seeding.
Anabranch	A section of a waterway that diverts from the main watercourse channel (or main stem) and rejoins the waterway downstream.
Aquifer	A layer of underground sediment or rock that holds water and allows water to flow through it.
Aquitard	A layer of rock or soil that does not easily allow water to move through it.
Augmentation	Increase in size and/or number (eg. of assets in a water supply system).
Baseflows	The component of streamflow supplied by groundwater discharge (or simulated by environmental water releases.
Bulk Entitlement (BE)	The right to water held by water corporations and other authorities defined in the *Water Act 1989*. The BE defines the amount of water that an authority is entitled to from a river or storage, and may include the rate at which it may be taken.
Cap	An upper limit for the diversion of water from a waterway, catchment or basin.
Capacity share bulk entitlement	Provides entitlement-holders with a share of the storage capacity and inflows of water in the system. It also gives them the right to take water from specified points in the system.
Carbon capture and storage	The capture of carbon dioxide from industrial emissions and injecting it under pressure into rock formations that can store it.
Carryover	Allows entitlement-holders to retain ownership of unused water allocated or purchased from the current season into the following season (according to specified rules).
Catchment	An area of land where run-off from rainfall goes into one river system.
Catchment management authorities (CMAs)	Government authorities established to manage river health, regional and catchment planning, and waterway, floodplain, salinity and water quality management.
Coal seam methane	The extraction of methane gas from deeper coal seams.
Culvert	A device used to channel water.
Dairy wash	Water used to wash down farm dairies.
Delivery share	An entitlement to have water delivered to land in an irrigation district and a share of the available channel capacity in a delivery system. It is linked to land and stays with the property if the water share is traded away.
Delivery share bulk entitlement	Provides a volume of water each year, subject to defined restrictions during periods of water shortages.
Desalination	Removing salt from water sources – normally for drinking purposes.
Distribution losses	See system operating water.
Diversions	The removal of water from a waterway.
Domestic and stock	Water used in households and for animals/stock.
Drainage water	By-product of irrigation. Use is licensed.
Drought response plan	Used by urban water corporations to manage water shortages, including implementation of water restrictions.
EC units/level EC	Electrical conductivity – a measure used to indicate salinity levels in water.
Ecologically sustainable development	The ideal to use, conserve and enhance the community's resources so that ecological processes on which life depends are maintained and the total quality of life, now and in the future, can be increased.
Ecosystem	A dynamic complex of plant, animal, fungal and microorganism communities and the associated non-living environment interacting as an ecological unit.
Effluent	Treated sewage that flows out of a sewage treatment plant.
Environmental flow regime	The timing, frequency, duration and magnitude of flows for the environment.
Environmental water reserve (EWR)	The share of water resources set aside to maintain the environmental values of a water system.

Glossary

Environmental Water Holder	A body established to hold and manage environmental entitlements across the State.
Estuaries	Zones where a river meets the sea, influenced by river flows and tides and characterised by a gradient from fresh to saltwater.
Farm dams	Individually owned storages that capture catchment run-off.
Fit-for-purpose	Water of a quality which requires no further treatment for its intended use.
Floodplain	Land subject to inundation during floods.
Freshes	The first seasonal 'flush' of water through a waterway.
Geothermal energy	The natural heat found within the earth.
Gigalitre (GL)	One billion (1,000,000,000) litres.
Greywater	Household water that has not been contaminated by toilet discharge, and can be reused for non-drinking purposes. Typically includes water from bathtubs, dishwashing machines and clothes washing machines.
Groundwater	All subsurface water, generally occupying the pores and crevices of rock and soil.
Groundwater dependent ecosystem (GDE)	Ecosystems such as wetlands, waterways, estuaries or vegetation that rely totally or in part on groundwater to provide water.
Groundwater management area (GMA)	Discrete area where groundwater resources of a suitable quality for irrigation, commercial or domestic and stock use are available or are expected to be available.
Groundwater management plans	Created for water supply protection areas that have been or are proposed to be proclaimed under the *Water Act 1989* to ensure equitable and sustainable use of groundwater.
Groundwater management unit (GMU)	A groundwater management area (GMA) or water supply protection area (WSPA).
Headworks	Dams, weirs and associated works used for the harvest and supply of water.
Heritage-listed river	Heritage River status means the river has important nature conservation, scenic, recreational and cultural values.
High-reliability water share	Legally recognised, secure entitlement to a defined share of water.
Hydrothermal energy	Deriving energy by bringing up to the surface naturally heated water from deep in the ground then extracting energy and returning water to the aquifer.
Inflows	Water flowing into a storage or waterway.
Instream	The component of a river within the river channel, including pools, riffles, woody debris, the river bank and benches along the bank.
Licensing authority	Administers the diversion of water from waterways and the extraction of groundwater on behalf of the Minister for Water.
Local management plans	Plans that describe the water resource, management objectives and specific rules for such things as restrictions in times of shortage, carryover (if applicable) and trade. Local management plans cannot amend licence conditions. Previous called local management rules.
Low-reliability water share	Legally recognised, secure entitlement to a defined share of water. Available after there is enough water for high-reliability water share allocations and reserves. Previously known as sales water.
Managed aquifer recharge (MAR)	The purposeful and actively managed recharge of water to aquifers for subsequent recovery and use or environmental benefit.
Megalitre (ML)	One million (1,000,000) litres.
MID2030	MID2030 is a long-term strategic plan for the Macalister Irrigation District (MID), the largest irrigation area in the south of Victoria. MID2030, which aims to significantly improve the efficiency of channels and pipelines by 2030, is being developed by Southern Rural Water.
National Water Initiative (NWI)	Agreed to and signed at the 2004 meeting of the Council of Australian Governments (COAG), with the agreed imperative of increasing the productivity and efficiency of water use and the health of river and groundwater systems in Australia.
Non-residential	Water use in industry, commercial/institutional buildings, open spaces (parks and gardens) and the water distribution system.
Outfall	The site of discharge of a liquid from a pipe. Applied particularly to the point at which a sewer discharges to a treatment works or receiving water (such as waterway or bay).
Passing flow	Flows that a water corporation must pass at its reservoirs before it can take any water for consumptive use.

Glossary

Permanent trade	Permanent transfer of a water share or licence.
Permissible consumptive volume (PCV)	The volume of water permitted to be allocated. Previously called permissible annual volumes (PAVs).
Point source	Any single identifiable source of pollution from which pollutants are discharged such as a pipe, ditch, ship or factory smokestack.
Potable	Suitable for drinking.
Qualification of rights	The Minister for Water declares a water shortage and qualifies existing water entitlements to reallocate water to priority uses.
Ramsar-listed wetlands	Wetlands listed as internationally significant under the Convention on Wetlands held in Ramsar, Iran in 1971.
Raw water	Water that has not been treated for the intended purpose.
Recharge (to groundwater)	The process where water moves downward from surface water to groundwater due to rainfall infiltration or seepage/leakage.
Recycled water	Water derived from sewerage systems or industry processes that is treated to a standard appropriate for its intended use.
Regional river health strategy	The key strategy for the protection of river values in each catchment management region in Victoria.
Regulated systems	Systems where the flow of the river is regulated through the operation of large dams or weirs.
Reliability of supply	Represents the frequency with which water that has been allocated under a water entitlement is expected to be supplied in full.
Required annual releases	The nominal annual volumes that Snowy Hydro is obliged to release under the Snowy Water Licence of 1,062 GL to the River Murray and 1,026 GL to the Murrumbidgee River.
Reservoir	Natural or artificial dam or lake used for the storage and regulation of water.
Residential use	Water use in private housing.
Reticulation	Network of pipelines used to deliver water to end users.
Return flows	The portion of an allocation that the entitlement-holder returns to the bulk supply system.
River basin	The land from which a river/s and tributaries drain.
Run-off	Precipitation or rainfall that flows from a catchment into waterways, lakes or reservoirs.
Salinity	The total amount of water-soluble salts present in the soil or a stream.
Salt wedge	A layer of saltwater below a layer of freshwater, which is pushed up and down an estuary by tides or freshwater flows.
Seasonal allocation	The specific volume of water allocated to a water share in a given season, defined according to rules established in the relevant water plan.
SECV Shell	A share of water from Blue Rock Reservoir that is currently linked to the development of the 3/4 bench.
Sewage	Wastewater produced from household and industry.
Sewerage	The pipes and plant that collect, remove, treat and dispose of liquid urban waste.
Share of delivery capacity	An entitlement to have water delivered to a property.
Snowy Mountains Hydroelectric Scheme	A large hydroelectricity and irrigation complex in south-east Australia.
Sleeper licence	Licences, which have been issued but are not being used.
Stormwater	Run-off from urban areas. The net increase in run–off and decrease in groundwater recharge resulting from the introduction of impervious surfaces such as roofs and roads within urban development.
Stranded assets	Distribution infrastructure left with too few customers to pay for its maintenance when water entitlements delivered by that asset trade to other systems.
Streamflow management plan	Prepared for a water supply protection area to manage the surface water resources of the area.
Stygofauna	Fauna that live within groundwater systems, such as caves and aquifers.
Sustainable diversion limit (SDL)	Unless specified otherwise, the term 'sustainable diversion limit' in this Strategy refers to those defined under the Victorian *Water Act 1989 – Policies for Managing Take and Use Licences*. In contrast, the Murray-Darling Basin Authority has proposed sustainable diversion limits for the Murray-Darling Basin which will be defined in the Murray-Darling Basin Plan.

Glossary

Sustainable yield	The proportion of natural capital (eg timber, fish, water) that can be extracted without compromising the integrity of the ecosystems and communities that depend on it.
System operating water	Water released out of storages to operate distribution systems (to deliver water to end users), provide for riparian rights and maintain environmental values and other community benefits.
Temporary trade	Temporary transfer of a seasonal allocation or licence.
Termination fee	One-off payment made by an entitlement-holder as a condition of surrender of a delivery share.
Traditional Owners	People who, through membership of a descent group or clan, are responsible for caring for particular Country. A Traditional Owner is authorised to speak for Country and its heritage as a senior Traditional Owner, an Elder or, in more recent times, a registered native title claimant.
Unaccounted water use	Water use outside the water entitlement framework.
Unbundling	Separation of traditional entitlements into a water share, delivery share and a water-use licence.
Underground coal gasification/liquification	The turning of coal into hydrocarbons in the coal bed without the coal being dug up.
Unincorporated areas	Areas with limited groundwater resources which are not defined as a groundwater management area or water supply protection area and do not have a defined permissible consumptive volume.
Unregulated systems	River systems with no large dams or weirs to regulate flow.
Water corporations	Government organisations charged with supplying water to urban and rural water users. They administer the diversion of water from waterways and the extraction of groundwater. Formerly known as water authorities.
Water market	Market in which the trade of permanent and temporary water is allowed under certain conditions.
Water plans	Outline the services water corporations will deliver over a three-year regulatory period and the prices that they will charge.
Water rights	Previously rights to water held by irrigators. As a result of 'unbundling', these have now been separated into a water share, delivery share and water use licence.
Water share	A legally recognised, secure share of the water available to be taken from a regulated water system. It can be traded permanently or leased.
Water supply-demand strategies	All urban water corporations in Victoria are required to develop these strategies, which detail how water supplies and water demands will be balanced over the long term.
Water supply protection area	An area declared under the *Water Act 1989* to protect groundwater and/or surface water resources in the area. Once an area has been declared, a water management plan is prepared.
Water-use licence	Authorises the use of water on land for irrigation.
Wetlands	Inland, standing, shallow bodies of water, which may be permanent or temporary, fresh or saline.
Winter-fill licence	A licence issued that permits taking water from a waterway only during the wetter months.
Yield	The quantity of water that a storage or aquifer can produce.

End notes

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5. SEACI fact sheet (2011) *The Millennium Drought and the 2010/11 Floods*, www.seaci.org.
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7. IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the *Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.
8. For example see:
   a. Steffen, W (2011) *The critical decade: Climate science, risks and responses*, Climate Commission Secretariat, Australian Government Department of Climate Change and Energy Efficiency, Canberra, Australia.
   b. Cleugh, H, Stafford Smith, M, Battaglia, M and Graham, P (eds) (2011) *Climate change: Science and solutions for Australia*, CSIRO Publishing, Australia, 155 pp.
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11. Hatton, T, Otto, C, Underschultz, J (2004) *Falling Water Levels in the Latrobe Aquifer, Gippsland Basin: Determination of Cause and Recommendations for Future Work*. Joint Report for CSIRO Wealth from Oceans Flagship Program, CSIRO Land and Water and CSIRO Petroleum Resources, 13 September 2004.
12. CSIRO (2007) Petroleum Report 07-003. *Simulation of coastal subsidence and storm wave inundation risk in the Gippsland Basin*. Freij-Ayoub, R, Underschultz, J, Li, F, Trefry, C, Hennig, A, Otto, C and McInnes, K.
13. Department of Primary Industries (2007) *Report for Gippsland Elevation Monitoring Survey* – Epoch 3 April/May 2007, Report June 2007, AAMHatch Pty Ltd, Western Australia.
14. Department of Sustainability and Environment (2009), *Victorian Irrigation Drainage Program Review*, State Government of Victoria, Melbourne.
15. Sinclair Knight Merz (2005) *West Gippsland Salinity Management Plan*, prepared for the West Gippsland Catchment Management Authority.
16. Department of Sustainability and Environment (2009) *Victorian Coastal Acid Sulfate Soils Strategy*, State Government of Victoria, Melbourne.
17. The Environmental Contribution Levy targets all water users (rural and urban) to meet costs associated with managing environmental water. The Government is required under the *Water Act 1989* to review environmental contributions every four years.
18. Ecologically sustainable development is economic development that does not sacrifice the future quality of life for short-term gains, and helps maintain the ecological processes on which all life depends.
19. Open cut coal mine operations in the Latrobe Valley primarily dewater from confined aquifers, which lowers water pressures in these aquifers over time.

End notes

20. CSIRO (2007). Petroleum Report 07-003. *Simulation of coastal subsidence and storm wave inundation risk in the Gippsland Basin*. Freij-Ayoub, R., Underschultz, J., Li, F., Trefry, C., Hennig, A., Otto. C., & McInnes, K.
21. An alternative water atlas will be included as part of each water corporation's water supply-demand strategy. They will provide information on specific opportunities for increasing the supply of alternative water services within the geographical bounds of the water corporation's service area. The atlas will identify volumes of stormwater, recycled water and other alternative water sources within the works of the water corporation and will help inform future opportunities to use alternative water sources.
22. Technical Paper 4: *Water demands in unregulated catchments – Southern Victoria: Final Report*. RMCG, Bendigo, August 2011.
23. Technical Paper 5: *Assessment of water availability for development in southern Victoria- Water availability in unregulated supply areas: Final*. Sinclair Knight Merz,, Melbourne, July 2011.
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25. Aboriginal Cultural Heritage, Parkweb Victoria, http://www.parkweb.vic.gov.au.
26. In the Draft Gippsland Region Sustainable Water Strategy, these were referred to as local management rules.
27. See Technical Paper 4 and Technical Paper 5, available at: http://www.water.vic.gov.au/programs/sws/gippsland.
28. South Gippsland Water Corporation (2011), Water Supply Demand Strategy, April 2011.
29. A Victorian Representative Waterway is a benchmark river type used for understanding how those river types functioned prior to European settlement.
30. In the Draft Gippsland Region Sustainable Water Strategy, these were referred to as local management rules.
31. Tilleard JW, O.Connor N, Boon PI (2009). *Understanding the environmental water requirements of the Gippsland Lakes system, Stage 1: Scoping Study*, report by Moroka Pty Ltd, Ecos Environmental Consulting and Dodo Environmental for the East and West Gippsland Catchment Management Authorities.
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33. See Technical Paper 4 and Technical Paper 5, available at: http://www.water.vic.gov.au/programs/sws/gippsland.
34. Independent Panel Report to the Draft Gippsland Region Sustainable Water Strategy, 2011.
35. Gippsland Water Corporation Water Supply Demand Strategy (2007).
36. East Gippsland Water Corporation Water Supply Demand Strategy (2011).
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38. Southern Rural Water (2007), *MID2030 Strategy*, September 2007. http://www.srw.com.au/Files/General_publications/MID2030_Strategy_paper.pdf.
39. Department of Sustainability and Environment (2009), *Victorian Irrigation Drainage Program Review*, State Government of Victoria, Melbourne.
40. Thomson-Macalister Environmental Flows Taskforce report, 2004
41. Sinclair Knight Merz (2010). *An investigation into the management options for preventing salt water intrusions into Lakes Wellington*, prepared for the Gippsland Lakes Taskforce.
42. 'Previous studies' refers to the references at the end of Lake Wellington Salinity study (see Endnote 42).
43. Although the entrance could be closed, this is not a realistic option because of the detrimental impact on fishing and tourism, and increasing risk of flooding in the lakes.
44. *Latrobe Environmental Entitlement 2010*. Victorian Government Gazette, 4 November 2010.
45. In the Draft Gippsland Region Sustainable Water Strategy, these were referred to as local management rules.
46. See Technical Paper 4 and Technical Paper 5, available at: http://www.water.vic.gov.au/programs/sws/gippsland.
47. East Gippsland Water Corporation Water Supply Demand Strategy (2011).
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