Victorian Water Accounts 2009–2010

A statement of Victorian water resources

Published by the Victorian Government Department of Sustainability and Environment
Melbourne, October 2011

© The State of Victoria Department of Sustainability and Environment 2011
This publication is copyright. No part may be reproduced by any process except in accordance with the provisions of the *Copyright Act 1968*.

Authorised by the Victorian Government, 8 Nicholson Street, East Melbourne.

Printed by Finsbury Green

Printed on 100% recycled paper.

ISSN 1837-591X (print)
ISSN 1837-5928 (online)

For more information contact the Department of Sustainability and Environment's Customer Service Centre 136186.

Disclaimer

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

Data presented in this report has been compiled from a number of sources and varies in reliability. However, where possible checks on the accuracy of the data have been undertaken and the data compilation process is auditable.

Acknowledgements

Data compilation: Sinclair Knight Merz

Edited by Andrew Macrae

Alphabetical listing of Victoria's river basins

Contents

Introduction

Overview of the *Victorian Water Accounts 2009–2010*

The *Victorian Water Accounts 2009–2010* documents the key water resource management issues for Victoria. It is the seventh in a series of reports providing an overview of water availability and use across Victoria and reflects the government's commitment to greater transparency and accountability in water resource information.

As a signatory to the National Water Initiative, Victoria has obligations to implement water accounting systems and report on water entitlements, consumption, trade, environmental releases and initiatives. The *Victorian Water Accounts 2009–2010* is an important contribution towards meeting Victoria's obligations.

The *Victorian Water Accounts 2009–2010* examines the entire state's water allocation and use for the 2009–2010 year at bulk supply level. It consolidates information from all Victorian water businesses,[1] catchment management authorities, the Department of Sustainability and Environment, the Essential Services Commission, the Murray-Darling Basin Authority, Victorian Alpine Resorts Commission, power generators and other major users of water.

The *Victorian Water Accounts 2009–2010* consists of two parts:

- Part 1 provides a statewide overview that summarises water availability. It includes information on rainfall, streamflow and storage levels, water taken for consumptive purposes, and how the government manages water for the environment.
- Part 2 contains the water accounts for each of Victoria's 29 river basins. The accounts include quantitative data on available water and water use as well as concise commentary to give context to the data. The introductory chapter of Part 2 describes the approach taken to compile the basin accounts, as well as key assumptions and any identified limitations of the data.

Drought in Victoria

2009–2010 was the fourteenth straight year of drought in Victoria, although the drought's grip on the state loosened a little with slightly higher than average statewide rainfall recorded.

The higher rainfall meant streamflows across most of Victoria were greater than the very low volumes recorded in 2008–2009. However, streamflows generally remained well below long-term averages given the dry condition of the catchments caused by many years of low rainfall.

While conditions started to improve, the drought and its impacts are the dominant themes of the *Victorian Water Accounts 2009–2010* and they each play an important role in providing both the factual and contextual information required for an accurate assessment of the long-running drought's effects on Victoria.

2009–2010, the year in water

The key statistics for 2009–2010 include:

- Rainfall was slightly higher than average across most of Victoria in 2009–2010. Most of the state received between 100% and 125% of the long-term average. Between 125% and 150% of the long-term average was received around Swan Hill and Bendigo, while lower totals of between 80% and 100% were recorded across Gippsland and in other isolated areas.
- Record rainfall in November 2009 in the north-west and in February 2010 in East Gippsland contributed to above-average rainfall figures for the state.
- Despite this, the total streamflow volume for Victoria was only 52% of the long-term average.
- The wettest river basins, relative to their long-term averages, were the Bunyip, Otway Coast, Portland Coast and South Gippsland basins in southern Victoria. The Bunyip basin was the only basin to experience above average inflows in 2009–2010 , recording 109% of the long-term average.
- The total volume of water stored in Victoria's major regional reservoirs started the year at 1,621,394 ML (15% of capacity) and ended at 3,723,448 ML (35% of capacity). Levels peaked in October and declined over summer and autumn as inflows receded and water was released from the reservoirs for irrigation and urban use. Levels increased again between April and June 2010 due to flooding in the Darling River which significantly increased Victoria's share of the water stored in the Menindee Lakes in New South Wales.

---

[1] Water businesses are water corporations established under the *Water Act 1989* and the metropolitan retailers established under the *Corporations Act 2001* that hold water and sewerage licences issued under the *Water Industry Act 1994*.

- Compared to groundwater level trends in 2008–2009, a larger number (32 in 2009–2010 compared to 26 in 2008–2009) of management units showed a declining trend. While this can be attributed to steady demand for groundwater, external factors such as climate change and lack of recharge are also causing a decline in water levels.

Actions taken to address drought

In 2009–2010, a number of measures were used to sustainably manage the reduced amount of water available to Victoria. These measures included water restrictions in urban areas, seasonal allocations of surface water and groundwater in regulated systems, restrictions, rosters and bans on users in unregulated systems, operation of the emergency water supply network, augmenting water supply systems, water carting and qualifying rights to water.

As a result of the ongoing drought, the volume of water taken under bulk entitlements in 2009–2010 was only 44% of the total entitlement volume. This was exemplified in the Tambo, Campaspe, Loddon, Glenelg, Wimmera, Werribee, Moorabool and Maribyrnong basins where water taken was again well below the entitlement volume because water availability in those basins was severely limited.

There were 20 qualifications of rights in place across 11 basins during 2009–2010.

The Minister for Water also restricted groundwater use by qualifying rights to groundwater entitlements in water supply protection areas.

No new water supply points were added to the emergency water supply network that operated throughout the previous year. The supply points continued to be accessed by rural customers who carted water to their properties for domestic and stock purposes and for emergency use.

Conclusion

Sustainable management of our water resources requires adequate monitoring, accounting and reporting. The *Victorian Water Accounts 2009–2010* provides public accountability for water availability, entitlements and use across Victoria. Importantly, Victoria's efforts in monitoring, reporting and accounting continue to improve.

This report is also available at: www.water.vic.gov.au/monitoring/accounts

Part 1: Overview of Victorian water resources 2009–10

Part 1 of the *Victorian Water Accounts 2009–2010* provides a statewide overview of Victoria's water resources during the year. It reports on the:

- quantity of water available in terms of rainfall, streamflow, reservoirs and aquifers
- quantity of water allocated for consumption from reservoirs, streams and aquifers under entitlements issued by government, as well as quantity used and quantity recycled
- actions taken by the government and water businesses to respond to drought, including water restrictions, qualifications of rights and bans
- water available to the environment.

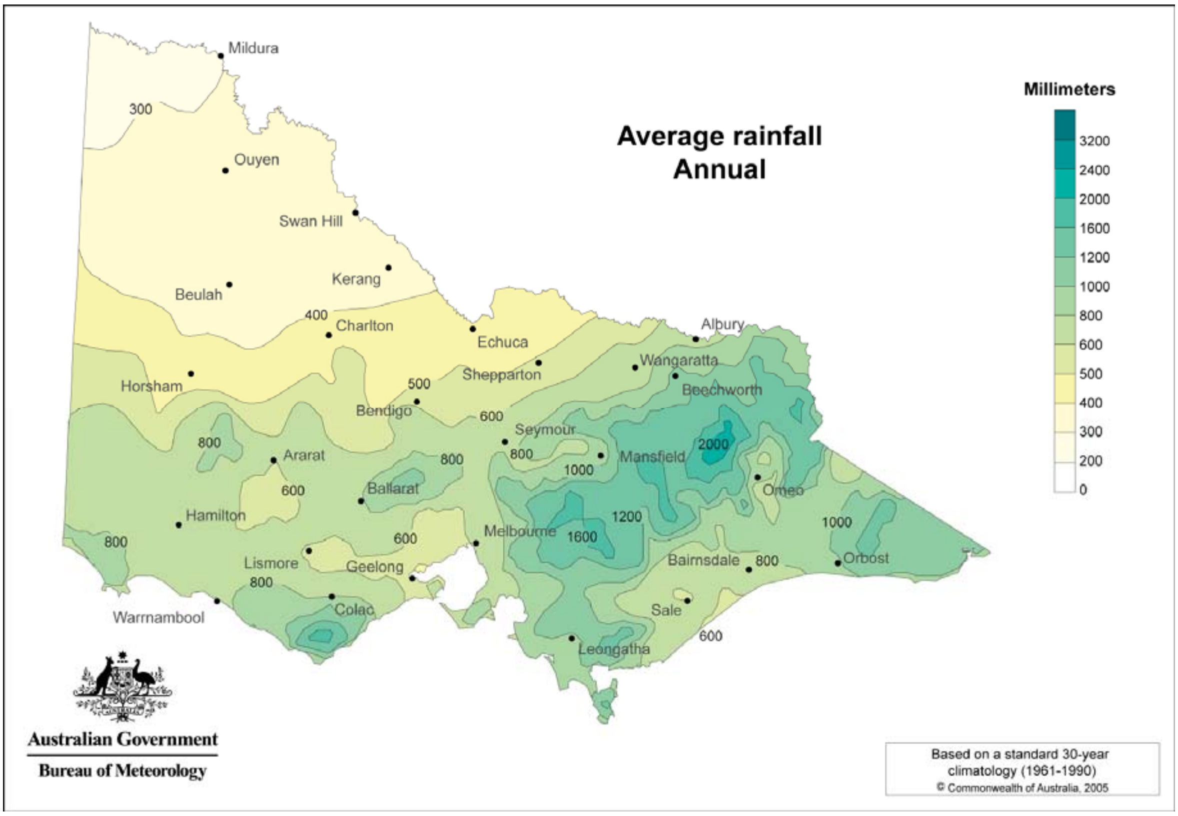
1 Water availability

This chapter presents a description and analysis of surface water and groundwater in Victoria during 2009–10. It examines how much surface water was available in Victoria during the year compared with previous years and reports rainfall, streamflow and reservoir levels. It also presents a high-level synopsis of Victoria's groundwater resources during 2009–10, including groundwater levels, entitlement volumes and extractions.

1.1 Rainfall

Victoria's rainfall in an average year is shown in Figure 1-1. The average rainfall varies from less than 300 millimetres a year in the north west of the state, up to approximately 2,000 millimetres a year in the alpine area of north-east Victoria.

Figure 1-1 Victorian average annual rainfall



Victoria's rainfall during 2009–10 is shown in Figure 1-2, while Figure 1-3 compares rainfall during 2009–10 to the long-term average.

Rainfall was slightly higher than average across most of Victoria in 2009–10. Most of the state received between 100% and 125% of the long-term average. Between 125% and 150% of the long-term average was received around Swan Hill and Bendigo, while lower totals of between 80% and 100% were recorded across Gippsland and in other isolated areas.

Figure 1-2 Victorian rainfall in 2009–10

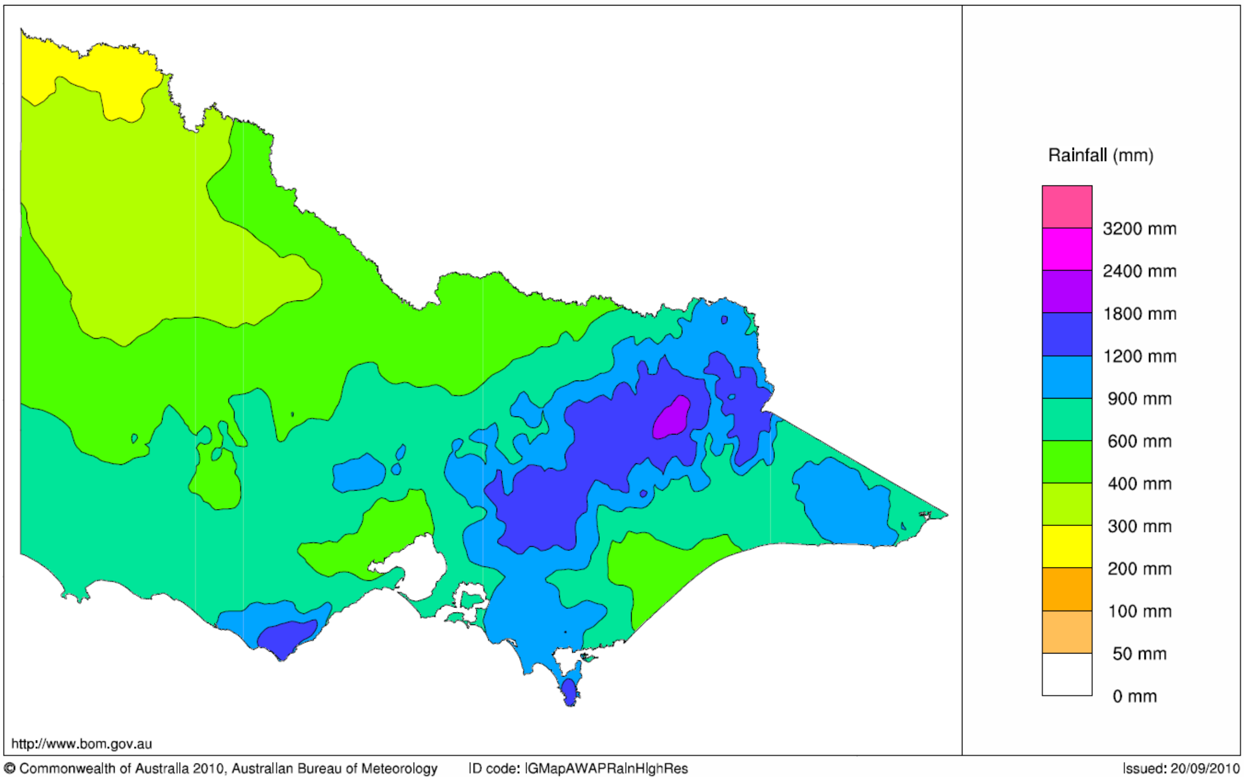
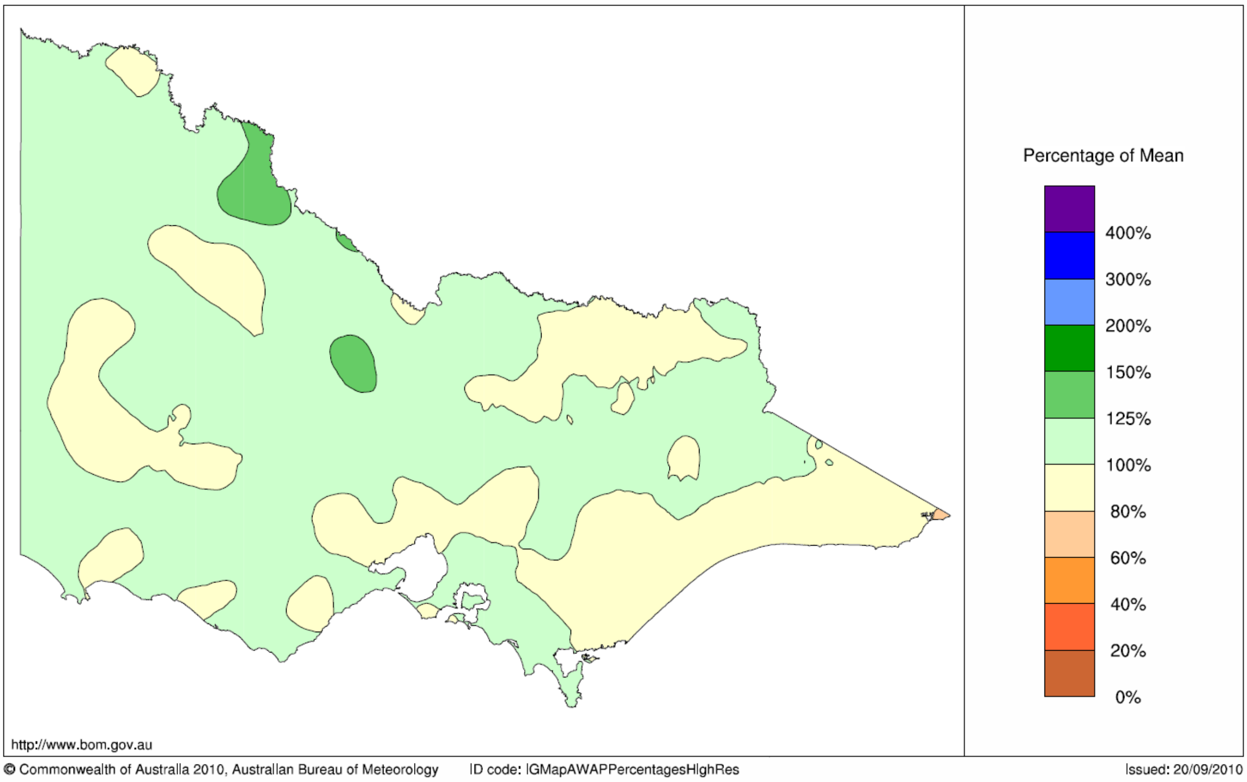
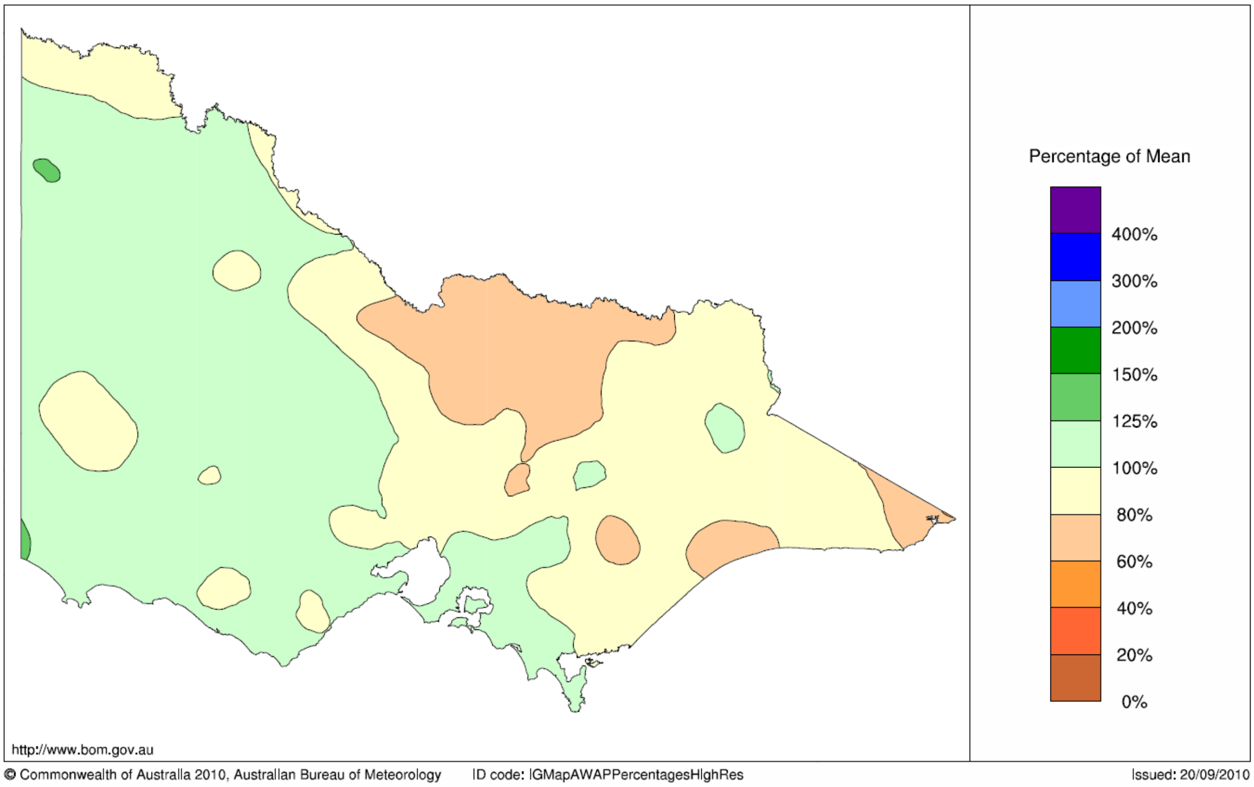


Figure 1-3 Victorian rainfall in 2009–10 relative to average rainfall



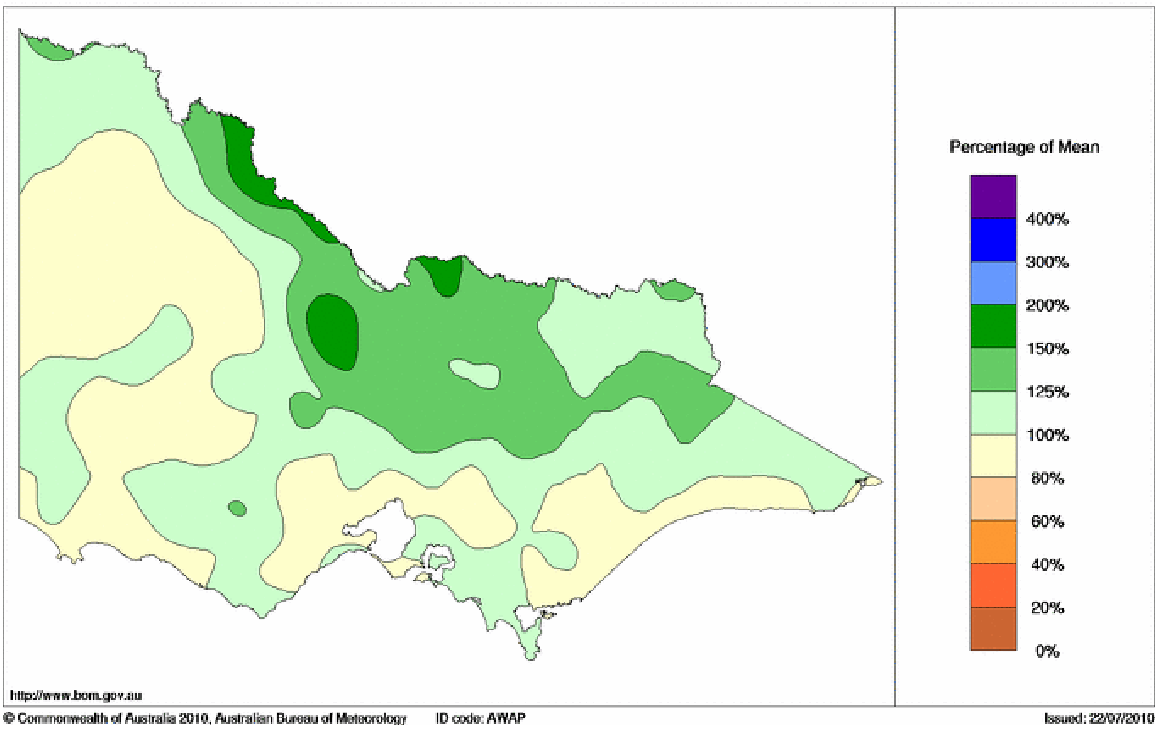
As Figure 1-4 shows, the first six months of 2009–10 were particularly wet across the western half of Victoria, South Gippsland and the Yarra Valley, where between 100% and 125% of the long term July to December average rainfall was recorded. The rest of the state only received between 60% and 100% of the long-term average.

Figure 1-4 Victorian rainfall from 1 July to 31 December 2009



As illustrated in Figure 1-5, rainfall for the January to June period was above average across most of Victoria. Rainfall conditions improved from February, showing signs that the strong El Niño event that persisted throughout 2009 was breaking down. February, March and April saw above-average rainfalls across much of the state. Although rainfall in June was largely below average, climate indicators were beginning to show signs of a developing La Niña event, which typically results in above-average rainfall over eastern Australia.

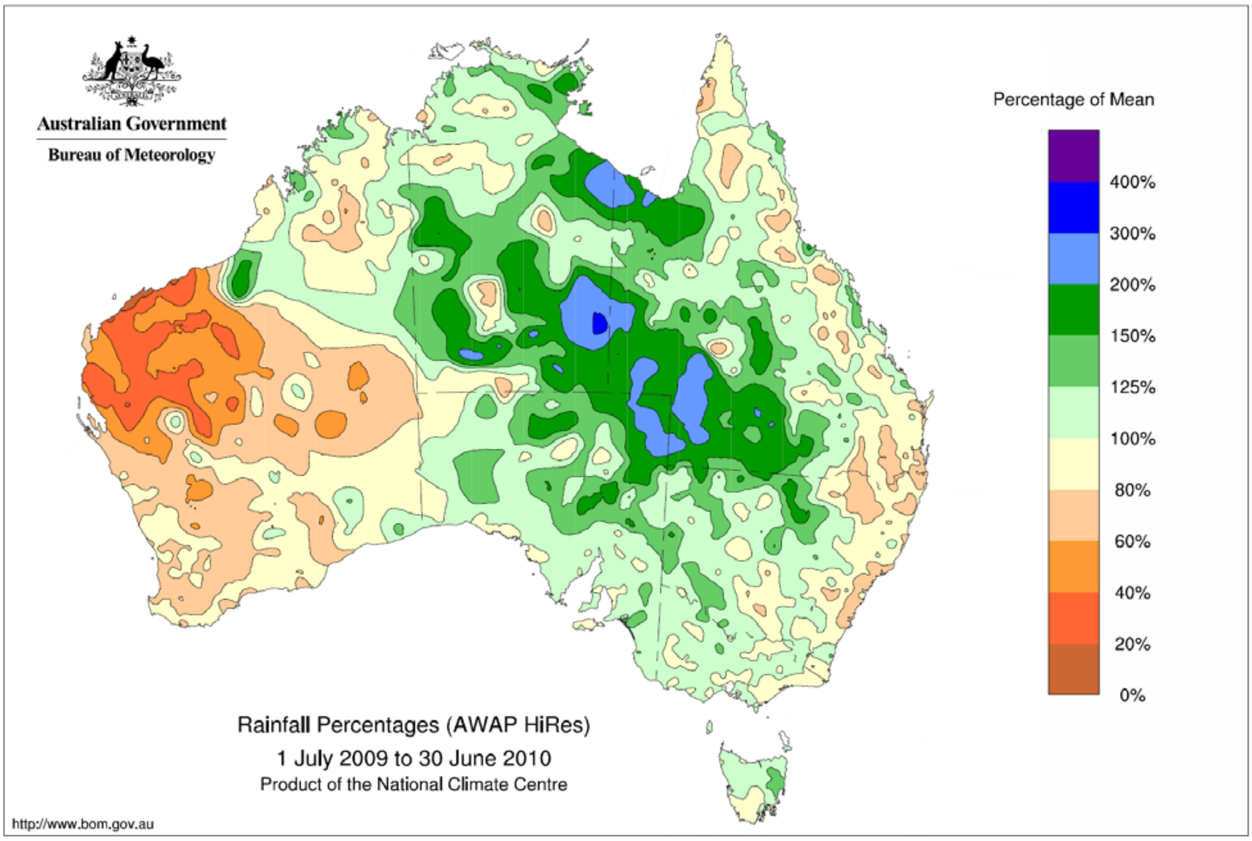
Figure 1-5 Victorian rainfall from 1 January to 30 June 2010



Despite the improved rainfall conditions, streamflows in many catchments across the state were relatively slow to respond. This is likely a result of the combined impact of the dry condition of the catchments after several preceding years of below-average rainfall and mean temperatures that were well above average or the highest on record across the state between July and December.

Figure 1-7 provides a national context, showing that the pattern of rainfall experienced across Victoria during 2009–10 is consistent with the rainfall patterns experienced across much of the Murray-Darling Basin and South Australia. Large areas of central Australia received rainfall above the long-term average conditions during 2009–10. However, rainfall deficiencies were observed in much of Western Australia and along the east coast of northern NSW and Queensland. The greatest deficiencies were observed in the Pilbara region of Western Australia.

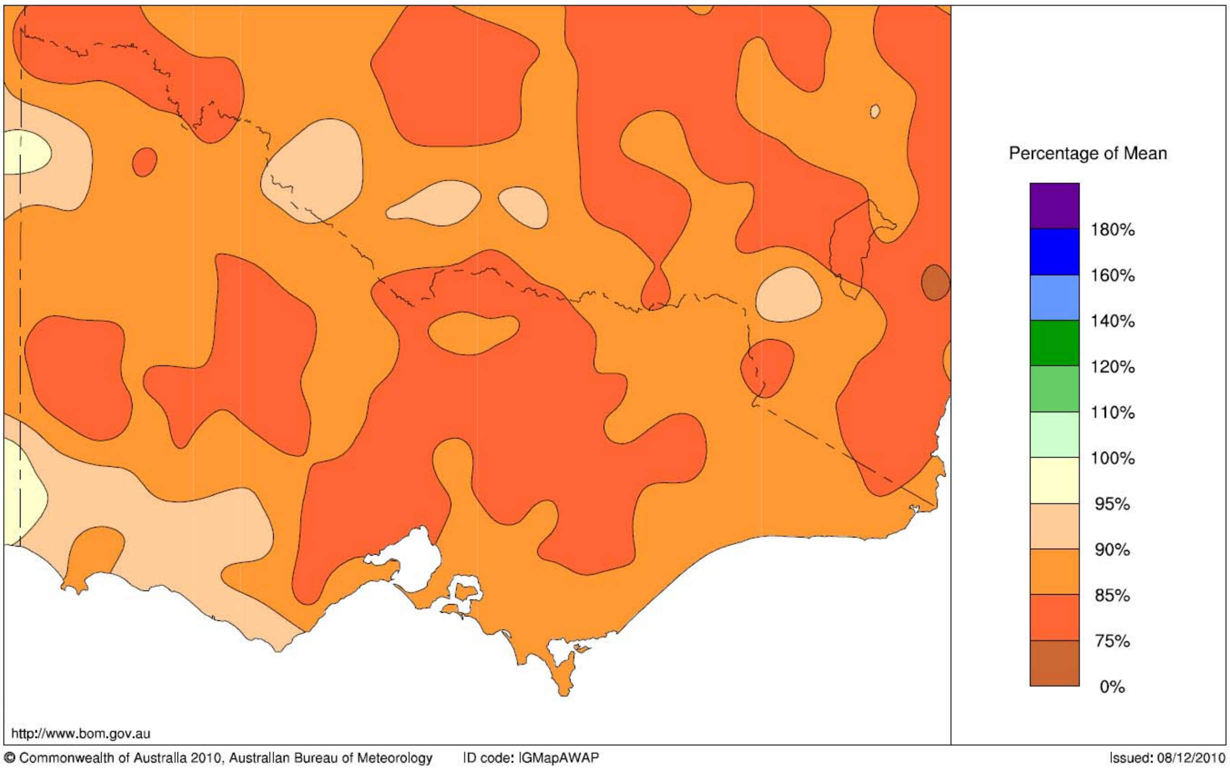
Figure 1-6 Australian rainfall, percentage of average, 1 July 2009 to 30 June 2010



© Commonwealth of Australia 2010, Australian Bureau of Meteorology

Figure 1-7 depicts the average annual rainfall in Victoria since July 1997 as a percentage of the long-term average. It shows that, despite the wetter conditions during 2009–10, yearly rainfall totals in the past 13 years across most of the state have been 75% to 90% of the long-term average. This figure demonstrates that even with above-average rainfall during 2009–10, rainfall in Victoria over the past 13 years has remained well below the long-term average.

Figure 1-7 Average annual rainfall percentage 13 years ending June 2010



1.2 Streamflow

Local factors influence how much rainfall ends up as streamflow and these factors vary between river basins. Local influences include subsurface geology, permeability and moisture levels of the soil, vegetation cover, and the pattern of individual rainfall events.

The streamflow data presented in Table 1-1 is taken from the water balance for each basin in Part 2 of this report. The table includes a comparison between streamflows in 2009–10, 2008–09 and over the long term.

Higher rainfall in 2009–10 ensured streamflows across most of Victoria were greater than the very low volumes recorded in 2008–09. However, streamflows generally remained well below long-term averages given the dry condition of the catchments after many years of low rainfall. Overall, the total streamflow volume for Victoria was 51% of the long-term average.

The wettest river basins, relative to their long-term averages, were the Bunyip, Otway Coast, Portland Coast and South Gippsland basins in southern Victoria. The Bunyip basin was the only basin to experience above-average inflows in 2009–10, recording 109% of the long-term average.

The Broken, Campaspe, Avoca, Maribyrnong and Werribee basins in northern and western Victoria were the driest in 2009–10. These basins recorded inflows of 19% to 22% of the long-term average. In contrast, the flows in the Bunyip were greater than the long-term average.

Streamflows remained below 50% of the long-term average in 15 river basins.

Table 1-1 Streamflow compared with long-term average

Basin	Average annual streamflow (ML) (1)	2009–10 streamflow (2)		2008–09 streamflow (2) (6)	
		(ML)	(% of average)	(ML)	(% of average)
Murray	7,618,000	3,199,100	42%	1,977,900	26%
Kiewa	689,000	525,400	76%	302,300	44%
Ovens	1,758,000	936,200	53%	498,600	28%
Broken	308,000	63,200	21%	51,200	17%
Goulburn	3,363,000	1,777,500	53%	933,400	28%
Campaspe	352,000	77,800	22%	46,100	13%
Loddon	373,000	102,500	27%	31,300	8%
Avoca	136,200	26,400	19%	24,200	18%
Mallee (3)	0	0	N/A	0	N/A
Wimmera	316,400	76,400	24%	48,700	15%
East Gippsland	714,000	241,800	34%	150,700	21%
Snowy (4)	1,022,000	559,000	55%	538,000	53%
Tambo	297,800	80,500	27%	170,700	57%
Mitchell	884,500	575,100	65%	365,800	41%
Thomson	1,101,760	641,800	58%	408,300	37%
Latrobe	847,400	520,700	61%	416,200	49%
South Gippsland	911,500	711,400	78%	454,000	50%
Bunyip	541,000	597,100	110%	296,800	55%
Yarra	1,054,000	568,000	54%	395,000	37%
Maribyrnong	113,000	24,000	21%	20,000	18%
Werribee	102,000	22,300	22%	11,500	14%
Moorabool	97,000	38,900	40%	28,700	30%
Barwon	360,000	147,800	41%	82,700	23%
Corangamite	316,000	144,100	46%	53,200	17%
Otway Coast	884,000	770,400	87%	479,100	54%
Hopkins	635,000	259,400	41%	166,000	26%
Portland Coast	361,000	276,500	77%	139,800	39%
Glenelg	964,000	330,800	34%	149,600	16%
Millicent Coast (5)	0	0	N/A	0	N/A
Total	**26,119,560**	**13,294,100**	**51%**	**8,239,800**	**32%**

Notes:

(1) Data is average annual basin inflow under current level of development. Average annual streamflow in the basins within the Murray-Darling catchment is based on estimates provided in a number of previous studies, including the Northern Sustainable Water Strategy (Department of Sustainability and Environment 2010) and the National Land and Water Resources Audit (2001). The average for all other catchments is based on the average annual flow calculations of the Sustainable Diversion Limits project (Department of Natural Resources and Environment, 2002), the Central Region Sustainable Water Strategy (Department of Sustainability and Environment 2006), and the Gippsland Sustainable Water Strategy (Department of Sustainability and Environment, 2010).

(2) 'Streamflow' in the above table is defined in the same manner as catchment inflow as shown in each basin water balance, that is excluding interbasin transfers, irrigation return flows and recycled water.

(3) Streamflow not calculated due to absence of surface water resources other than direct rainfall.

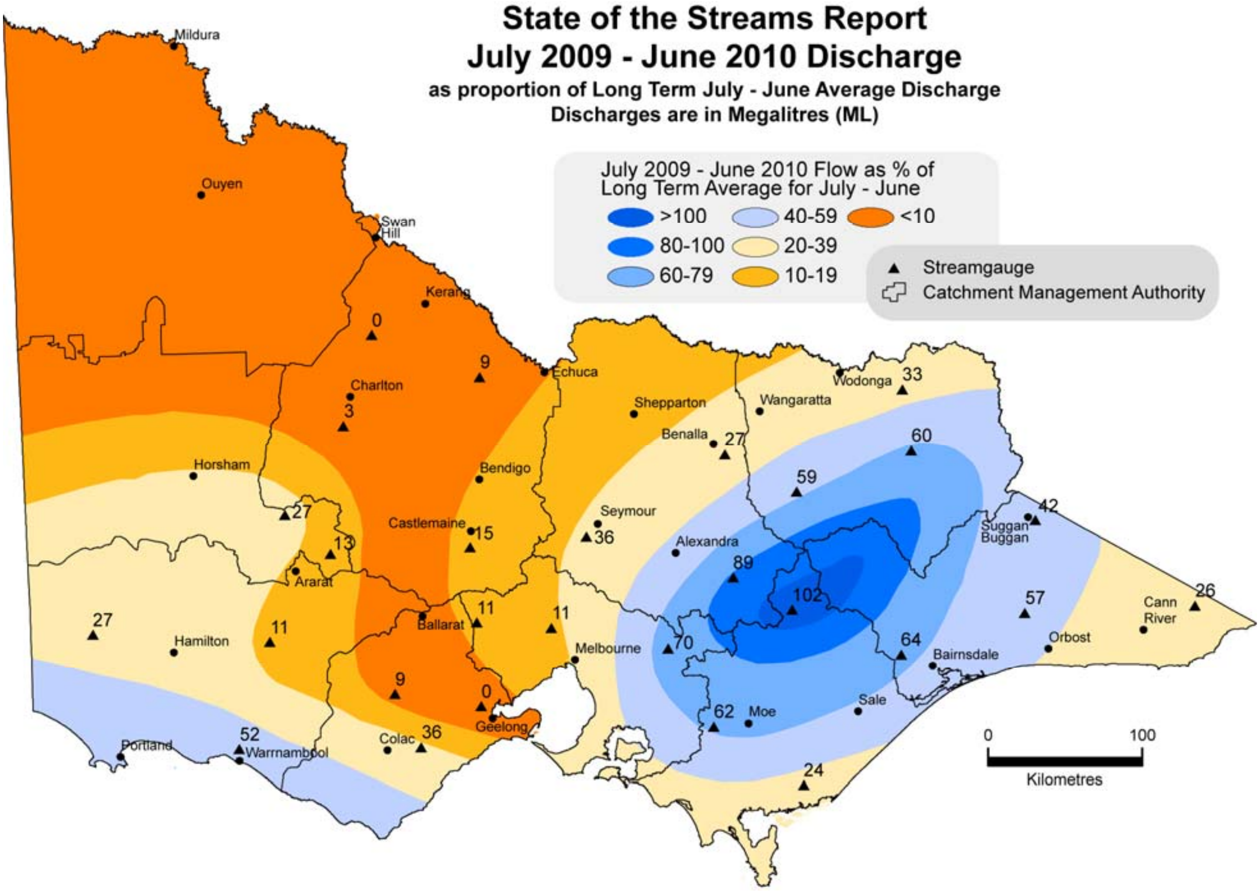
(4) Volumes shown for Snowy basin exclude catchment inflows from NSW (that is above Burnt Hut Crossing).

(5) A reliable estimate of streamflows could not be made as there are no streamflow gauges within the basin. Estimated streamflow is assumed to equal the estimated volume of water diverted.

(6) The total 2008–09 streamflow differs from the value of 8,244,900 ML reported in the *Victorian Water Accounts 2008–2009* due to updated data for the Werribee and Portland Coast basins.

Figure 1-8 shows Victorian streamflows in 2009–10 as a percentage of the long-term average flow. The figure illustrates how widespread the dry conditions were across Victoria. Streamflows across north-western Victoria were less than 10% of the long-term average. The areas affected by the extremely low inflows represent about one quarter of the state. Streamflows were higher as a proportion of the long-term average across eastern and southwest Victoria but volumes in most of these districts were still below the long-term average. The exception to this trend was the alpine area of eastern Victoria, where streamflows were above average.

Figure 1-8 Streamflow in 2009–10 expressed as a percentage of long-term average flow(1)

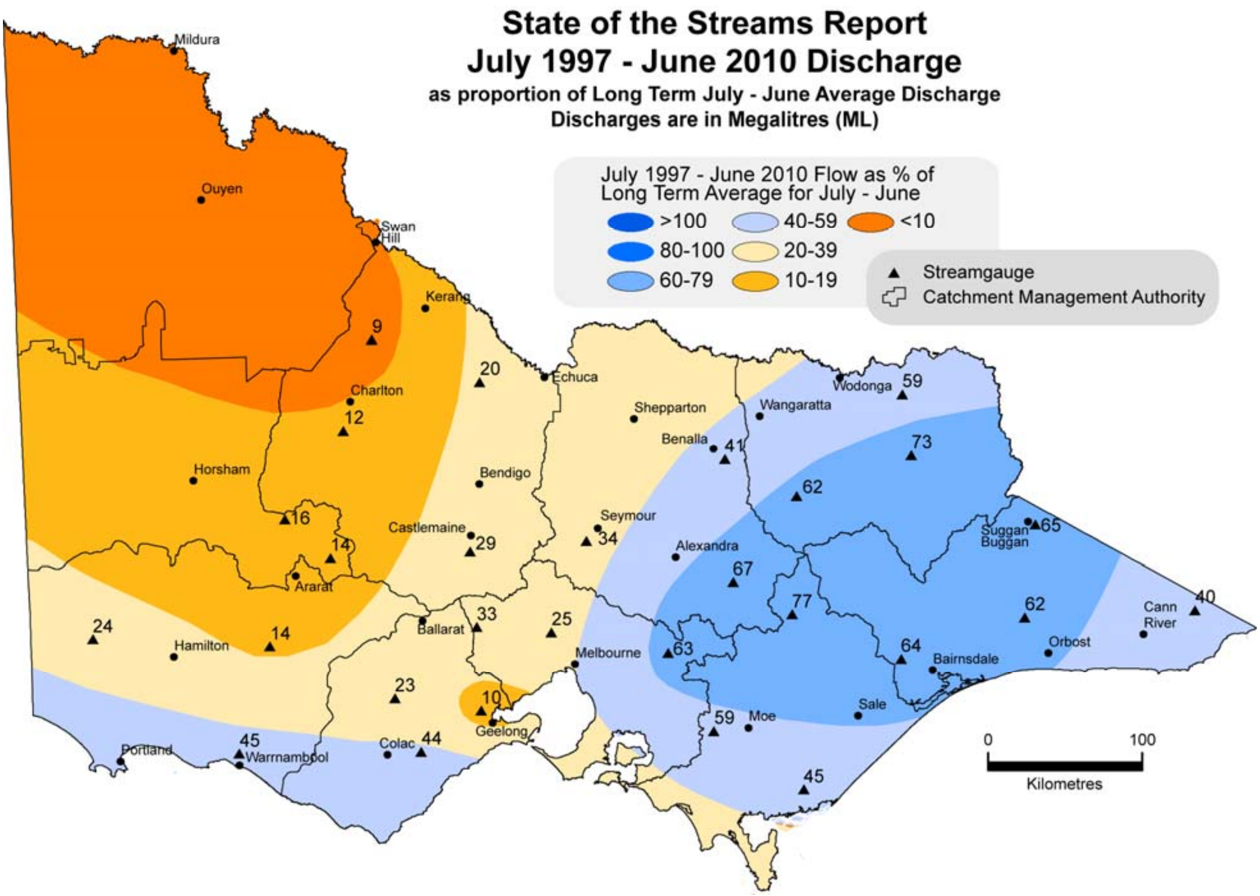


Note:

(1) Figure 1-8 shows an isoline representation of 2009–10 streamflow as a percentage of long-term average streamflow (inclusive of 2009–10), based on data from 28 selected streamflow gauges distributed across Victoria. The percentages are not directly comparable to the total river basin flows listed in Table 1-1 because some gauges are located downstream of major storages, and the period of streamflow record differs for each site.

Figure 1-9 depicts the average streamflows in Victoria since 1997–98 as a percentage of the long-term average. It shows streamflows across central and western Victoria have reduced considerably since 1997. It also shows that flows across eastern Victoria have fallen by around 20% to 60%. The noticeable difference between the pattern of flows depicted in Figure 1-8 and Figure 1-9 is the scale of dry conditions experienced in north-east and central Victoria in 2009–10 when compared to the last 13 years. For example, there are some areas in central and western Victoria where streamflows since 1997 have been between 20% and 60% of the long-term average, but flows in 2009–10 were less than 10% of the average. In south-western and eastern Victoria, the trends are generally consistent.

Figure 1-9 Streamflow July 1997 to June 2010 expressed as a percentage of long-term average flow (1)



Note:

(1) An isoline representation of 1997–98 to 2009–10 streamflow as a percentage of long-term average streamflow (inclusive of 2009–10), based on data from 28 selected streamflow gauges distributed across Victoria. The percentages are not directly comparable to the total river basin flows listed in Table 1-1 because some gauges are located downstream of major storages, and the period of streamflow record differs for each site.

The streamflow data presented in Table 1-2 allows a comparison between total streamflow volumes for Victoria in 2009–10 and the volumes recorded each year since 2003–04. Streamflows in 2009–10 were 51% of the long-term average, and 61% higher than that of 2008–09. This streamflow reflects the largest flows experienced since 2005–06.

Table 1-2 Streamflow compared with long-term average (1)

Year	Streamflow (ML)	% of average (Average flow is 26,119,560 ML)
2003–04	16,848,300	65%
2004–05	17,015,900	65%
2005–06	15,296,700	59%
2006–07	7,091,100	27%
2007–08	11,070,600	42%
2008–09 (2)	8,239,800	32%
2009–10	13,294,100	51%

Note:

(1) Long-term average streamflows were updated during 2008–09 based on information from the Northern Sustainable Water Strategy and Gippsland Sustainable Water Strategy. The Victorian long-term average streamflow reduced from 27,602,900 ML to 26,119,600 ML.

(2) The total 2008–09 streamflow differs from the value of 8,244,900 ML reported in the *Victorian Water Accounts 2008–2009* due to updated data for the Werribee and Portland Coast basins.

1.2.1 Long term streamflow trends

As mentioned above, average annual streamflows in the past 13 years have generally been below the long-term average across all of Victoria. Streamflows have fallen more significantly in central and western Victoria over this period, with annual flows in the Mallee basin having reduced to less than 10% of the long-term average.

The following graphs depict flows across a selection of Victorian waterways for the calendar year to the end of 2009 (note that 2009–10 streamflows in Table 1-1 are for the period from 1 July 2009 to 30 June 2010). They demonstrate that streamflows in 2009 across all of these sites were below the long-term average conditions. In all but the Goulburn and

Wimmera rivers, streamflows were also below the average of the past 13 years. Conditions in central and western Victoria were much drier relative to their long-term averages than in the east of the state.

Figure 1-10 depicts annual flows in the Goulburn River at Doherty's, which is upstream of Lake Eildon. Annual flows here over the past 13 years have been 66% of the long-term average. Flows in 2009 were higher than this, at 81% of the long-term average, which was close to double the volume recorded in 2008.

Water restrictions for urban users were able to be eased to lower levels in November 2009. Irrigators in the Goulburn system received a higher allocation than 2008–09. At 71%, the 2009–10 allocation for high-reliability water shares was the highest since the 2005–06 season.

Figure 1-10 Annual streamflow at Goulburn River

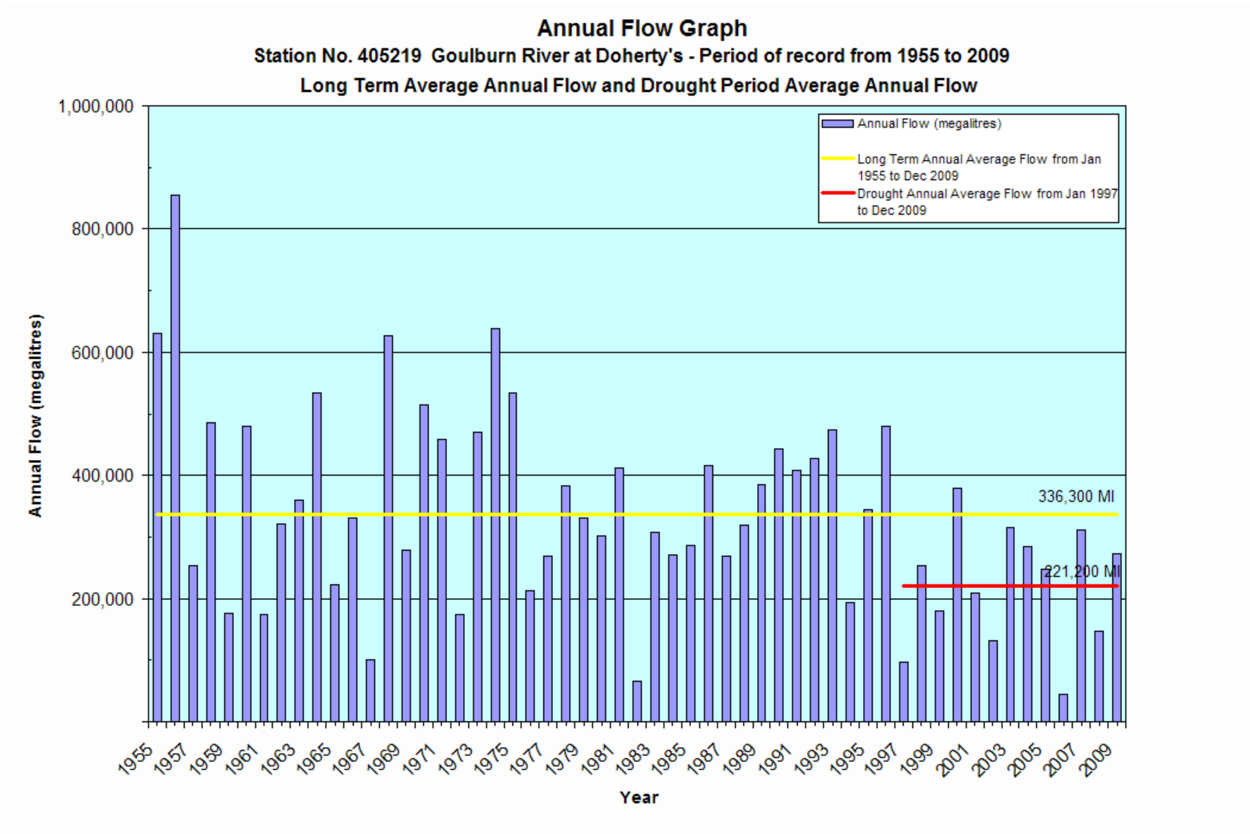


Figure 1-11 depicts annual flows in the Loddon River at Vaughan, which is upstream of Cairn Curran Reservoir. Over the past 13 years, annual flows here have been 29% of the long-term average. Flows in 2009 were again very low at just 14% of the long-term average. Successive years of low inflows in the Loddon system meant irrigation allocations and urban supplies were again severely restricted and water resource management focused on ensuring essential supplies for towns and for domestic and stock use.

Figure 1-11 Annual streamflow at Loddon River

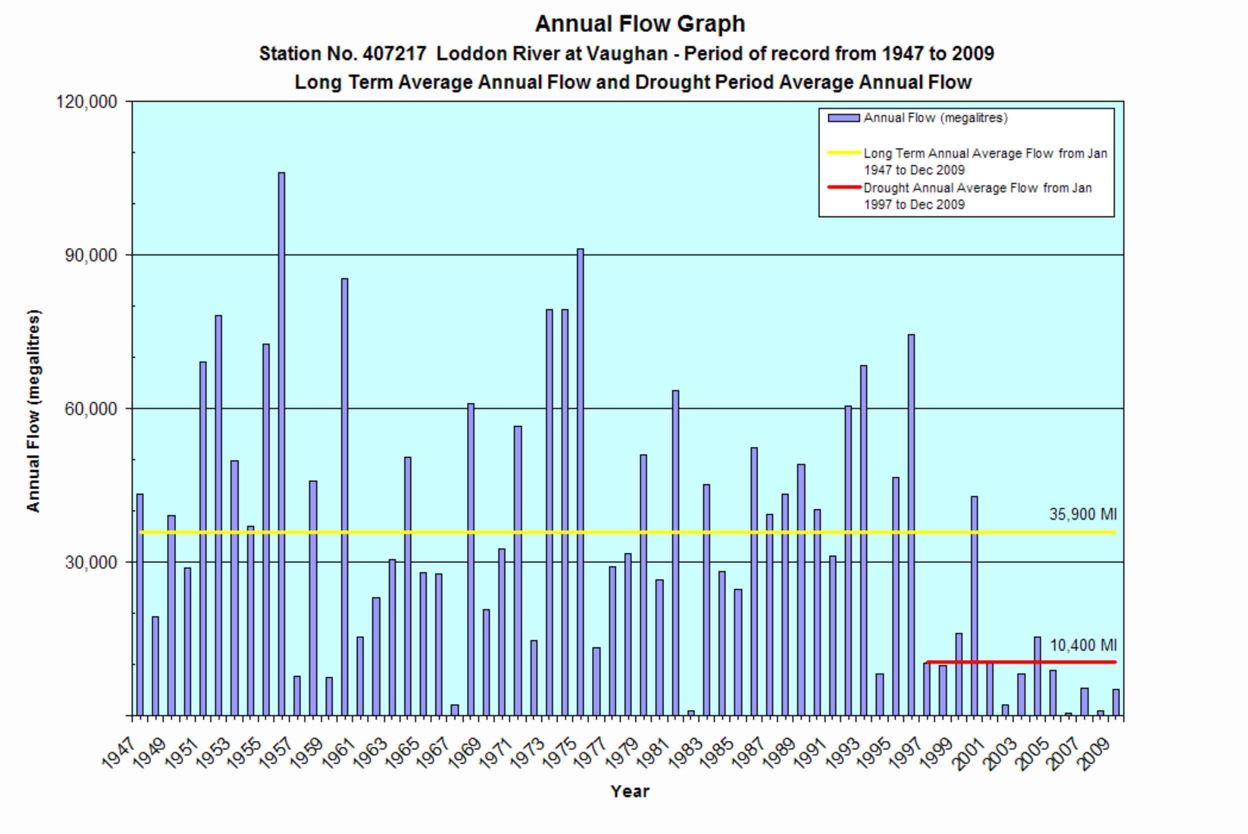


Figure 1-12 depicts annual flows in the Wimmera River at Glynwylln. The Wimmera River at this location has also experienced a severe decrease in flows over the past 13 years, with average annual flows over this period at 16% of the long-term average. Flows in 2009 were higher than this, but still low at only 27% of the long-term average. The extreme water shortage in the Wimmera basin continued.

The final works on the Wimmera-Mallee Pipeline were completed in May 2010. The pipeline was very important in reducing demands on the Grampians storages and GWMWater was able to reduce restrictions for many towns in October 2009. Rural customers who were yet to be connected to the pipeline continued to rely on the rural water carting program for essential needs until a supply via the pipeline was available. Users in the Wimmera irrigation area did not receive an allocation for the sixth year in a row.

Figure 1-12 Annual streamflow at Wimmera River

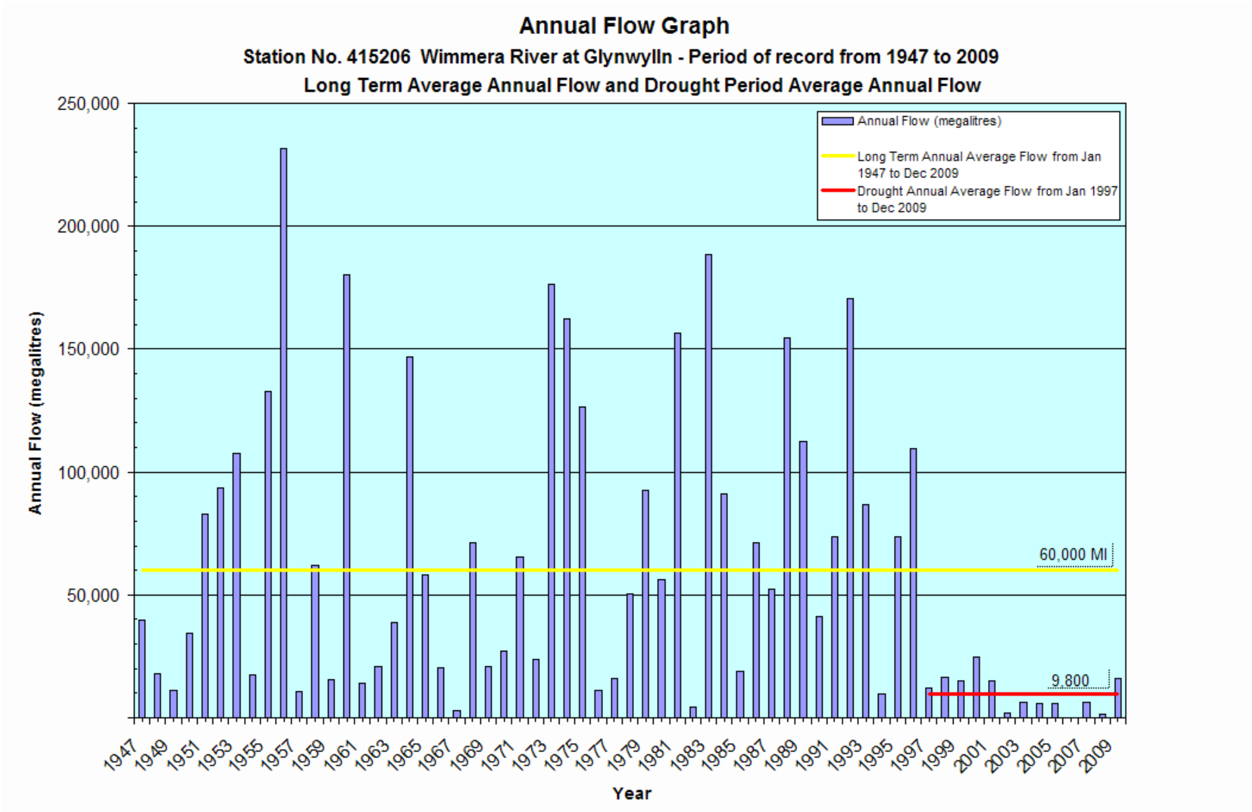


Figure 1-13 depicts annual flows in the Mitchell River at Glenaladale, which is approximately 25 kilometres upstream of Bairnsdale. Annual flows in the Mitchell River over the past 13 years have been 64% of the long-term average. Flows in 2009 were lower still at just 52%. In contrast to users in northern and western Victoria, urban and rural water users in the Mitchell basin were mostly unrestricted throughout the year because consumptive use is low compared to the total surface-water resource.

Figure 1-13 Annual streamflow at Mitchell River

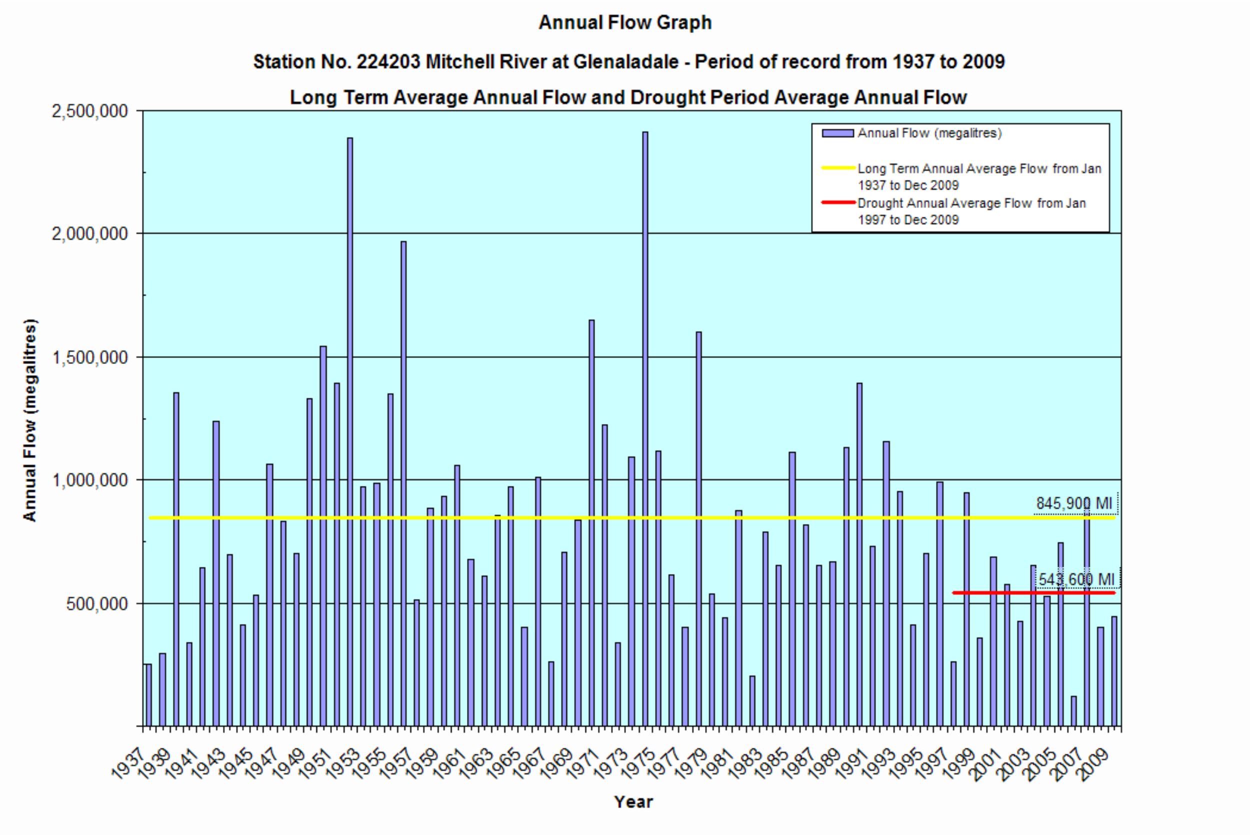


Figure 1-14 depicts annual inflow to Melbourne's harvesting reservoirs in the Yarra and Thomson basins. Since 1997, the average annual inflows to Melbourne's storages have been 73% of the long-term average. Inflows in 2009 were again below the average inflows experienced in the past 13 years. The system's failure to recover prolonged Melbourne's water shortage. Stage 3a restrictions continued into 2010, as did the temporary qualifications of the Yarra and Thomson River Environmental Entitlements. The qualifications reduced environmental flows in these rivers to supplement Melbourne's supplies.

Figure 1-14 Annual streamflow at Melbourne's storages

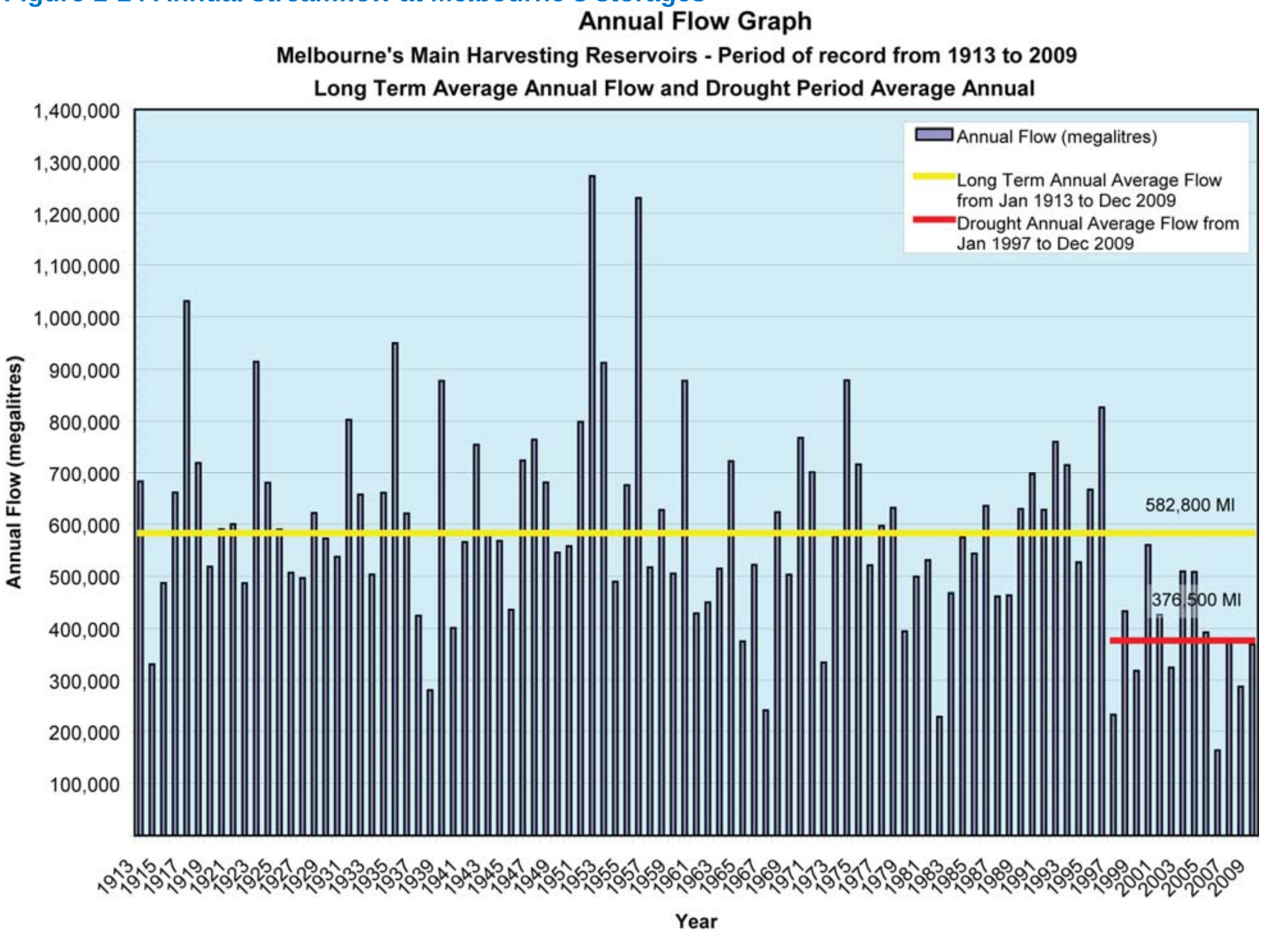


Figure 1-15 depicts annual flows in the Werribee River at Ballan which have been just 33% of the long term annual average flow over the past 13 years. Flows in 2009 were just 10% of the annual average. Low storage levels combined with low inflows meant that yet again very little of the Werribee basin's surface water was available for use. The severe water shortage required a range of contingency measures to be implemented across the basin to supplement supplies. Irrigators in the Bacchus Marsh and Werribee irrigation districts received only a 14% allocation and Western Water relied completely on Melbourne's water supply system to supply its towns.

Figure 1-15 Annual streamflow at Werribee River

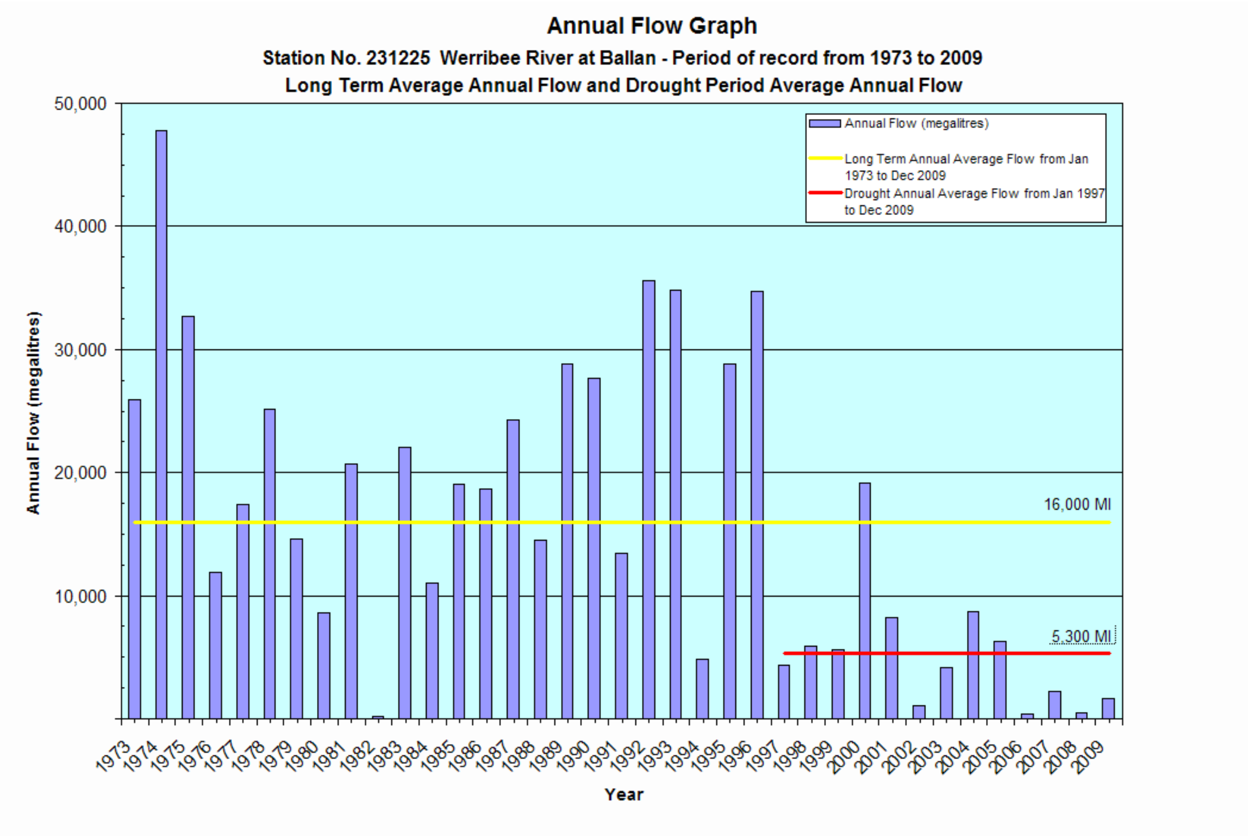
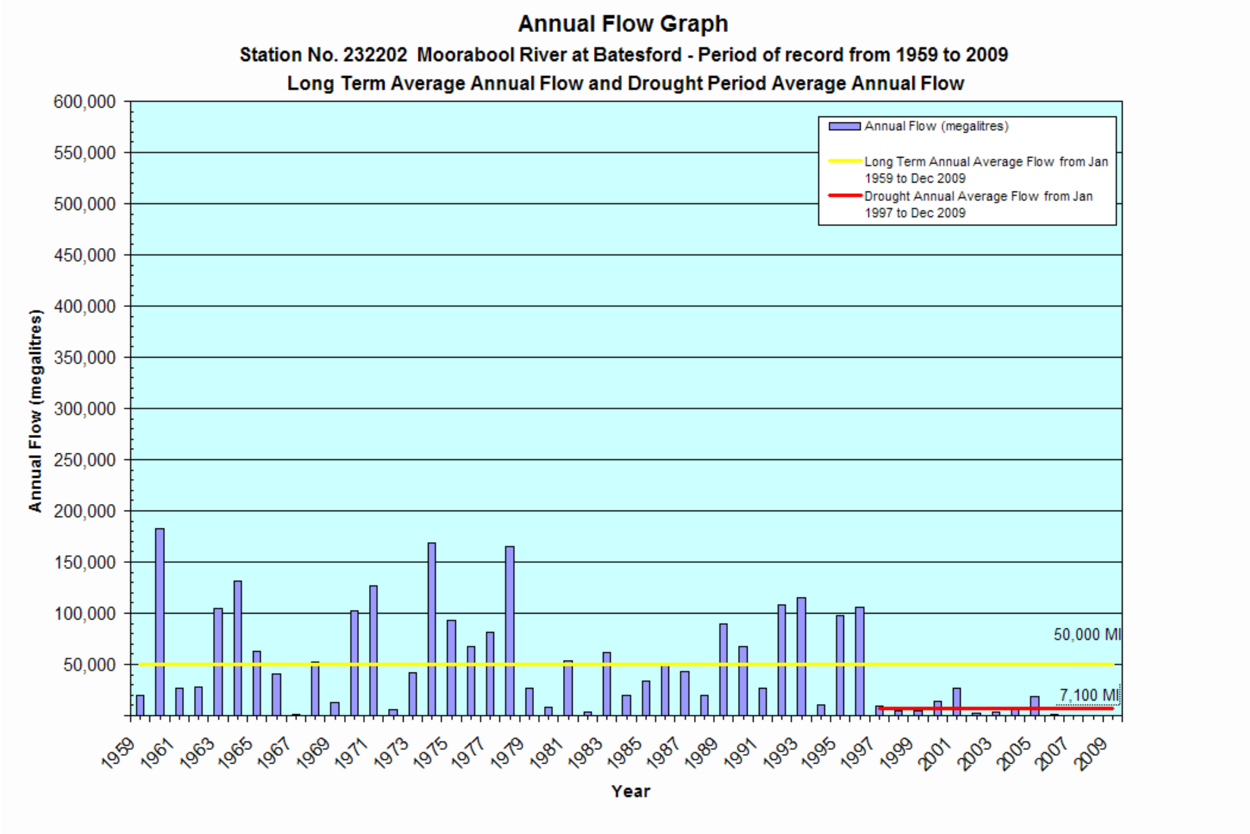


Figure 1-16 depicts annual flows in the Moorabool River at Batesford. Over the past 13 years, annual flows here have been 1% of long-term average. Flows in 2009 were extremely low at just 197 ML. This was the third consecutive year where flows were less than 1% of the long-term average. The extremely low streamflows can be largely attributed to a qualification of rights which waived passing-flow requirements downstream of Lal Lal Reservoir and West Moorabool Reservoir to supplement supplies for Ballarat and Barwon Water. The qualification of rights expired on 1 January 2010 when Stage 4 restrictions for Ballarat were eased to Stage 3. Ballarat's water resource position improved in 2009–10 due to transfers from Goulburn system via the Goldfields Superpipe.

Figure 1-16 Annual streamflow at Moorabool River



Note: Unlike the other figures, this figure shows readings taken downstream from water storages.

1.2.2 Bushfires

There were no major bushfires during the 2009–10 period.

1.2.3 Blue-green algal blooms

Blue-green algae (cyanobacteria) is a common seasonal occurrence in Victoria and a natural component of most aquatic systems, including streams, lakes, estuaries and the sea. Many factors trigger blue-green algae blooms including nutrient loads, low inflows, low storage volumes and high temperatures.

In 2009–10 there were 32 high alert blue-green algae outbreaks.

The number of high alert blooms for both drinking and recreational blooms was close to the average when compared to the last five years of data. However there was a major event with a regional bloom on the Murray River. This bloom required regional coordination and liaison between a number of Victorian and New South Wales agencies to ensure the public were aware of the risk and that appropriate management action was taken. All town water remained safe to drink throughout the bloom.

Blue-green algae blooms are monitored regularly by water corporations and local waterway managers. Table 1-3 summarises the significant high alert blue-green algae blooms recorded in 2009–10. A high alert status indicates that direct use for drinking water, domestic and stock watering and recreational activities (swimming, diving et cetera.) should be avoided. When a bloom occurs in a drinking-water supply, water corporations notify the public and activate their risk management plans for drinking-water supplies to ensure either that treatment removes the algae, or the water source is taken offline.

Table 1-3 High alert blue-green algal blooms for 2009–10

Basin	Location	Major use	Reporting body	Duration	Actions
Barwon	Barwon River (between Baums Weir and Breakwater Road)	I,R	Corangamite CMA	January 2010	Access to Barwon River was closed between Baums Weir and Breakwater Road.
	McLeods Waterholes	R	City of Greater Geelong	January 2010	Warning signs erected and public notified via media releases.

	Painkalac Reservoir	D	Barwon Water	January – June 2010	Water treatment and regular monitoring.
Broken	Boosey Creek	I,R	Parks Victoria	January – May 2010	Warning signs erected.
Campaspe	Spring Creek Reservoir	I	Coliban Water	February – March 2010	Stakeholders notified.
Corangamite	Lake Cobden	R	Corangamite Shire	July 2009 – April 2010	Warning signs erected and public notified via media releases.
	Lake Bullen Merri	R	Corangamite Shire	November – December 2009	Warning signs erected and public notified via media releases.
Glenelg	Lake Fyans	R, D	GWMWater	August – September 2009	Warning signs erected and public notified via media releases.
	Lake Hamilton	R	Southern Grampians Shire	December 2009 – March 2010	Warning signs erected and regular monitoring.
Goulburn	Reedy Swamp	R	Parks Victoria	January – May 2010	Warning signs erected and public notified via media releases.
Hopkins	Merri River	R	Warrnambool City Council	February – March 2010	Warning signs erected and public notified via media releases. Regular monitoring.
Latrobe	Lake Narracan	D,R,I, S&D	Southern Rural Water	February – March 2010	Stakeholders notified. Regular monitoring.
Loddon	Gum Lagoon	I, S&D	G-M Water	November – December 2009	Stakeholders notified and warning signs erected.
	Wychitella Service Basin	D	Coliban Water	January 2010	Basin was not in use. Regular monitoring.
	Little Lake Charm	I,S&D	Goulburn-Murray Water	February 2010	Stakeholders notified, public notified via media releases and warning signs erected. Regular monitoring.
	Little Lake Charm	I,S&D	Goulburn-Murray Water	May 2010	Stakeholders notified, public notified via media releases and warning signs erected. Regular monitoring.
	Evansford Reservoir	D	Central Highlands Water	March – April 2010	Water storage taken offline. Regular monitoring.
	Tullaroop Reservoir	R,I,S&D	Goulburn-Murray Water	March – April 2010	Stakeholders notified, public notified via media releases and warning signs erected. Regular monitoring.
	Torrumbarry Irrigation Area (Part No.& channel, Racecourse Lake, Kangaroo Lake)	I,R,S&D	Goulburn-Murray Water	May 2010	Stakeholders notified, public notified via media releases and warning signs erected. Regular monitoring.
Mallee	Hattah Lakes	R	Parks Victoria	February – June 2010	Warning signs erected and regular monitoring.
Murray	Murray River (varied in extent, at largest Lake Hume to Yelta)	D,R,I, S&D	Lower Murray Water, Goulburn-Murray Water	February – March 2010	Coordination arrangements for Regional blooms put in place. Stakeholders were notified, monitoring conducted, public notified via media releases. All relevant agencies notified and warning signs erected.
	Murray Valley Irrigation Area Channels	R,I,S&D	Goulburn-Murray Water	March 2010	Stakeholders notified, public notified via media releases and warning signs erected. Regular monitoring.

Otway Coast	Simpson Historical Park Dam	R	Corangamite Shire	July – December 2009	Warning signs erected.
Ovens	Diddah Diddah Reservoir	D	North East Water	October 2009 – June 2010	Reservoir not in use.
South Gippsland	Lance Creek Reservoir	D	South Gippsland Water	December 2009	Monitoring and powdered activated-carbon dosing.
	Lance Creek Reservoir	D	South Gippsland Water	Match 2010	Monitoring and powdered activated-carbon dosing.
	Poowong Raw Water Reservoir	D	South Gippsland Water	January 2010	Monitoring and powdered activated-carbon dosing.
Werribee	Pykes Creek Reservoir	S&D,D,I, R	Southern Rural Water	December 2009 – January 2010	Stakeholders notified. Regular monitoring occurred.
Yarra	Royal Botanic Gardens – Ornamental Lake	PR	Royal Botanic Gardens	July 2009	Warning signs erected and regular monitoring.
	Royal Botanic Gardens – Ornamental Lake	PR	Royal Botanic Gardens	February – May 2010	Warning signs erected and regular monitoring.
	Heritage Golf and Country Club	R,I	Heritage Golf and Country Club	January – May 2010	Warning signs erected and regular monitoring.
	Yean Yan Reservoir	D	Melbourne Water	February – May 2010	Reservoir not in use.

Legend:

D	Drinking water	I	Irrigation
S&D	Stock and domestic	PR	Passive recreation
R	Recreation		

1.3 Storages

Victoria's major water storages are capable of holding around 12,580,000 ML. Of this, Melbourne's storage capacity is 1,810,500 ML, while the combined capacity of the state's regional storages is 10,769,500 ML. The total capacity and regional capacity figures are greater than reported in 2008–09 due to the inclusion of Victoria's share of the capacity of the Menindee Lakes in north-west New South Wales.

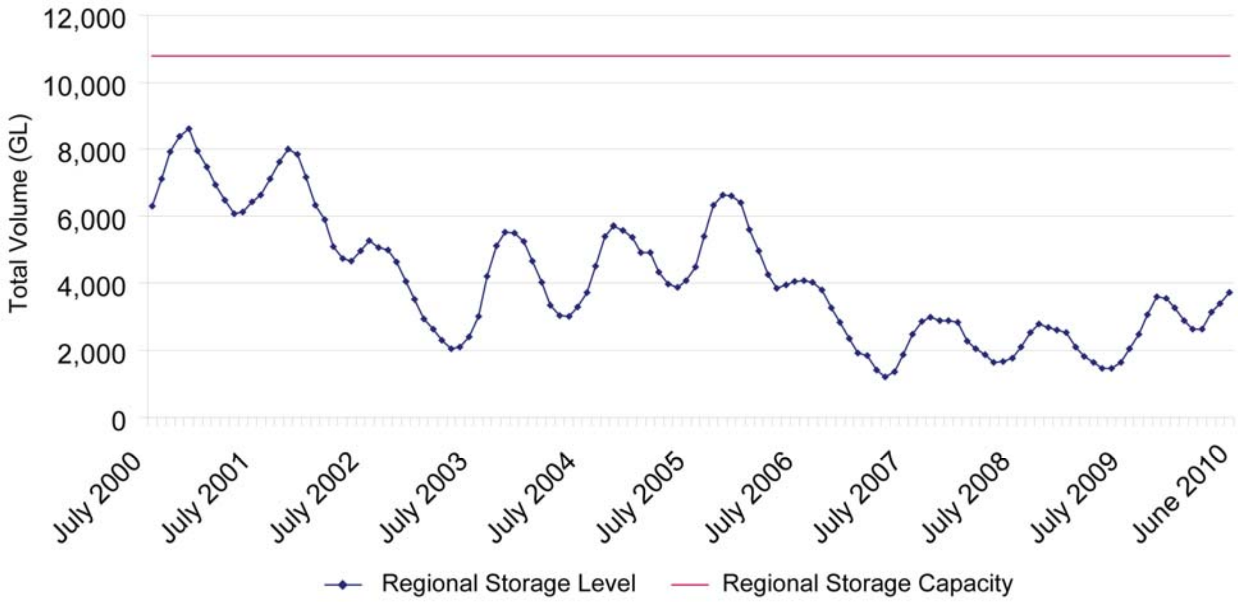
Victoria's storage capacity well exceeds annual use in any one year. For example, Melbourne's total water consumption in 2009–10 was around 219,750 ML, which is about 20% of the volume it can hold in its storages. This large storage capacity is necessary to manage the yearly streamflow fluctuations in Victoria's rivers in order to provide continuous and reliable water supplies.

As shown in Figure 1-17 the total volume of water stored in Victoria's major regional reservoirs started the year at 1,621,394 ML (15% of capacity) and ended at 3,723,448 ML (35% of capacity). Levels peaked in October and declined over summer and autumn as inflows receded and water was released from the reservoirs for irrigation and urban use. Levels increased again between April and June 2010 due to flooding in the Darling River which significantly increased Victoria's share of the water stored in the Menindee Lakes.

Storage levels at the end of the year varied greatly across the state. Storages were only 10% full or less in the Campaspe, Glenelg, Wimmera, Loddon, Maribyrnong and Werribee basins at the end of June 2010. Storages levels were higher in the Ballarat, Bendigo, Broken, Geelong, Goulburn and Murray systems than at the end of 2008–09, but were still low at between 20% and 30% full. In contrast, storages in the Ovens, Latrobe and South Gippsland basins were between 77% and 80% full.

Information on storage levels in individual basins is set out in Appendix B and in the basin water accounts. A subset of these storages has been used to provide the information in this section.

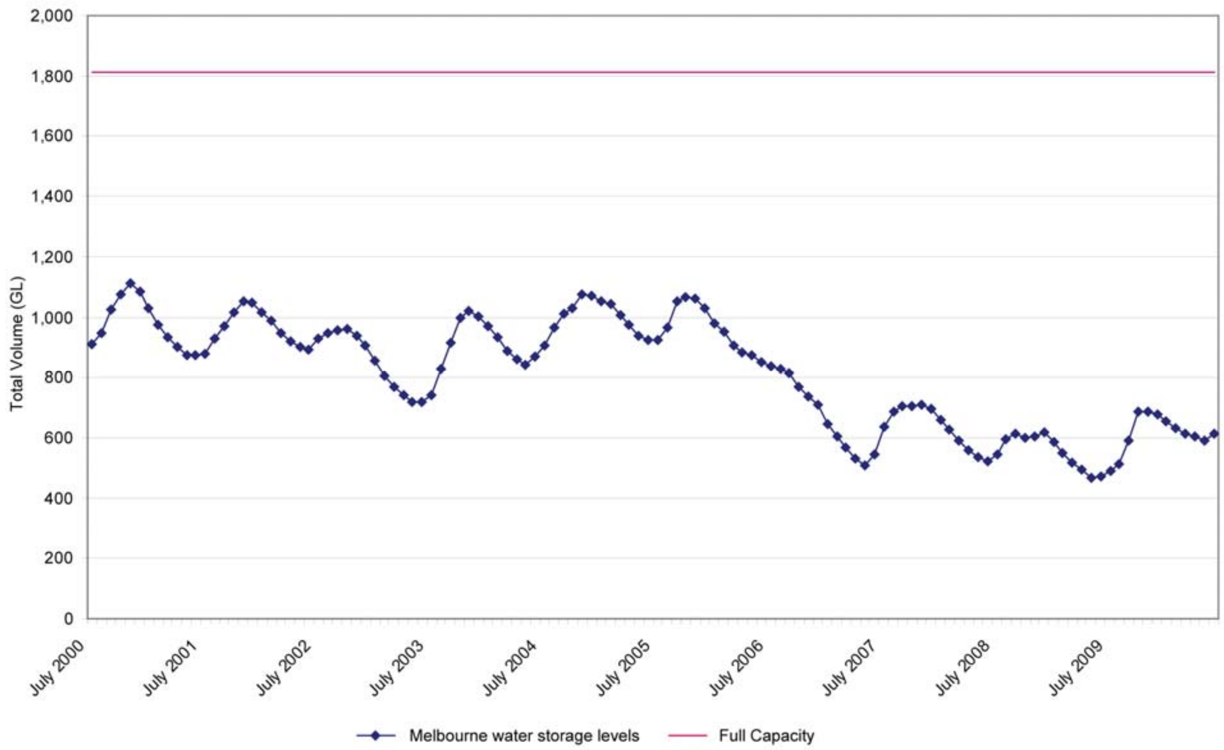
Figure 1-17 Volume in major regional corporation storages from 1 July 2000 to 30 June 2010



Melbourne's water storages started the year at 470,894 ML (26% of total storage capacity of 1,810,500 ML), recovered over winter and spring to 687,616 ML (38% total of capacity), and ended the year at 611,414 ML (34% of total storage capacity). It was the first time since 2004–05 that storage levels ended the year higher than they started.

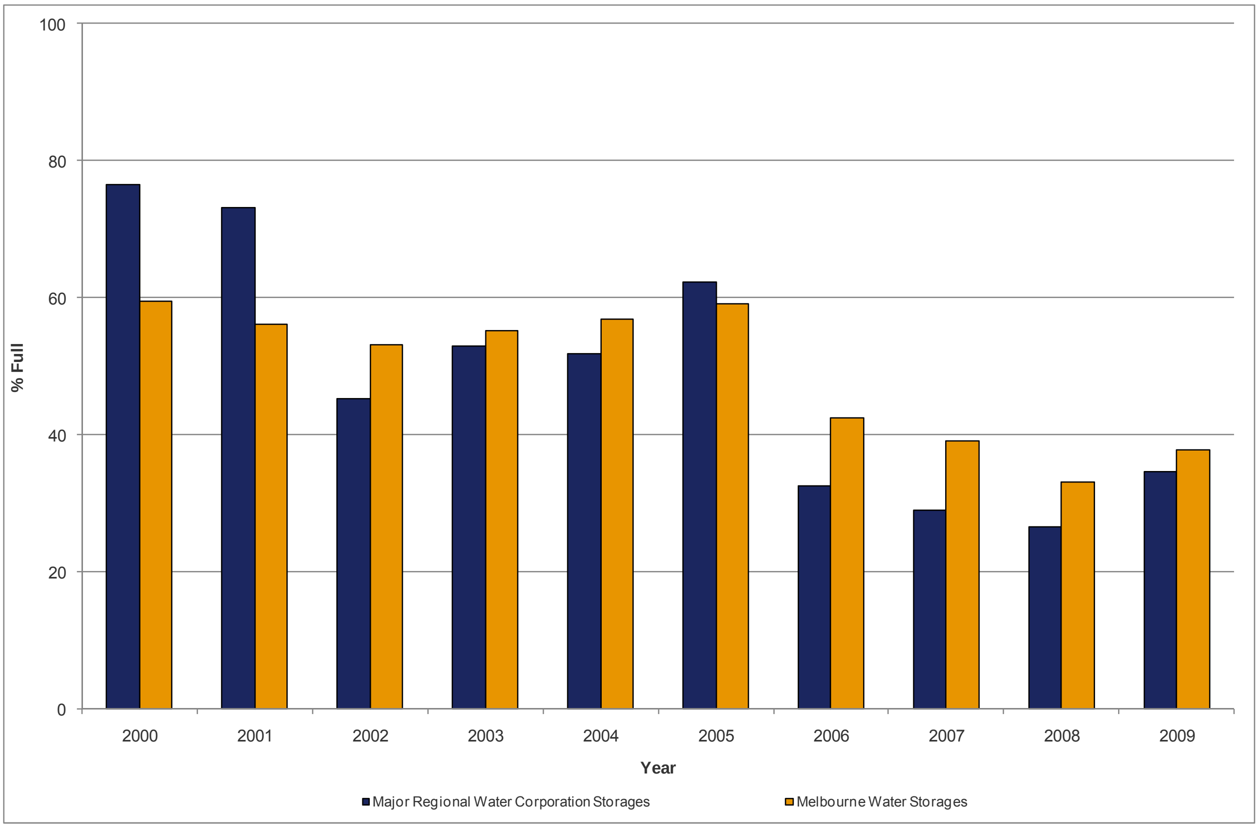
By April 2010, the improvement in storage levels, completion of the north-south pipeline and reconnection of Tarago reservoir enabled Melbourne's water restriction levels to be reduced from Stage 3a to Stage 2. This also provided the opportunity to reinstate 3,000 ML of the environment's water in the Thomson River and 7,000 ML in the Yarra River that had been retained in storage under qualification of rights to secure Melbourne's water supplies.

Figure 1-18 Volume in Melbourne Water Corporation storages from 1 July 2000 to 30 June 2010



The total volume of water stored in Victoria's major reservoirs in October provides a good indication of water availability in a year because this is when levels are usually at their maximum. Figure 1-19 presents October storage levels, as a percentage of storage capacity, from 1997 to 2009 for Melbourne and Victoria's major regional water corporation reservoirs. It shows that October storage levels have generally declined since 2000 as inflows have not been sufficient for systems to recover. A significant drop in levels occurred between 2005 and 2006, when winter and spring rainfall was extremely low. Levels in 2009 increased slightly compared to 2008 but did not recover to levels consistent with 2005.

Figure 1-19 Water stored in reservoirs at the end of October, 2000–2009 (shown as a percentage of total storage capacity)

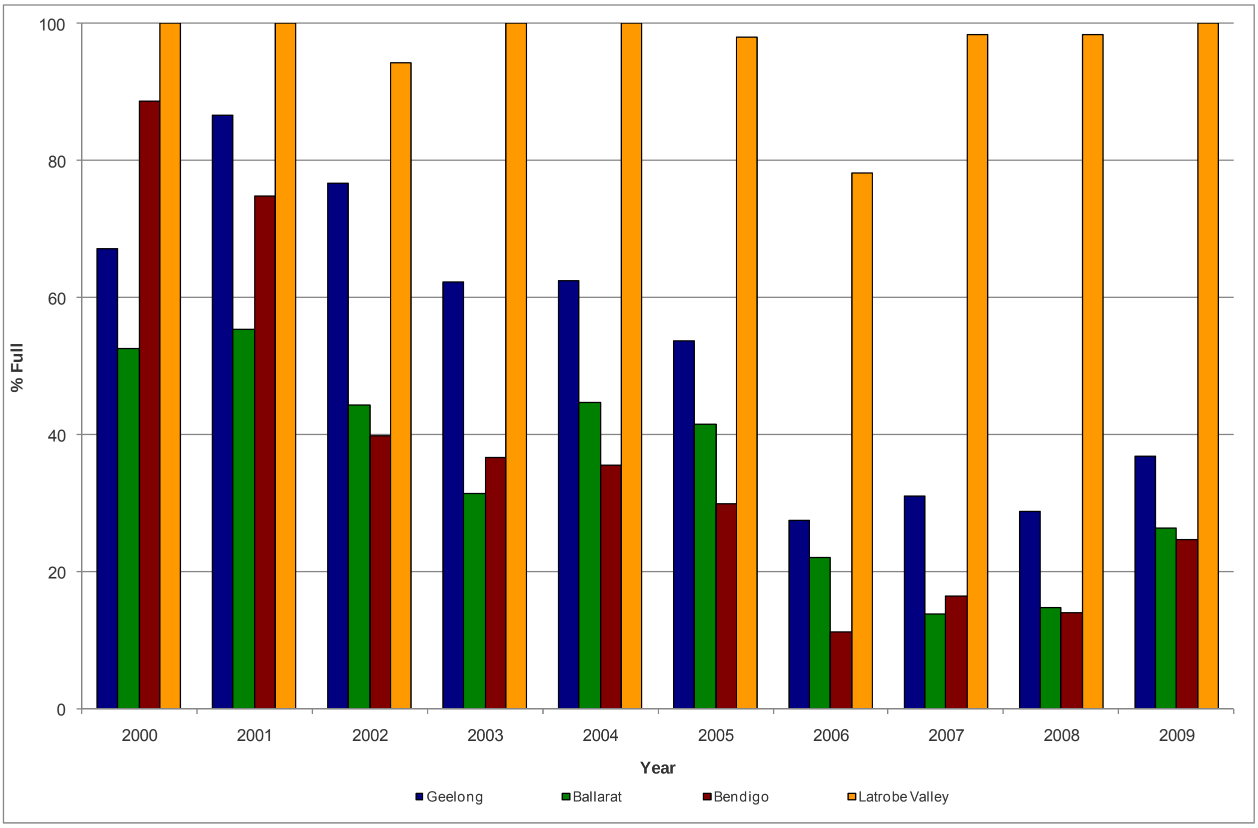


Notes: The storages included in the regional water corporation storages total have been updated to include major regional urban water corporation storages in addition to major rural water corporation storages. The total storage capacity is provided based on the capacity at 30 June 2010, with data presented dating from 2000. This figure is slightly different to that presented in previous accounts, however the general trends in storage levels over the period remain consistent.

October storage levels from 2000 to 2009 for selected regional centres are shown in Figure 1-20. Storage volumes in Victoria's regional cities have generally increased over the past year, with all centres holding more than 20% of full capacity in October 2009. This represents the highest storage levels since 2005 for Geelong, Ballarat and Bendigo, and the highest storage levels for the Latrobe Valley since 2004.

The failure of winter and spring inflows in 2006 caused a significant drop in levels for the state's major regional centres.

Figure 1-20 Water stored in key regional cities' reservoirs at the end of October, 2000–2009 (shown as a percentage of total storage capacity)



Notes:

The storages included in the regional totals have been updated to reflect major regional water storages for each of the centres:

- Geelong: Barwon Water's share of the Lal Lal Reservoir, plus the volumes in the Wurdee Boluc, West Barwon, Korweinguboora, Bostock and Stony Creek Reservoirs
- Bendigo: Coliban Water's share of Lake Eppalock, plus the volumes in the Upper Coliban, Lauriston and Malmsbury Reservoirs
- Ballarat: Central Highland Water's share of the Lal Lal and White Swan Reservoirs
- Latrobe Valley: Moondarra Reservoir.

Using this calculation approach, the total storage capacity is provided from 2000 and may be slightly different to that used in previous accounts. The general trends in storage levels over the period displayed remain consistent despite the updated calculation approach.

1.4 Groundwater

The consumption of groundwater from Victoria's aquifers is managed according to geographical area. The principal management unit for groundwater in Victoria is the groundwater management unit (GMU), the boundaries of which often fall across more than one river basin. A GMU can be a:

- **Groundwater management area (GMA**): an area where groundwater has been intensively developed or has the potential to be. GMA boundaries are defined for the purposes of ongoing management.
- **Water supply protection area (WSPA**): an area declared under the *Water Act 1989* to protect groundwater or surface water resources through the development of a management plan.
- **Unincorporated area (UA)**: an area where limited development or use of groundwater has occurred. This is usually because the resource is low yielding, or its quality has limited its use, or there is limited information about resource availability. UAs are important for the supply of domestic and stock water.

At present, there are 66 GMUs in Victoria, of which 25 are WSPAs, 38 are GMAs and three are unincorporated areas. As of June 2010, there were six approved groundwater management plans. Two management plans were revoked in June 2010: Campaspe Deep Lead Groundwater Management Plan and Spring Hill Groundwater Management Plan. Management plans will be prepared for the proposed replacement WSPAs: Loddon Highlands and Lower Campaspe Valley. The consultative committees to draft these plans are expected to be appointed by the Minister in the near future. The plans should be complete by early to mid-2012.

Groundwater management plans are being drafted for Koo Wee Rup WSPA, Warrion WSPA and Yarram WSPA. Good progress is also being made on the preparation of the plan for the Upper Ovens WSPA which will be the first plan applying similar management rules to both groundwater and surface water. GWMWater expects to complete the West Wimmera Groundwater Management Strategy in 2011. The strategy will provide clear direction about future groundwater management in the Apsley, Neuarpur, Telopea Downs and Kaniva WSPAs and Balrootan GMA, Goroke, Nhill, Kaniva TCSA, and Little Desert GMAs.

Local management rules (LMRs) are being considered as a way to document the management approach for some GMAs. LMRs are developed by the water authority and its customers. They set out the local terms and conditions for management of a water resource. These terms and conditions are designed to protect entitlements, the resource and the environment consistent with the overall objective for each system. They describe how the responsible water corporation will manage the water resources. LMRs for Mid-Loddon GMA were completed by GWMWater in June 2009.

In addition, a groundwater sharing agreement is in place between South Australia and Victoria where aquifers straddle the state borders. The agreement was entered into in 1985 as groundwater is the only reliable water source in the region and there is increasing demand for its use. The designated area is a 40-kilometre-wide strip centred on the border and extending its full length. This area is managed under the *Groundwater (Border Agreement) Act 1985*.

The location of aquifers is unrelated to surface water basins, with some aquifers extending beneath several. Nevertheless for the purpose of the basin accounts, groundwater use has been apportioned according to the surface area by basin. See Chapter 5 for an explanation of the method used.

Groundwater occurrence varies in size and volume throughout Victoria. It lies beneath all parts of the state but is not always useable. Its potential for use is generally dependent on its salinity and how much water can be extracted (aquifer yield).

While groundwater can be a reliable source of water, its overuse can result in failure of supply. Groundwater has a value both when it is extracted for a range of uses including irrigation, commercial, urban or stock watering, and a value when left in situ where it may support groundwater-dependent ecosystems including contributing to base flow in streams and wetlands or supporting a variety of terrestrial flora.

Victoria monitors approximately 2,500 bores to understand the groundwater level trends on a quarterly basis. Additionally, the rural water corporations conduct monthly infill monitoring of approximately 500 bores. In recent dry years groundwater has become a key water resource for towns, agriculture and industry. The need for greater security for this resource has placed increasing need for the state to upgrade its monitoring network.

Improving the understanding of the extent, availability and quality of the state's groundwater resources is one of the primary objectives of the State Observation Bore Network (SOBN) refurbishment project. Through this project, 67 new state observation bores were constructed in 2009–10 in 15 key groundwater management areas. A further two failed bores have been removed from the network, protecting the integrity of the groundwater resource and the surrounding environment.

Compared to groundwater level trends in 2008–09, a larger number (32 in 2009–10 compared to 26 in 2008–09) of management units are now showing a declining trend. While this can be attributed to steady demand for groundwater, external factors such as climate change and lack of recharge are also causing a decline in water levels..

Drought and climate change affect all aquifers, as recharge to groundwater is largely dependent on rainfall. Declining trends are likely to be caused by a combination of reduced rainfall infiltration and groundwater extraction. For some management areas, restrictions were enforced to ensure groundwater levels did not continue to decline. The environment is also affected by declining groundwater levels as baseflow to waterways, wetlands and other groundwater-dependent ecosystems are reduced. Key actions developed as part of the Northern and Western Sustainable Water Strategies aim to improve the management of groundwater dependent ecosystems. Sustainable management of the groundwater resources will result in optimisation of the volume extracted and the value obtained from the resource, while minimising the impacts on other users and the environment.

Water level trends using the past five or more years of data gathered from the SOBN are presented in Figure 1-21, Figure 1-22 and Table 1-4.

Water metering is fundamental to responsible management of Victoria's water resources. All new groundwater licences must be metered. To improve water-use compliance and accounting for existing licensed-groundwater use, a statewide metering program was implemented in 2004. Under the program, DSE provided a subsidy to install meters on licensed groundwater sites that take 20 ML per year. This program installed 1,565 meters.

Figure 1-21 Groundwater trends in WSPAs

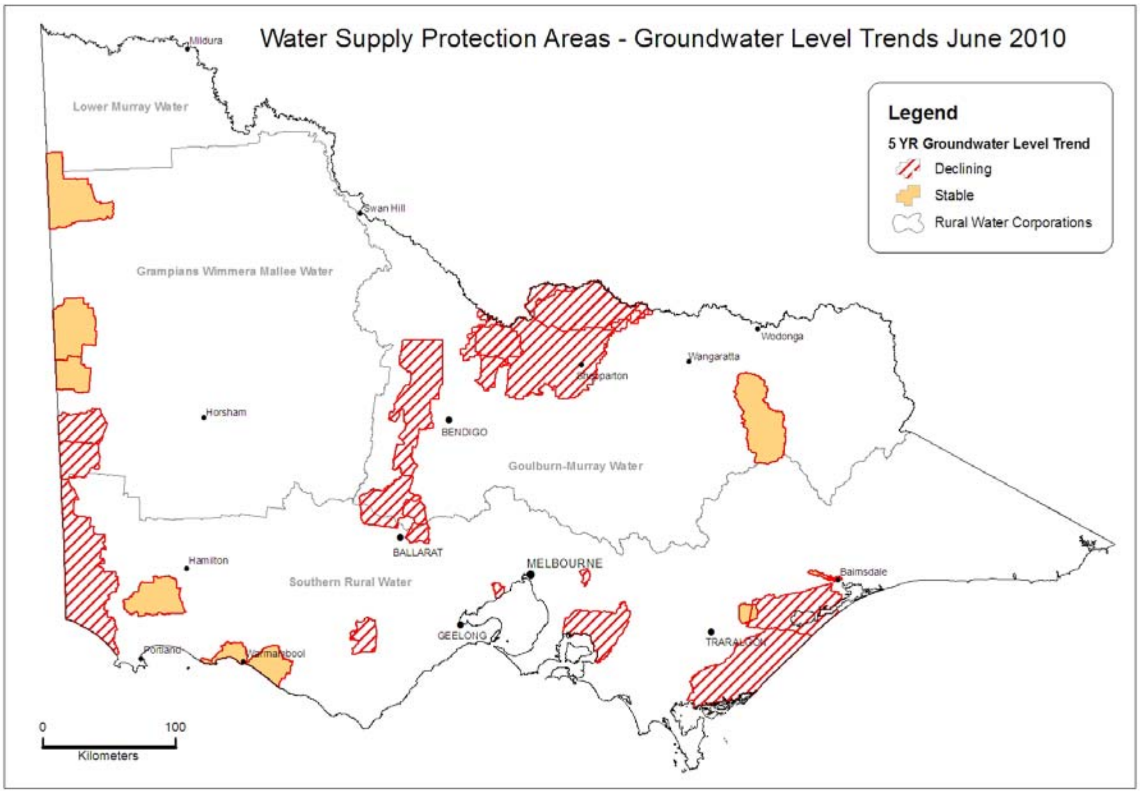


Figure 1-22 Groundwater trends in GMAs

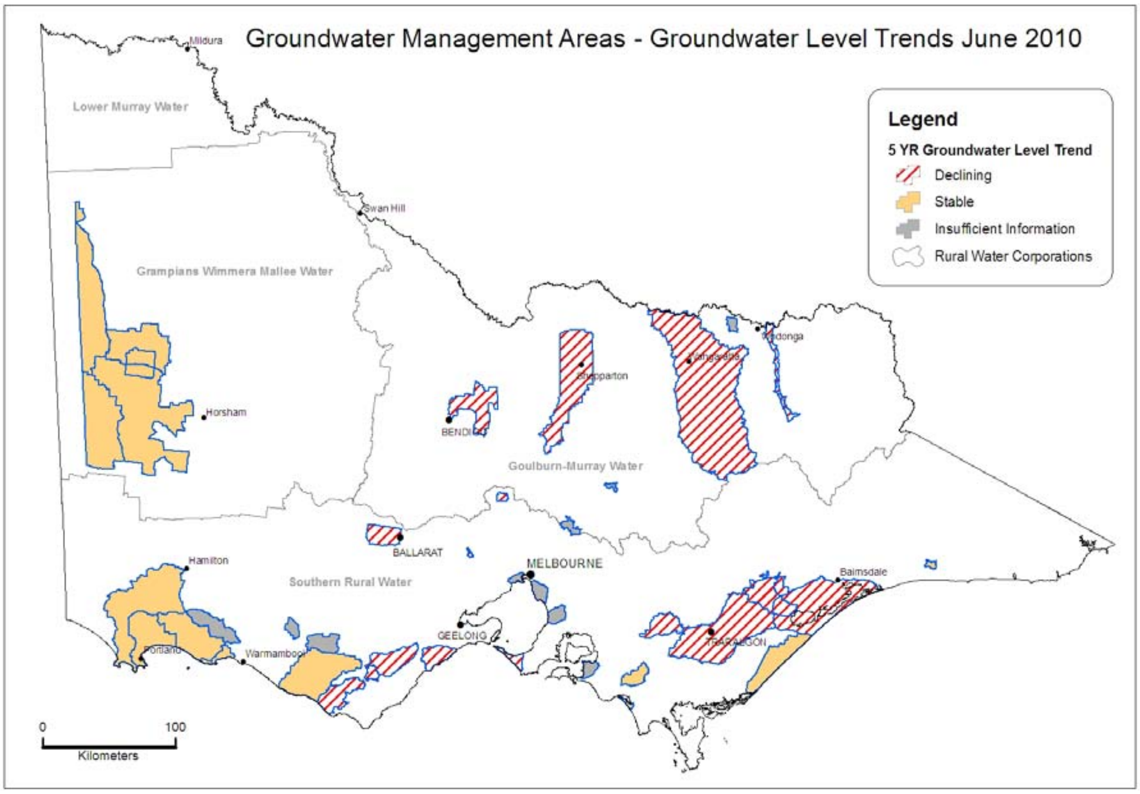


Table 1-4 Groundwater level trends in WSPAs

	SOBN coverage	Groundwater-level trend 2009–10	Groundwater-level trend 2008–09	Management activities
Goulburn Murray Water				
Campaspe Deep Lead	Adequate	Declining	Declining	MP, R[2], A*
Katunga	Adequate	Declining	Stable	MP, R[1]
Mid Loddon	Adequate	Declining	Declining	LMR, A
Shepparton Irrigation Region	Adequate	Declining	Declining	MP
Spring Hill	Limited	Declining	Declining	MP, R[3], A
Upper Loddon	Limited	Declining	Declining	A
Upper Oven[s]	Limited	Stable	Stable	MP*
Grampians Wimmera Mallee Water[(1)]				
Apsley	Limited	Declining	Declining	A
Kaniva	Limited	Stable	Stable	
Murrayville	Limited	Stable	Declining	MP
Neuarpur	Limited	Declining	Declining	MP
Telopea Downs	Limited	Stable	Stable	
Southern Rural Water				
Bungaree	Adequate	Declining	Stable	
Condah	Adequate	Stable	Declining	A
Denison	Inadequate	Stable	Stable	
Deutgam	Adequate	Declining	Stable	R[4]
Glenelg	Limited	Declining	Declining	
Koo Wee Rup	Adequate	Declining	Declining	MP*
Nullawarre	Adequate	Stable	Stable	MP, A
Sale	Adequate	Declining	Declining	A
Wandin Yallock	Adequate	Declining	Stable	
Warrion	Adequate	Declining	Declining	MP*
Wy Yung	Adequate	Stable	Stable	
Yangery	Adequate	Stable	Stable	MP, A
Yarram	Limited	Declining	Declining	MP*

Management activities key:

MP Management plan
MP* Management plan being prepared
LMR Local management rules in development
R Restrictions on use
A* Resource appraisal commenced
A Resource appraisal completed

Current restrictions on groundwater use:

R1 Katunga – 70% allocation
R2 Campaspe Deep Lead - 50% allocation and rights qualified to 65% March 2010.
R3 Spring Hill – 100% allocation in zones 1001 and 1004, 80% allocation in zone 1002 and 50% allocation in zone 1003
R4 Deutgam – rights qualified to 0% as at 1st July 2009

Note:
(1) The West Wimmera resource appraisal and subsequent management plan will cover the areas of Apsley WSPA, Kaniva WSPA, Neuarpur WSPA, Telopea Downs WSPA, Balrootan GMA, Little Desert GMA and Nhill GMA.

1.5 Conclusion

Rainfall was around average conditions in 2009–10. Despite this, streamflows across most of Victoria were below average over the same period. This difference is a result of the underlying dry catchment conditions which limit the runoff generated following rainfall events. On a state basis, 2009–10 streamflow was 51% of the long-term average. This was 61% higher than 2008–09 streamflow.

Despite the increase in streamflows compared to 2008–09, the 2009–10 period was generally below average-long-term streamflow conditions. This further extended the current sequence of dry years to 13 and meant water availability across many parts of Victoria remained low. Storage levels in Victoria's major regional reservoirs increased slightly during 2009–10 compared to the previous year to hold 34% of capacity, while Melbourne's storages held 38% of capacity in October 2009.

Streamflows, relative to long-term averages, were highest in the Bunyip, Kiewa, South Gippsland, Portland Coast and Otway Coast basins. Streamflows were lowest in the Avoca, Werribee and Broken basins.

The continuing dry conditions also affected groundwater resources, with 32 groundwater management units showing a short term trend of declining water levels. This can be attributed to reduced recharge, increased demands for groundwater, and factors such as climate change.

2 Management of scarce water resources

2.1 Living with less water

Victoria experienced an extended period of below average rainfall between 1997 and 2010. During this period, a lack of very wet years has failed to offset the dry years and a change in seasonality has seen large decreases in autumn and winter rainfall. While periods of below-average rainfall are not unusual, the loss of inter-annual variability and change in rainfall patterns make the recent climate unprecedented.

This extended dry period has resulted in a major reduction in streamflows and inflows into Victoria's major reservoirs, resulting in severe water shortages for communities and severely impacting the environment through the reduction of above-cap flows and a number of qualifications of rights that were declared.

Victoria's water allocation framework provides measures to conserve and share water between users in response to dry seasonal conditions. Measures include water restrictions in urban areas, seasonal allocations in irrigation districts, restrictions, rosters and bans on users in unregulated catchments, and development of the water market.

The duration and severity of the low flows has required the Victorian Government, water businesses and water users to take additional measures to respond not only to the ongoing water shortage, but to the risk that the recent low flows will continue. In 2009–10, a large number of measures were employed across the state to manage the impacts of ongoing reduced water availability. These measures are detailed in this chapter.

2.2 Role of government in responding to less water availability

The government plays an important role in assisting and guiding water businesses in times of serious water shortage and prolonged drought. Specifically, this role is to implement and expand water conservation measures and contingency responses, forge new agreements and new approaches to water management and sharing, and activate emergency plans to provide immediate short-term relief to those most in need.

Victoria's water businesses are responsible for maintaining sufficient water supplies during drought and for implementing and funding contingency measures when required. Many businesses were again required to activate their dry-inflow contingency plans as water availability remained low at the start of 2009–10, following successive years of very dry conditions. Many of the lessons learnt through managing scarce water resources since 2006–07 were applied as water supplies failed to fully recover in 2009–10, despite close-to-average rainfall across much of the state. The government again worked closely with the businesses throughout the year, monitoring the water supply situation and facilitating emergency response measures when required.

Water businesses are expected to manage water shortages within their bulk entitlements by implementing their drought response plans, and making up shortfalls in water supply through the water market where possible. However, water shortages continued in 2009–10 in many parts of the state and required a high number of qualifications of rights in many water systems. Specifically, 11 basins had qualifications of rights throughout the 2009–10 water year. These included the large water systems in northern Victoria, such as the Murray and Goulburn systems, as well as Melbourne. The revised water sharing arrangements under qualifications helped to meet essential urban, rural and environmental needs, as well as ensuring necessary contingency measures were implemented consistently across the state.

In October 2009, the government announced $47 million in assistance to help rural communities capitalise on good spring rains and boost recovery from more than a decade of drought. Key features of the package included $13.5 million for Farm Improvement Grants for farm infrastructure and on-farm productivity improvements, 30% subsidies on municipal rates and charges worth $9 million, and water rebates for irrigators worth $9 million.

2.3 Victoria's regional sustainable water strategies

The government is undertaking regional sustainable water strategies to plan for long-term water security across Victoria. Each sustainable water strategy will set out a long-term regional plan to secure water for local growth, while maintaining the balance of the area's water system and safeguarding the future of its rivers and other natural water sources.

The Gippsland and Western Region Sustainable Water Strategies are currently in development.

2.4 Urban water restrictions

All Victorian towns are subject to a uniform scale of water restrictions under the Victorian Uniform Drought Water Restriction Guidelines. The guidelines provide for four stages of restrictions; however water businesses may grant exemptions from water restrictions.

The scale has four key stages of restrictions plus intermediate Stage 3a and Stage 4 Ex, with increasing levels of severity. While water businesses can tailor the restrictions under each stage to suit local conditions (that is, by providing exemptions), each stage's restrictions are mostly generic. The trigger points for each stage of water restrictions are outlined in the drought response plan of each water business. These plans also include contingency measures for temporary water supplies or savings beyond Stage 4.

The number of towns on water restrictions reduced during 2009–10. At 1 July 2009, 337 towns were on some form of water restrictions, with 152 towns on Stage 4 restrictions. By 30 June 2010, that number had decreased to 243, with 34 towns on Stage 4 restrictions. Under the guidelines, Stage 4 restrictions prohibit a range of activities, including:

- the watering of any public, residential or commercial garden or lawn
- the watering of sports grounds
- cleaning of vehicles with water with the exception of windows, mirrors and lights
- cleaning of building facades or windows with water
- filling any new pond, lake or swimming pool.

A number of water corporations continued to implement exemptions to Stage 4 restrictions for their towns (Stage 4 Ex) to reduce the impacts on local communities.

Each urban water business also has a permanent water savings plan which applies at all times and sets basic conditions for water use when water restrictions are not in place. At June 2010, approximately 270 towns were not on water restrictions, but were subject to permanent water saving rules.

Figure 2-1 summarises the number of towns on restrictions over 2008–09 and 2009–10, and the level of those restrictions. Restrictions have continued to ease over the past two years, with a reduced number of towns on restrictions in 2009–10 compared with 2008–09. These restrictions tended to be less severe than in the previous year. Water consumption decreased marginally compared with 2008–09. Despite this, urban water businesses reported that domestic metered water use was 3.75% or 12,531 ML lower in 2009–10 compared with 2008–09. A reduction in the number of towns on Stage 1 restrictions occurred in November 2009, shown by the obvious drop in Figure 2-1.

Figure 2-1 Number of Victorian towns on restrictions from July 2008 to June 2010

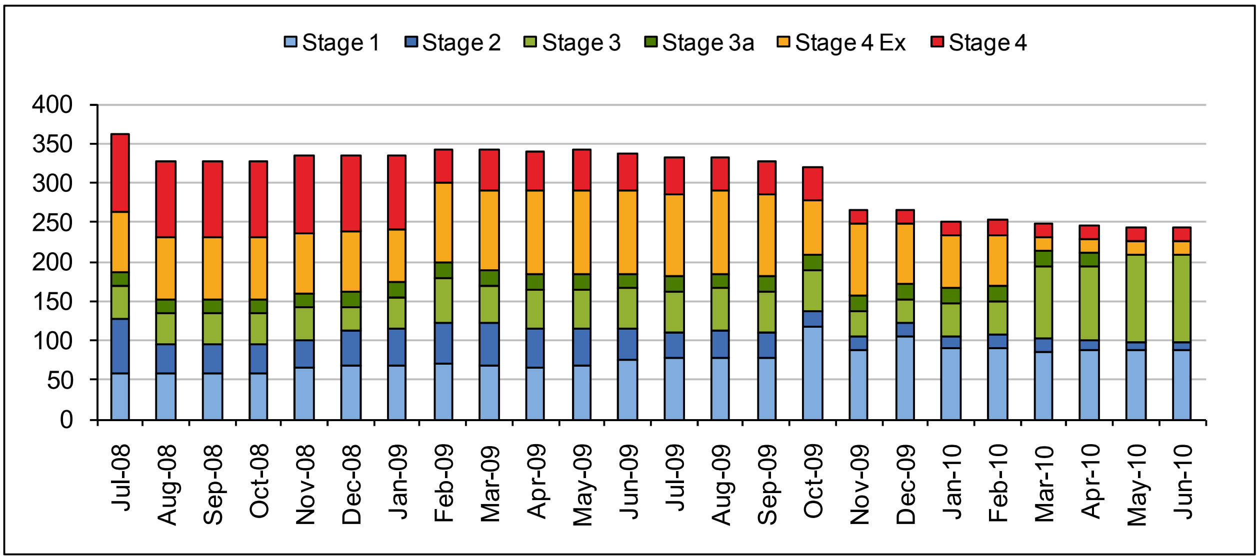
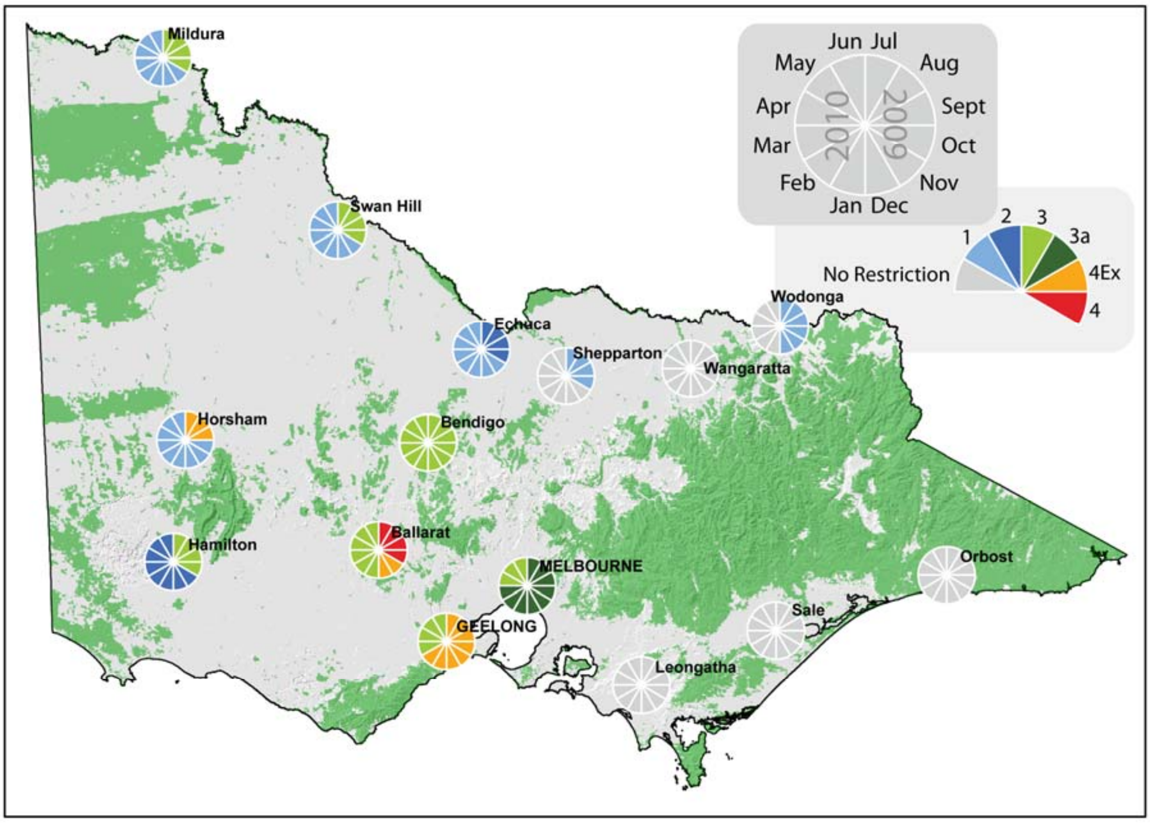


Figure 2-2 shows the level of restrictions for the major population centres and the manner in which they changed over 2009–10. Towns tended to finish the year on either the same level or a lower level of restriction than they began. For example, Horsham began the year in July 2009 on Stage 4 with exemptions. These restrictions were eased throughout the year and Horsham was on Stage 1 restrictions by June 2010. Towns in East and South Gippsland and the Latrobe basins were on permanent water savings throughout the year. Towns in the Goulburn basin and a number of towns in the Broken basin also ended the year on permanent water savings measures.

Figure 2-2 Changes in restrictions levels for major towns, 2009–10



2.5 Seasonal allocation of water in irrigation districts

The amount of water made available to irrigators in regulated systems each year is determined by seasonal water allocations. The seasonal allocation differs from urban restrictions in that every year each irrigator is allocated a share of the available resource which will vary from year to year. An irrigator's seasonal allocation can be used at any time throughout the irrigation season.

Seasonal allocations in declared water systems are expressed as a percentage of high reliability and low-reliability water shares. Water entitlements in the regulated systems of northern Victoria were converted to high and low-reliability water shares when unbundled on 1 July 2008. Unbundling extended to the Werribee–Bacchus Marsh and Thomson–Macalister water systems on 1 July 2009.

Initial allocations are made early in the irrigation season based on the current volume of water in storage, estimated inflows during the season and the amount of water required to provide for subsequent years. Allocations are reviewed by rural water corporations throughout the irrigation season and increased if the available water exceeds their forecasts. The initial seasonal allocations are often low because water corporations do not know until late spring how much water will be available for use.

The 2009–10 seasonal allocations for Victoria's irrigation districts are shown in Table 2-1. For the third year in a row all irrigation systems in northern Victoria started with a zero allocation. Allocations increased throughout the season for most systems, resulting in greater allocations than 2008–09.

All irrigation systems, except the Murray and Thomson–Macalister systems, received allocations less than 100%. End-of-season allocations were nil in four irrigation districts. The irrigation districts with zero allocations include Campaspe, Wimmera and the Maribyrnong systems supplied by both Southern Rural Water and Melbourne Water.

The Murray and Thomson–Macalister irrigation districts received a 100% allocation in 2009–10. In the Thomson–Macalister irrigation district this 100% allocation was against high-reliability water shares while the allocation received against low-reliability water shares was 45%.

Table 2-1 Seasonal irrigation water allocations

Irrigation system		Initial allocation August 2009 (% of entitlement)	Mid-season allocation February 2010 (% of entitlement)	Final allocation May 2010 (% of entitlement)	2008–09 final allocation (% of entitlement)
Murray – gravity & pumped (% HRWS)		0	63	100	35
Goulburn (% HRWS)		0	58	71	33
Broken (% HRWS)		0	4	17	0
Campaspe (% HRWS)		0	0	0	0
Loddon (% HRWS)		0	0	3	0
Bullarook Creek (% HRWS)		0	11	19	0
Wimmera (% entitlement volume)		0	0	0	0
Thomson–Macalister (% HRWS)		40	100	100	100
Thomson–Macalister (% LRWS)		0	10	45	10
Werribee (% HRWS)		2	12	14	5
Bacchus Marsh (% HRWS)		2	12	14	0
Maribyrnong (% licence volume)	Southern Rural Water	0	0	0	0
	Melbourne Water	0	0	0	0

Note:
HRWS – high-reliability water share
LRWS – low-reliability water share

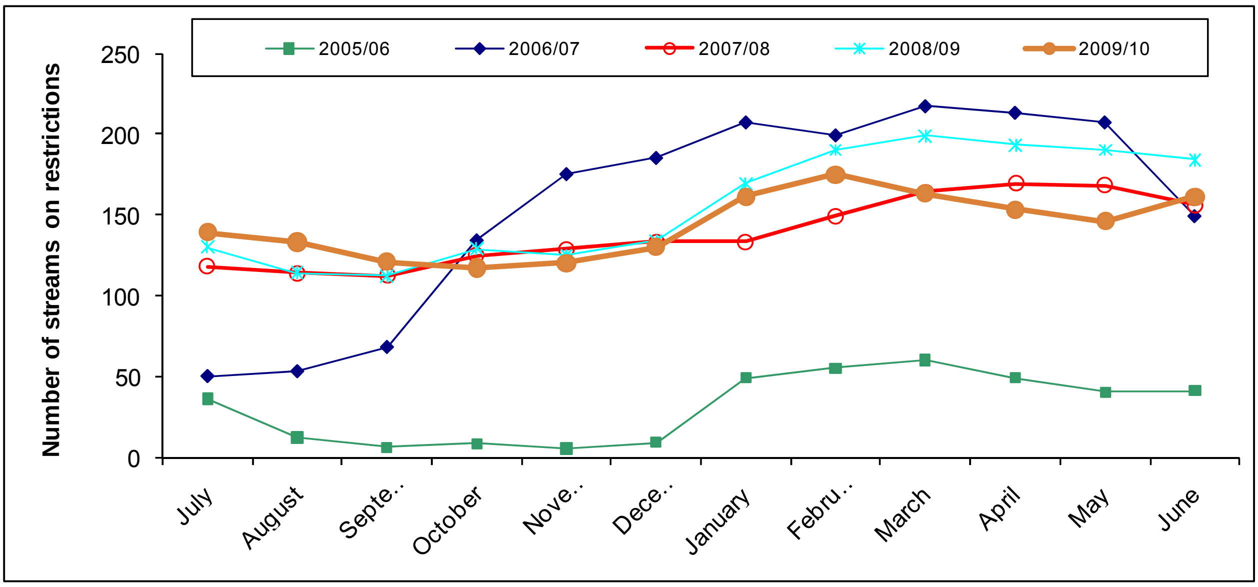
Low seasonal allocations and reduced water availability for urban purposes led to an increase in the amount of water traded on the water market as rural customers and urban water businesses sought to augment their water supply.

2.6 Restrictions on diversions from unregulated streams

When streamflow in an unregulated stream drops below a specified threshold, water corporations have the power to impose restrictions, rosters and bans on the water taken from streams by licensed diverters. Rosters and restrictions set out the order in which licence holders are allowed to take water and the quantity allowed to be taken (for example, 75% of licensed volume). When water is particularly scarce, bans are imposed on diversions from waterways.

Restrictions on diversions from unregulated streams typically fluctuate over the course of the year, depending on rainfall and streamflows. Restrictions and bans are usually most severe in summer and autumn and are more likely to be lifted over the winter and spring seasons. Restrictions on diversions in 2009–10 broadly followed this trend. Restrictions were at their most severe in summer and autumn, with an increase in January through to March. Restrictions peaked in February 2010, with 175 unregulated streams on some form of restriction or ban. In June 2010, users on 161 streams were on some form of restriction compared to 184 in June 2008. The magnitude of restrictions during winter and spring was similar to that of 2008–09 and 2007–08. The restrictions over summer and autumn were lower than those experienced during 2008–09, and during April and May the restrictions were even lower than those over the same months in 2007–08.

Figure 2-3 Number of Victorian unregulated streams on restrictions



2.7 Seasonal allocations of groundwater in water supply protection areas

Seasonal allocations are announced in accordance with the groundwater management plans developed for a number of water supply protection areas (WSPAs). An allocation of less than 100% of the licensed entitlement may be put in place to achieve one or more of the following:

- reduce the risks from falling groundwater levels. Risks can include increased pumping costs, bores drying up and compromising access to domestic and stock groundwater, and potential long-term irreversible impacts on the quality of the resource if all entitlement is extracted
- allow the resource to be shared between all users
- recognise and reduce the social and environmental costs of lowering groundwater levels.

For 2009–10, seasonal allocations applied for the following management areas:

- Katunga WSPA – 70% allocation
- Spring Hill WSPA – 61% allocation
- Campaspe Deep Lead WSPA – 65% allocation
- Deutgam WSPA – total use ban except for qualification of rights exemptions of 35 ML and a dewatering licence of 52 ML.

2.8 Emergency water supply network

In locations where water shortages became critical, the government and water corporations ensured that emergency water supply points were available to eligible customers.

Local councils are responsible for maintaining water supply points.

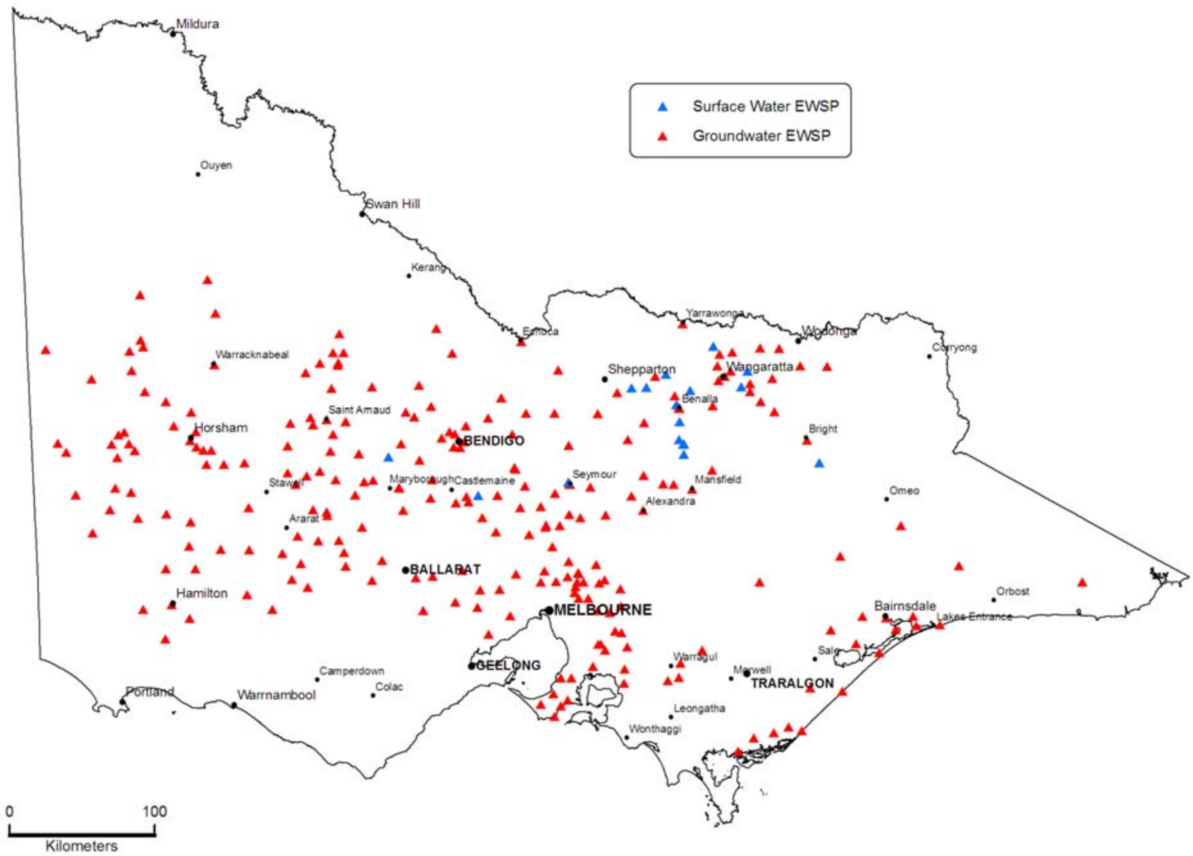
Emergency water supply points comprise a combination of municipal drought relief bores, urban surface water standpipes and surface extraction points on channels and streams.

Since 2006, the government has invested $6.2 million (GST inclusive) towards the growth of the network and access to the information and mapping that supports it.

The aim of the emergency water supply points program is to ensure that landholders do not have to travel more than 20 kilometres to access emergency water in the most drought-affected areas. In some instances, some supply points are fitted with Country Fire Authority standard fittings to allow access in case of an emergency.

In 2009–10 no new points were added to the 270 water supply points that operated throughout 2008–09. These continued to be accessed by rural customers who carted water to their properties for domestic and stock purposes and for emergency use. In the north-west region where 91 water supply points were in operation in 2009–10, 83 of these bores were metered during the year.

Figure 2-4 Emergency water supply point network 2009–10



2.9 Water carting

Water carting is another option used by water corporations to augment supplies when local sources cannot meet the demands on them. Doing so, however, is a time-consuming and expensive exercise and is therefore usually only implemented as a last resort to supply smaller towns.

Table 2-2 summarises the towns that received carted water in 2009–10.

Table 2-2 Towns receiving carted water 2009–10

Basin	Water authority	Town receiving water	Source of water	Period	Volume
Ovens	North East Water	Springhurst	Wangaratta	28 to 31 July, October to end of year	0.015 ML per day
Ovens	North East Water	Bundalong	Yarrawonga	1 July to 17 August, 10 to 31 March	18 KL per day
Ovens	North East Water	Moyhu	Wangaratta	31 January to 1 February, 26 to 27 June	0.015 ML per day
Ovens	North East Water	Oxley	Wangaratta	31 January to 1 February	0.015 ML per day
Broken	North East Water	Goorambat	Yarrawonga	25 to 27 November	0.015 ML per day
Loddon	Coliban Water	Raywood	Bendigo	all year	0.04–0.07 ML per day
Loddon	Coliban Water	Sebastian	Bendigo	all year	0.03–0.06 ML per day
Loddon	Coliban Water	Serpentine	Bendigo	all year	0.03–0.04 ML per day
Wimmera	GWMWater	Clear Lake	GWMWater system	July to December	500 L per day
Wimmera	GWMWater	Rural customers	GWMWater system	July to April	2.2 ML total
Loddon	Central Highlands Water	Lexton	Ballarat, Learmonth	July to September	2.5 ML total
Moorabool	Barwon Water	Meredith	Lethbridge	July to October	0.25–0.35 ML per day

GWMWater continued to implement its rural water carting program in 2009–10. It provided emergency water supplies to rural customers in the Wimmera Mallee system that were yet to be connected to the Wimmera Mallee Pipeline. Under the program, GWMWater provided 28,000 litres of water for domestic use every month to eligible customers. Water was carted from town storages and from other strategic carting sites. Water was also available for carting by customers for intensive industries, stock watering and crop spraying until a supply via the Wimmera Mallee Pipeline was available to them. In total, 79 deliveries were made to GWMWater customers in 2009–10, totalling approximately 2.2 ML.

2.10 Augmenting water supply systems

A number of water businesses across the state upgraded their systems to augment their water supplies in response to the continuing water shortages. While many of the emergency contingencies initiated in 2008–09 were again employed in 2009–10, a number of important infrastructure projects completed during the year increased both short and long-term security of water supplies for both urban and rural customers. Details of these projects are shown in Table 2-3.

Work on the north-south pipeline was completed in 2009–2010. This included construction of over 70 kilometres of pipeline linking the Goulburn River near Yea to the Sugarloaf Reservoir in Melbourne's north east, introducing the capacity to provide an average of 75 GL to Melbourne.

Table 2-3 Infrastructure augmentations to improve water availability 2009–10

Basin	Water business	Infrastructure	Description
Otway Coast	Barwon Water	Groundwater bores	Construction of bores, pre-treatment plant, pump stations and transfer mains for the Anglesea Borefield project continued in 2009–10. Construction of two of seven production bores and transfer and treatment infrastructure was completed. Production expected to commence in later 2010.
Loddon	Central Highlands Water	Groundwater bores	Central Highlands Water completed works on Bore 1A and Bore 2 as a part of the Forest Hill Bore Deepening project. This involved recasing and screening to the full bore depth to ensure ongoing extraction capabilities under declining groundwater levels. The work is expected to be completed in 2011.
Loddon	Central Highlands Water	Groundwater bores	Ongoing investigations into additional groundwater resources for Maryborough. Investigations were undertaken in the Waubra area in 2009–10.
Loddon	Central Highlands Water	Augmentation	Options for Lexton water supply were investigated to ensure improved water resource reliability and water quality. During 2009–10, a preferred option for connection to Waubra was identified and funds secured.
Wimmera	Central Highlands Water	Groundwater bores	A new water treatment facility and new bore were constructed as a part of the Landsborough groundwater project. The project is expected to be completed in late 2010.
Avoca	Central Highlands Water	Groundwater Bores	A new water treatment facility and new bore were constructed as a part of the Avoca groundwater project. The project is expected to be completed in late 2010.
Werribee	Central Highlands Water	Storage	The design and construction of an additional storage basin was completed in 2009–10 for the Blackwood reliability project. The project is expected to be completed in mid-2011.
Yarra	Melbourne Water	Pump station	Construction of a pumping station at Preston Reservoir to transfer water from Winneke to Silvan reservoir. The construction was completed during 2009–10.
Goulburn/ Yarra	Melbourne Water	Pipeline	Constructing a 70 kilometre pipeline linking the Goulburn River near Yea to the Sugarloaf Reservoir in Melbourne's north-east. This project will provide an average 75 GL of supply to Melbourne and was completed in February 2010.
Goulburn/ Yarra	Melbourne Water	Treatment plant	Installation of additional two new filters, centrifuges for sludge treatment and other small works at the Winneke Treatment Plant. This upgrade will increase the capacity of the treatment plant for Sugarloaf pipeline flows. Works completed except for centrifuges.
Loddon	Coliban Water	Desalination plant	A small reverse-osmosis treatment plant was constructed at Bridgewater to improve water quality. The project is expected to be completed in late 2010.
Loddon	Coliban Water	Storage lining and covering	Coliban Water replaced open storages in the Wimmera system with two 2ML lined basins and two 100 KL steel tanks. This work was completed in January 2010.
Mitchell	East Gippsland Water	Water treatment plant	East Gippsland Water has prepared contracts for the Woodglen water treatment plant project. This project will see the construction of a new 20 ML per day water treatment facility.
Tambo	East Gippsland Water	Storage tank	An open basin at Sarsfield will be replaced with a 6 ML tank to reduce losses and improve water quality. It is expected that the project will be completed by mid-2010.
Goulburn	Goulburn Valley Water	Pipeline	Construction of a pipeline from Alexandra to Thornton and Eildon commenced, with construction of the pipeline to Eildon and Thornton.
Broken	G-MW	Pipeline	Lake Mokoan decommissioned. Broken system supplies maintained from Lake Nillahcootie.
Goulburn/ Broken	G-MW	Pipeline	Northern Victoria Irrigation Renewal Project continued in 2009–10, with rationalisation works, meter installations, channel lining and the installation of modernised gates. It is expected that the project will be completed within five years.
Loddon	G-MW	Storage	The mid-Murray storage capacity will be increased by incorporating Lake Boga. The Murray Bulk Entitlement was amended as required, the coffer dam removed and the filling of Lake Boga commenced in March 2010.
Wimmera and Mallee	GWMWater	Pipelining	Construction of the Wimmera Mallee Pipeline completed in May 2010. This project replaced an open earthen channel with a 9000 kilometres pipeline system.
Murray, Wimmera and Mallee	Lower Murray Water/FMIT	Pipelining	Replacement of the Robinvale irrigation district water delivery system progressed in 2009–10 with the construction the main pipeline and lateral spurs. It is expected that the project will be completed in late 2010.
South	Melbourne	Treatment	A desalination plant will be built to service Melbourne, Geelong, and towns in the

Gippsland	Water	Plant	Westernport and South Gippsland region. The plant will add an additional 150 GL per annum to Melbourne's water supply system and will be transferred via an 85-kilometre pipe to Melbourne.
Ovens	North East Water	Storage	Site selection, storage modelling and detailed design works were completed in 2009–10 as part of the Bright offstream storage project to secure supply for Bright, Porepunkah and Wandiligong.
Ovens	North East Water	Groundwater	A bore was drilled, installed and pump tested during 2009–10 to provide supply to Bright, Porepunkah and Wandiligong until the offstream storage is completed.
Kiewa	North East Water	Alternative supply pipeline	North East Water commissioned works to provide alternative supply to Wodonga industry. The installation of pumps and pipework to connect industry to fit-for-purpose water supplied from the wastewater treatment plant was completed and approximately 300 ML of reclaimed water was supplied to customers in 2009–10.
Upper Murray	North East Water	Alternative supply	During 2009–10, North East Water finalised the installation of the Mitta Mitta offtake, the construction of a water treatment plant, reticulation and water storage to provide residents of Eskdale with a secure supply. Approximately 9 ML of potable water was supplied to customers in 2009–10.
South Gippsland	South Gippsland Water	Groundwater bores	South Gippsland Water constructed the Wron Wron Road bore and 3.4 kilometre pipeline to Devon North Water Treatment Plant to augment urban water supply to Yarram and surrounding towns. The bore was commissioned in 2010.
South Gippsland	South Gippsland Water	Groundwater bores	South Gippsland Water constructed a 10.5 kilometre pipeline to connect the Lance Creek system to the desalination plant. This will provide water to the desalination plant during the construction phase, but will later be used to connect SGW to the Melbourne Water grid.
Thomson	Southern Rural Water	Automation	Channel automation works are being undertaken, with flume gates being retrofitted to 50 regulators in the number 4 channel of the Nambrok Denison supply zone. This work is expected to be completed in 2010.
Glenelg	Wannon Water	Pipeline	Construction of 53 kilometres of pipeline from Rocklands Reservoir to Hamilton completed in 2010.
Glenelg	Wannon Water	Pipeline	Construction of 29 kilometres of pipeline from Casterton to Coleraine was completed in 2009. A clear water storage tank was constructed in Coleraine to improve water quality and security of supply to Coleraine.
South Gippsland	Westernport Water	Groundwater bores	Westernport Water is constructing three bores in the Corinella aquifer to supplement existing water supply. In 2009–10, two bores were developed and extensive field testing was undertaken.
South Gippsland	Westernport Water	Storage	In 2009–10, Westernport Water completed a functional design and business case for the augmentation of Candowie Reservoir.
Maribyrnong	Western Water	Storage	During 2009–10, Western Water completed the upgrade to the Loch Road Tank, Mount Macedon.
Maribyrnong	Western Water	Storage	Upgrades to Rosslynne and Merrimu tanks will provide an additional 10 ML storage. This project is 50% complete.
Maribyrnong	Western Water	Pressure management	Installation of two Pressure Management Areas in Sunbury to create pressure controlled areas.
Yarra	Yarra Valley Water	Pump station	Yarra Valley Water completed upgrades to the Birts Hill and Apollo Parkways pump stations.
Yarra	Yarra Valley Water	Pipeline	1.8 kilometres of water main was constructed to connect customers to a treated water reticulation system. This work was completed in December 2009.
Yarra	Yarra Valley Water	Pressure management	A pressure-reducing valve with surge protection was constructed to enable supply to a development west of Beveridge.
Yarra	Yarra Valley Water	Pressure management	Nine pressure-reducing stations were installed across the Yarra Valley Water area, as well as valves, mains and hydrants.

2.11 Qualification of rights

Rights to water are clearly specified in bulk entitlements, environmental entitlements, water shares and licences (refer to Chapter 3 for details of Victoria's allocation framework). However, in extremely dry years where there is an imminent risk to water supplies, the Minister for Water can declare that a water shortage exists and qualify these rights to maintain essential supplies to towns and rural communities. These powers are specified in section 33AAA of the *Water Act 1989*.

The qualification of rights is used by the government as a last resort approach to managing low water availability: it takes water from one class of water user, often the environment, to supply another. Qualifications secured water supplies in many parts of the state in 2009–10 as water shortages continued. To minimise the impacts of qualifying rights, a water business applying for the qualification needed to demonstrate that:

- it could not meet the critical needs of its customers under its bulk entitlement
- all other reasonable contingency options had been identified and implemented
- the impacts on other parties had been assessed and adequate remedial actions identified.

There were 20 qualifications of rights in place across 11 basins during 2009–10. These are summarised in Table 2-4 while more detail is provided in the relevant basin water accounts.

Ten qualifications of rights in southern Victoria continued on from 2008–09 into 2009–10, all of which expired throughout the course of the year.

The Minister made seven new qualifications of rights on the major northern Victorian systems at the beginning of 2009–10 in response to the ongoing water shortage. Two new qualifications on the Thomson system and an additional qualification on the Goulburn system were also made by the Minister during the year.

Qualifications played an especially important role in ensuring domestic supplies in the major northern Victorian water systems, particularly at the start of the season when none of the systems had enough water to announce an allocation under bulk entitlements rules. Water on the Yarra and Thomson rivers was retained in storage under qualifications to provide additional reserves for Melbourne. Modernisation savings from Stage 1 of Northern Victoria Irrigation Renewal Project were also retained for supply to Melbourne, the environment and irrigators under a qualification.

The Minister for Water also qualified rights to groundwater entitlements in WSPAs in 2009–10. In the Deutgam WSPA, the Minister for Water qualified rights to 0% of licensed entitlement and suspended rights to take water for domestic and stock use until 30 June 2010. A small number of exemptions were applied as part of the qualification. The Campaspe Deep Lead WSPA was subject to seasonal allocations of 50% under the management plan as outlined in section 2.7. The licence volumes in the Campaspe Deep Lead WSPA were increased by qualifying the rights to 65% to support farming enterprises suffering from low surface-water availability in the region.

Table 2-4 Qualifications of surface water rights in 2009–10

Basin	Number of qualifications in place	Qualification type							
		New diversion point provided	Extended pumping/ diversion times	Reduced passing-flow requirements	Differential access by priority entitlements	Modified cap	Access to unallocated water provided	Environmental water traded on market	Volume carried over
Murray	1								
Broken	1								
Goulburn	2								
Campaspe	1								
Loddon	3								
Thomson	6								
South Gippsland	2								
Maribyrnong	1								
Yarra	1[(1)]								
Moorabool	1								
Werribee	1								
Total	20								

Notes:

(1) The Minister for Water requalified rights on the Yarra River in 2009–10 after re-declaring a water shortage still existed for Melbourne. The qualification included the same terms and conditions as previously in place and therefore has been treated as on-going.

2.12 Conclusion

Victoria's rainfall pattern over the last 14 years is unprecedented. Streamflows in 2009–10 were generally higher than those experienced in 2008–09 although most parts of the state continued to experience conditions well-below average. This required the government, water businesses and communities to continue to play an active role in managing reduced water availability. The large number of actions taken by water corporations and access to the water market in northern Victoria ensured essential supplies were maintained throughout the year and water resources remained at a sustainable level for commencing the 2010–11 season.

Some major infrastructure projects were undertaken during 2009–10, which helped to provide water to users. Augmentation works were also undertaken by water businesses in response to the continuing water shortages. Restrictions were eased for many towns across Victoria in 2009–10.

3 Water for consumptive use

3.1 Victoria's water allocation framework

Victoria's water entitlement system comprises well-defined rights to water, and markets have been established to reallocate water between uses.

The government retains the overall right to the use, flow and control of all Victoria's surface water and groundwater resources. The Minister for Water is responsible for issuing entitlements in accordance with the *Water Act 1989*.

A water entitlement is the amount of water authorised to be stored, taken and used by a person under specific conditions. In declared water systems there are associated entitlements that set conditions for delivery and use.

3.1.1 Bulk entitlements

A bulk entitlement is a right to use and supply water which may be granted to water corporations, the Minister for Environment and other specified bodies (for example, electricity companies) with secure tenure in perpetuity.

Bulk entitlements are issued with a range of conditions and obligations set out under Part 4 of the *Water Act 1989*. Bulk entitlements can be held in relation to water in a waterway, water in storage, works of a water corporation, and groundwater. To date, bulk entitlements have generally covered surface water systems, however the first groundwater specific bulk entitlement was issued on 1 July 2009 in the Anglesea Groundwater Bulk Entitlement.

A bulk entitlement is usually specified in one of two ways:

- **source bulk entitlement** – is an entitlement to harvest water directly from a water source and which typically describes the different sharing arrangements at that source. Source entitlements can cover multiple storages operated in an integrated way within a river basin.
- **delivery bulk entitlement** – is an entitlement to be supplied water from another water corporation's dam or within a water supply system which is regulated by the works of another corporation.

3.1.2 Environmental entitlements

An environmental entitlement is a right to water granted to the Minister for Environment for the purpose of maintaining an environmental water reserve or improving the environmental values and health of the water ecosystems and other users that depend on environmental condition.

Environmental entitlements are issued by the Minister for Water under section 48B of the *Water Act 198*9. Before the Act was amended to provide for environmental entitlements, a number of bulk entitlements were issued to the Minister for Environment for environmental water in systems.

Environmental entitlements form part of the Environmental Water Reserve. They enable active management of water by providing water in storage that can be released to meet specific environmental needs such as fish spawning triggers or maintaining critical habitat during drought.

The objective of the Environmental Water Reserve is to preserve the environmental values and health of water ecosystems, including their biodiversity, ecological functioning and quality of water and other uses that depend on environmental condition. It is the responsibility of the holder of an environmental entitlement to manage it accordingly.

Further details regarding water set aside for the environment are provided in Chapter 4.

3.1.3 Water shares

The reform of Victorian entitlements in declared water systems meets the National Water Initiative requirement that access to water be specified separately to land.

Traditional water rights and take-and-use licences in declared water systems have been unbundled into three entitlements:

- **water share** – a legally recognised, secure share of the water available to be taken from a defined water system: a water share is specified as a maximum volume of seasonal allocation that may be made against that share.
- **delivery share** – the right to have water delivered by a water corporation and a share of the available flow in a delivery system: a share in terms of unit volume per unit of time of the total amount of water that can be drawn from a water system at a certain point.
- **water-use licences** – the right to use water on a specific piece of land, or water-use registration: an authorisation to use water for purposes other than irrigation.

Entitlements in declared systems in Victoria are automatically recorded in the Water Register, the public register of all water-related entitlements in Victoria.

On 16 September 2009, amendments to the Water Act came into affect that removed the 10% non-water user limit on the amount of water shares in any water supply system that can be owned without being associated with land.

Water shares are classed according to their reliability, which is defined by the frequency with which full seasonal allocations are expected to be available.

Most water shares are classified as either high-reliability or low-reliability. In each water system there are separate 10% limits for high-reliability and low-reliability shares that can be held as unassociated water shares.

3.1.4 Water licences and section 8 rights

A water licence is a licence to take and use water. A water licence can be held by any individual, business or corporation and allows water to be taken from a range of surface water and groundwater sources. Small catchment dams used for purposes other than domestic and stock also require a licence.

In addition to the entitlements that are formally issued, the *Water Act 1989* enables individuals to take water for domestic and stock purposes from a range of surface water and groundwater sources without a licence. These domestic and stock rights are defined in section 8 of the *Water Act 1989* and are not formally issued.

The *Water Act 1989* also legally recognises the amount of water set aside to meet environmental benefits through the Environmental Water Reserve. More details are provided in Chapter 4.

3.2 Consumptive entitlements

Table 3-1 presents a summary of Victoria's consumptive entitlements in both 2009–10 and 2008–09. The total volume of consumptive entitlements changes each year as new entitlements are issued or existing entitlements are modified.

Most basins in the state are capped and therefore there is only a minor change in the total number of entitlements from one year to the next. In capped catchments no new entitlements are created unless the entitlement is purchased from an existing user. This ensures no net increase in entitlement in a capped catchment. The volume of bulk entitlements increased marginally in 2009–10, mainly due to additional bulk entitlements in the Bunyip and South Gippsland basins. However, decrease in entitlements occurred in some northern Victorian basins, with the revoking of the Tungamah Bulk Entitlement in the Broken Basin and a reduction in the supplement of the Goulburn from the Loddon Basin. Groundwater entitlements also decreased compared with 2008–09.

There was also an increase in the volume of licences, which may be explained by ongoing improvements in record keeping by the water businesses making the current year's estimate more accurate. Groundwater licences declined in 2009–10.

The impact of small catchment dams increased compared with 2008–09. This is a result of the wetter conditions prevailing during the 2009–10 period, which enabled increased harvesting from farm dams. Estimates of volumes taken by small catchment dams use the method developed by the Department of Sustainability and Environment for the Flow Stress Ranking project. In 2009–10 it was assumed that the usage and impact of farm dams was consistent with an average year, whereas the dry conditions in 2008–09 required the usage and impact of farm dams to be adjusted to reflect the low inflows.

Table 3-1 Consumptive water entitlements in Victoria as at 30 June 2009 and 2010

Entitlement	Volume 2009–10 (ML)	Volume 2008–09 (ML)
Surface water		
Bulk entitlements(1)	6,134,990	6,008,150
Licences(2)	338,189	328,657
Small catchment dams (mainly domestic and stock)(3)	523,200	405,200
Groundwater licences	993,703	1,012,370
Groundwater bulk entitlement (4)	10,000	N/A
Total water entitlements	**7,990,079**	**7,754,377**

Notes:

(1) An estimate of the total volume of bulk entitlements granted as at 30 June 2010. Total volume does not include environmental entitlements.

(2) Includes only licences issued for unregulated rivers. Licences within regulated water supply systems are not included as they are part of rural water businesses' bulk entitlements.

(3) An estimate of water taken by small catchment dams in 2009–10 includes domestic and stock dams and also small catchment dams for commercial and irrigation use. The latter are required by the *Water Act 1989* to be licensed (or registered), a process that is currently underway. The 2009–10 estimate reflects estimates of prior years and therefore it is likely that some water has been double counted. This is because some water previously classified as from a small catchment dam may now also be counted as a licensed volume.

(4) No more than 35,000 ML in a five-year period.

3.3 Water availability and use

The volume and use of Victoria's water resources for 2009–10 is summarised in Table 3-2.

It is important to note that the water-use data presented in this overview and in the *Victorian Water Accounts* is reported as the volume of water diverted from a water source. It is not the 'use' on a farm or in a town, it is the bulk volume of water extracted from a stream or groundwater bore.

Consistent with previous years, the volume of water entitlements issued in Victoria has been less than the available resource. Table 3-2 shows that the available streamflow in 2008–09 was more than 13,000,000 ML, which is greater than the 6,909,680 ML of entitlements issued across the state.

The substantial difference between the volume of issued entitlements and volume of water used in 2009–10 demonstrates an important feature of the water allocation framework: an entitlement does not necessarily guarantee that the entitlement volume will always be available for use. An entitlement holder must meet all the conditions attached to that entitlement including meeting passing-flow obligations and sharing any shortfall of the available water with other entitlement holders including the environment. In 2009–10 water businesses addressed each shortfall by drawing on their reserves in storage and reducing their customers' use of water (through urban restrictions and irrigation allocations) to ensure that they operated within the conditions of their entitlements. As a consequence, the total volume of water extracted by water businesses and individuals from waterways across the state was significantly less than the total resource. The range of drought contingency measures by water businesses is discussed in Chapter 2 and the basin water accounts.

Table 3-2 Victoria's water availability and water taken for consumptive use in 2009–10

	Surface water(1) (ML)	Groundwater(2) (ML)	Recycled water (ML)
Total resource	13,294,100	1,038,071	399,030
Entitlement	7,023,380	993,703	not available
Water used	3,305,660	438,140	115,400

Notes:

(1) Catchment inflow as shown in each basin water balance in the *Victorian Water Accounts 2009–10*, excluding inter-basin transfers, irrigation return flows and recycled water.

(2) The actual groundwater resource (that is the volume of water in aquifers) is unknown and therefore for the purposes of the *Victorian Water Accounts 2009-2010*, the total resource has been assumed to be the allocation limit, which is represented by the permissible consumptive volume (PCV) (including restrictions in the Campaspe Deep Lead, Spring Hill, Katunga and Deutgam WSPAs), except where a PCV has not been established (for example Shepparton WSPA), in which case the licensed entitlement is used.

3.3.1 Diversions under surface water consumptive entitlements

Consumptive entitlements are used for many different purposes, however they can broadly be classified as either:

- irrigation
- domestic and stock
- urban and commercial
- power generation (which has its own category due to the water-intensive nature of its operations).

Table 3-3 and Figure 3-1 show the diversions made under consumptive entitlements for each of the above four categories.

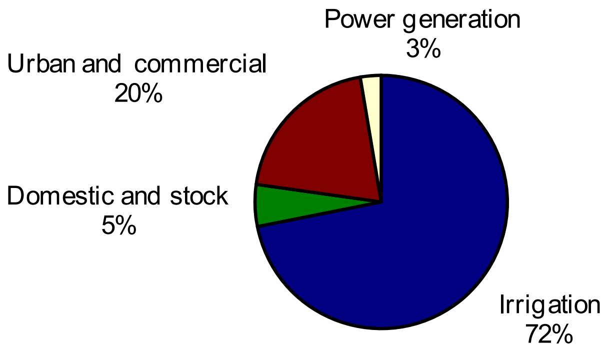
Table 3-3 Surface water diversions made under consumptive entitlements 2009–10

Consumptive end use	Volume of water diverted (ML)
Irrigation	2,375,920
Domestic and stock	176,640
Urban and commercial	665,150
Power generation	87,950
Total consumptive diversions 2009–10	**3,305,660**
Total consumptive diversions 2008–09	2,883,450

As demonstrated in Table 3-3, the volume of water taken under consumptive bulk entitlements in 2009–10 increased compared to 2008–09. The increase in 2009–10 was a result of increased usage for irrigation, urban and commercial, and domestic and stock purposes. Water diverted for power generation decreased compared with 2008–09.

Irrigation continues to be the highest category of water use in the state, comprising 72% of all diversions (Figure 3-1). This portion has increased slightly compared to 2008–09 however is still less than the 75% in 2007–08. This is a result of the low allocations over the last few years.

Figure 3-1 Total surface water diversions for consumptive purposes in Victoria, 2009–10



3.3.2 Urban surface water consumption

Consumption in urban areas is often measured by the metered volume of water delivered to customers. This figure differs from the water use figures presented in Table 3-3 and Figure 3-1 because water is lost in the distribution network through evaporation and leakage between the point of diversion and point of delivery. Therefore the metered consumption volumes discussed below are less than the urban diversion volumes in Table 3-3 and Figure 3-1.

Metered urban water consumption in Victoria decreased during 2009–10 when compared to 2008–09. Total urban water consumption by residential users decreased by 1% when compared to 2008–09 and non-residential use decreased by 4% in 2009–10 compared to 2008–09. The largest decreases were in regional Victoria, with regional residential and non-residential customers decreasing their water consumption by 9% and 10%, respectively. Table 3-4 is represented as a pie chart in Figure 3-2.

Urban consumption declined from 2008–09 to 2009–10, however total diversions increased over the same period.

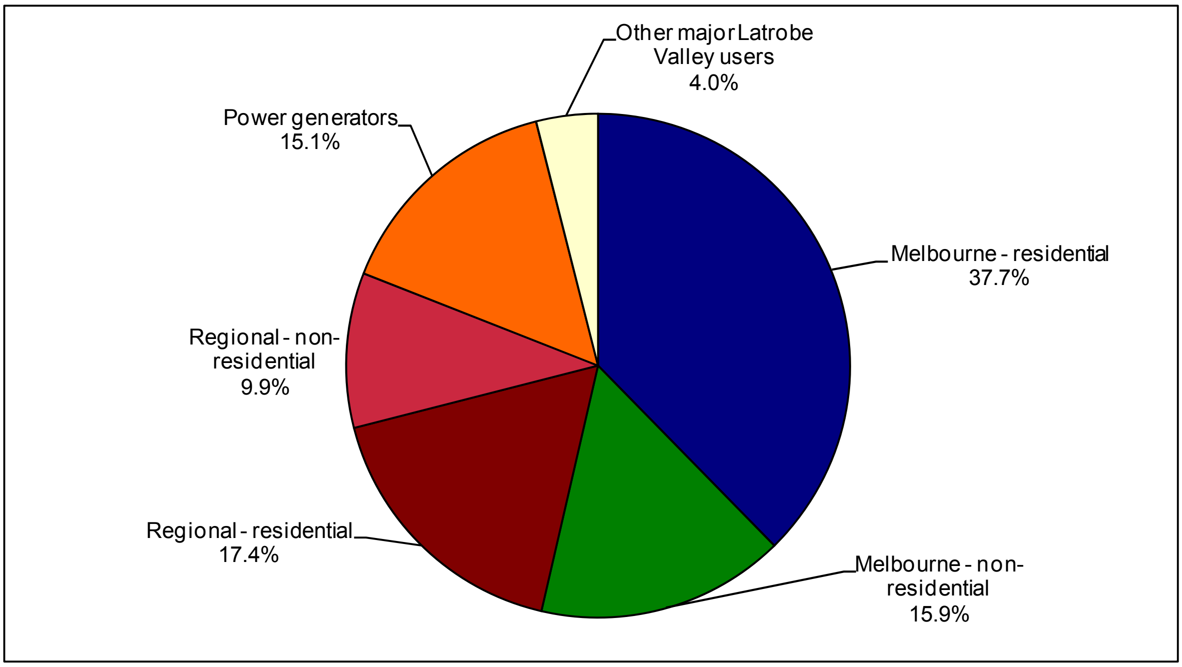
Table 3-4 Urban metered water consumption in Victoria 2009–10

	2009–10 (ML)	2008–09 (ML)	% Change
Melbourne – residential	219,740	222,570	-1%
Melbourne – non-residential	93,040	97,230	-4%
Regional – residential	101,590	111,290	-9%
Regional – non-residential	58,010	64,180	-10%
Power generators(1)	87,950	91,780	-4%
Other major Latrobe Valley industrial users	23,095	23,952	-4%
Total urban consumption	**583,425**	**611,002**	-5%

Note:

(1) Water consumption for power generators with their own bulk entitlements represents the volume of water diverted under those bulk entitlements and not necessarily what was ultimately used for power generation.

Figure 3-2 Consumptive uses of urban and commercial metered water in Victoria, 2009–10



3.3.3 Consumption by major users

In October 2006, the *Water Act 1989* and the *Water Industry Act 1994* were amended to require urban water corporations and the metropolitan retailers to publicly report on major urban water customers. In accordance with the amendments, these water businesses published in their annual reports the number of customers that fell into a range of water consumption bands. Table 3.5 presents a summary of the major water user information reported for 2009–10. There were 283 customers using more than 50 ML of water across Victoria's water businesses. These are split between metropolitan Melbourne (167 customers) and regional water customers (116 customers). The number of customers using more than 50 ML in 2009–10 has decreased by more than two per cent compared to 2008–09.

Table 3-5 Major urban water users in Victoria 2009–10 and 2008–09

Water consumption	Number of customers	
	2009–10	2008–09
Equal to or greater than 50 ML and less than 100 ML	141	152
Equal to or greater than 100 ML and less than 200 ML	66	62
Equal to or greater than 200 ML and less than 300 ML	32	24
Equal to or greater than 300 ML and less than 400 ML	9	17
Equal to or greater than 400 ML and less than 500 ML	11	8
Equal to or greater than 500 ML and less than 750 ML	10	11
Equal to or greater than 750 ML and less than 1,000 ML	2	3
Greater than 1,000 ML	12	13
Total customers	**283**	**290**

Since September 2007, all non-residential urban water customers in Victoria consuming 10 ML or more of drinking water have been required to prepare, submit and report annually against a Water Management Action Plan (waterMAP) to their water corporation.

WaterMAP covers 1,750 customers throughout Victoria. In the 2009–10 year, participating waterMAP customers across the state saved approximately 2.8 billion litres of water. Over the life of the program, waterMAP customers have saved approximately 17 billion litres of water.

In support of waterMAP, the Victorian Government and water corporations conduct a range of water-efficiency and trade-waste reduction programs that targeted diverse industry sectors such as hospitality, education, hotels and motels, and health services. Collectively, these programs have contributed to an overall reduction in consumption for the non-residential urban sector within Melbourne and regional Victoria.

3.4 Urban water conservation measures

3.4.1 Water Smart Gardens and Homes Rebates Scheme

A key component of the state's water conservation strategy is the Water Smart Gardens and Homes Rebate Scheme. Since January 2003, the scheme has provided over 280,600 rebates for urban water customers, saving over 2.9 billion litres of potable water each year (to 30 June 2010).

The total rebate numbers are lower in 2009–10 because of the special on the basket of goods rebates in 2008–09 which reduced the threshold from $100 to $50 for claiming the basket rebate for the autumn period. This special also allowed a second basket of goods rebate for those customers that claimed a special rebate. Large rainwater tank rebates were up by about 900.

Dual-flush toilet rebates were also up by almost 5,500 because of the toilet retrofit program in Melbourne which provided dual-flush toilets fully installed at a discount price. This program commenced in September 2009.

Table 3-6 Rebates approved in 2009–10, 2008–09, 2007–08 and 2006–07 under the Water Smart Gardens and Homes Rebates Scheme

Product	Rebates 2009–10	Rebates 2008–09	Rebates 2007–08	Rebates 2006–07
AAA shower rose	225	375	513	2,112
AAA shower rose(1)	503	577	345	N/A
Dual flush toilet	7,067	1,532	1,845	3,389
Greywater permanent tank system	473	618	790	704
High pressure cleaning device(2)	N/A	N/A	55	705
Hot water recirculator(1)	48	58	45	N/A
Rainwater tank to toilet system	487	271	172	399
Rainwater tanks ($150 rebate)	3,091	4,462	5,191	4,385
Water conservation audit(3)	890	10,289	5,446	822
Rebate when purchasing $100 worth of goods	19,713	27,717	14,554	19,847
Large tank rebates: 2000 - 3999 (4999) litres (connected to toilet or laundry)(4) (5)	720	668	850	241
Large tank rebates: > 4000 (5000) litres (connected to toilet or laundry)(4) (5)	1,203	810	749	172
Large tank rebates: > 4000 (5000) litres (connected to toilet and laundry)(4) (5)	1,704	1,303	1,320	278
Total number of rebates	**36,124**	**48,680**	**31,875**	**33,054**

Notes:
(1) Rebate commenced 1 July 2007.
(2) Rebate finished June 2006.
(3) Rebate increase to $50 on 1 January 2007.
(4) Rebate commenced on 1 January 2007.
(5) Large Tank sizes changed to 4,000 L from 1 July 2009

3.4.2 Urban residential water consumption

Through the continued implementation of government water conservation programs Victoria's urban residential water consumers continued to maintain water consumption at desirable levels.

Key among the tools used to manage urban water demand were water restrictions which were reduced across the state with Stage 3 being the highest level of restriction in place by the end of 2009–10.

The table provides urban residential water consumption figures for the top 20 population centres within Victoria.

Total volumes of water consumed have been obtained from the 2009–10 annual reports of relevant water corporations while the average volumes of consumption have been calculated by the Department of Sustainability and Environment.

The data presented in the table is not intended to be comparative, in view of the different levels of restrictions applying, different climatic conditions driving demand for water and different dwelling densities across the population centres.

Information within the table on water restrictions applicable to locations in 2009–10 adds context to the water consumption levels for each location.

Locations identified in the table may incorporate surrounding districts. Refer to the notes to establish whether additional locations are accounted for in locations identified.

At a different scale, Figure 3.3 provides a geographical context in which differing water consumption levels are recorded on a water corporation basis.

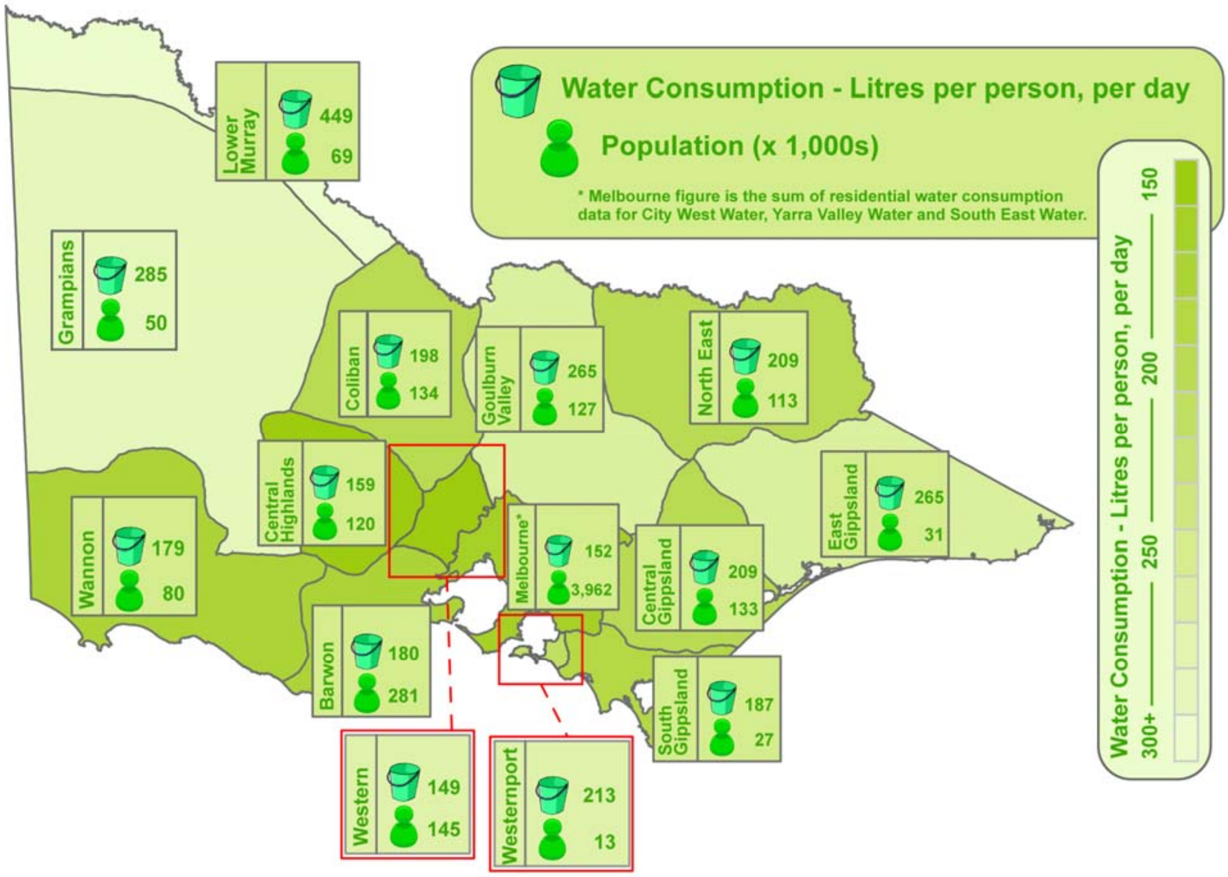
Table 3-7 Urban residential water consumption and water restriction levels for the top 20 population centres in Victoria 2009–10

Location	Permanent population	Average residential consumption (L) per capita per day (1)	Total residential consumption (ML) (1)	Water restrictions levels											
				July 2009	August 2009	September 2009	October 2009	November 2009	December 2009	January 2010	February 2010	March 2010	April 2010	May 2010	June 2010
Bacchus Marsh	19,807	161	1,163												
Bairnsdale	26,203	269	2,568												
Ballarat & district	95,693	160	5,577												
Bendigo	87,072	182	5,784												
Colac & district	15,076	301	1,656												
Cowes & district	13,176	213	1025												
Echuca	13,158	289	1,386												
Geelong (2)	260,436	172	16,353												
Horsham	13,516	273	1,347												
Melbourne	3,962,003	152	219,743												
Melton	54,330	161	3,192												
Mildura (3)	42,011	497	7,614												
Moe/Newborough (4)	22,986	197	1,652												
Morwell/Traralgon & surrounds (5)	54,353	224	4,437												
Shepparton (6)	51,791	300	5,673												
Sunbury/Macedon	64,151	138	3,241												
Wangaratta	19,365	248	1,756												
Warragul/Drouin (7)	25,533	178	1,658												
Warrnambool	28,433	204	2,121												
Wodonga (8)	45,142	169	2,782												

Legend	
Permanent Water Savings Rules	
Stage 1	
Stage 2	
Stage 3	
Stage 3A	
Stage 4 with exemptions	
Stage 4	

Notes
(1) Totals appearing in this column are sourced where possible from 2009–10 annual reports for the relevant water corporations.
(2) Geelong also includes Lara, Batesford, Waurn Ponds, Fyansford and adjoining semi-rural development, Leopold, Drysdale, Clifton Springs, Portarlington, Indented Head, St Leonards, Queenscliff, Point Lonsdale, Ocean Grove, Barwon Heads, Torquay, Jan Juc, Anglesea, Winchelsea and Birregurra.
(3) Mildura also includes Merbein and Irymple.
(4) Supplies Moe, Newborough, Trafalgar, Yarragon, Yallourn and Yallourn North.
(6) Shepparton also includes Congupna, Tallygaroopna, Mooroopna and Toolamba
(7) Supplies Buln Buln, Darnum, Drouin, Nilma, Rokeby and Warragul
(8) Includes Ebden

Figure 3-3 Per-capita per-day water consumption by water corporation 2009–10



3.4.3 Schools Water Efficiency Program

Savings of potable water continued in Victoria's 2,200 Victorian primary and secondary schools connected to the reticulated water supply system. Operating since 2006, the Schools Water Efficiency Program (SWEP) offers schools the opportunity to identify and implement low cost solutions to achieve indoor water savings. Savings can be achieved through measures such as flow control valves on taps and water fountains and identifying and repairing leaks.

Registration for the Schools Water Efficiency Program finished in June 2009 by which time 1,739 schools had registered for the program. The focus in 2010 was on completing the retrofit works and finalising the reporting on the overall program. Several schools were exempted from the retrofit works in 2010 because of building programs being undertaken by a large number of schools in Victoria and a number of schools had estimated savings of less than 5% and did not have retrofits. In the end 972 completed the recommended retrofits. The program has achieved ongoing water savings of over 272 ML per year, giving an average saving of over 12% per school of those that completed works.

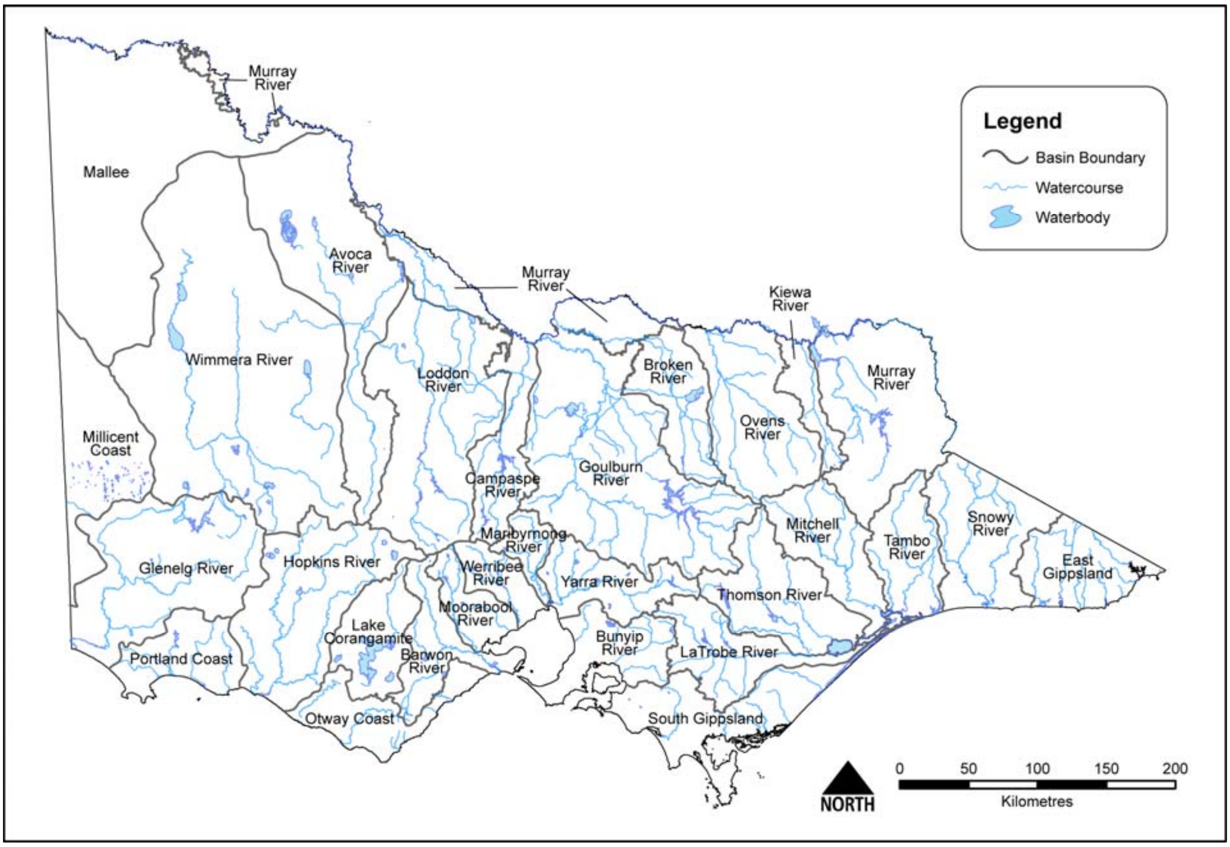
The assistance provided by the Department of Education and Early Childhood Development in mandating that all of Victoria's public schools participate in SWEP helped to gain a high level of participation by these schools. This has resulted in an understanding about what other action may be taken to save water in our public schools through the audit reports for the various schools.

3.5 Surface water entitlement and use

This section provides an overview of the extractions of surface water under bulk entitlements across Victoria.

The information on water taken from Victoria's rivers is summarised according to river basins as defined by the Australian Water Resource Council (AWRC). The exception to this is the Murray basin which, for the purposes of this report, includes the Upper Murray basin as defined by AWRC and areas in Victoria supplied from the River Murray downstream of Lake Hume. The extent of each of Victoria's river basins is shown in Figure 3-4. Refer to Part 2 of this report for details of water availability and use in each basin.

Figure 3-4 River basins in Victoria



Water businesses have an obligation to report on water diversions against their entitlements in their annual reports. These annual reports can be found on the website of each water business.

Part 2 of this report shows water use against each bulk entitlement and an assessment of compliance with the entitlement volume. Some bulk entitlements have an upper limit described, for example as a five-year or ten-year rolling average. The outcome of the compliance calculation is reported in the relevant basin chapter.

The information on water diversions against water business entitlements in Part 2 is as reported in water business annual reports except where water businesses have provided updated information.

Table 3-8 shows the volume of entitlements and water used under bulk entitlements, licences and rights in each basin and the volume diverted from waterways in 2009–10. The volume diverted in each basin is within the entitlement volume.

As a result of the ongoing drought, the volume of water taken under bulk entitlements in 2009–10 was only 44% of the total entitlement volume. Water taken from basins such as the Tambo, Campaspe, Loddon, Glenelg, Wimmera, Werribee, Moorabool and Maribyrnong was again well below the entitlement volume because water availability was severely limited in those basins.

The bulk entitlement volumes for a number of basins are noticeably different compared to the values reported in the 2008–09 accounts. In particular:

- In the Broken basin, the Tungamah Bulk Entitlement (approximately 6,000 ML) has been revoked following the completion of the Tungamah Pipeline Project. This change has been incorporated into the current account.
- In the South Gippsland basin, bulk entitlements for the Lance Creek and Powlett River systems were increased, and the Bass River Bulk Entitlement was established since the 2008–09 account.
- For the Bunyip basin, Bulk Entitlement data was not available at the time of publication of the *Victorian Water Accounts* 2008–09.

Table 3-8 Volume allocated and taken under surface water entitlements in 2009–10

Basin	Bulk entitlements[1]			Unregulated river licensed diversions[1]			Small catchment dams
	Entitlement volume[2] (ML)	Volume taken[3] (ML)	Volume taken (% of entitlement volume)	Entitlement volume (ML)	Volume taken (ML)	Volume taken (% of entitlement volume)	Volume taken[4] (ML)
Murray	2,185,490	977,020	45%	28,230	2,100	7%	6,500
Kiewa	1,160	540	47%	18,510	3,800	21%	3,900
Ovens	58,410	14,130	24%	25,040	6,700	27%	15,900
Broken	25,950	5,470	21%	9,750	1,000	10%	15,800
Goulburn	2,177,270	927,320	43%	40,090	9,900	25%	47,500
Campaspe	140,180	5,220	4%	8,700	100	1%	28,800
Loddon	137,050	3,590	3%	30,240	100	0%	50,000
Avoca	280	30	11%	3,620	1,600	44%	12,700
Mallee	0	0	n/a	0	0	n/a	0
Wimmera	168,940	19,050	11%	2,490	1,800	72%	14,400
East Gippsland	620	130	21%	770	220	29%	1,100
Snowy	2,200	790	36%	4,030	810	20%	3,400
Tambo	3,650	30	1%	4,190	1,140	27%	3,900
Mitchell	5,900	4,800	81%	16,900	13,670	81%	4,500
Thomson	458,940	284,720	62%	17,200	10,000	58%	7,000
Latrobe	216,840	128,740	59%	18,560	7,900	43%	20,500
South Gippsland	20,490	8,000	39%	12,310	5,220	42%	24,300
Bunyip	34,040	16,820	49%	19,320	5,300	27%	15,500
Yarra	428,250	300,370	70%	45,750	14,290	31%	15,900
Maribyrnong	9,920	1,360	14%	1,790	430	24%	7,800
Werribee	37,680	1,480	4%	1,240	280	23%	9,300
Moorabool	43,100	1,500	3%	3,750	870	23%	22,200
Barwon	55,730	36,470	65%	5,520	2,010	36%	30,900
Corangamite	0	0	n/a	1,155	84	7%	12,300
Otway Coast	19,230	14,250	74%	5,530	1,250	23%	12,800
Hopkins	630	300	48%	10,350	1,800	17%	64,600
Portland Coast	0	0	n/a	2,014	92	5%	16,200
Glenelg[5]	4,999	1,186	24%	1,040	230	22%	55,500
Millicent Coast	0	0	n/a	100	100	100%	0
Total	**6,236,949**	**2,753,316**	**44%**	**338,189**	**92,796**	**27%**	**523,200**

Notes:

(1) Bulk entitlement volume and use rounded to nearest 10 ML.

(2) Estimate of the total volume of bulk entitlement granted as at 30 June 2010. Estimate is for an average year and is not adjusted for trade, caps that are climatically adjusted, or caps that are long-term rolling averages, and includes environmental and consumptive entitlements.

(3) Includes water taken under bulk entitlements and water taken under historical rights.

(4) Refers to the total volume of usage from small catchment dams (that is, for both domestic and stock and irrigation and commercial use).

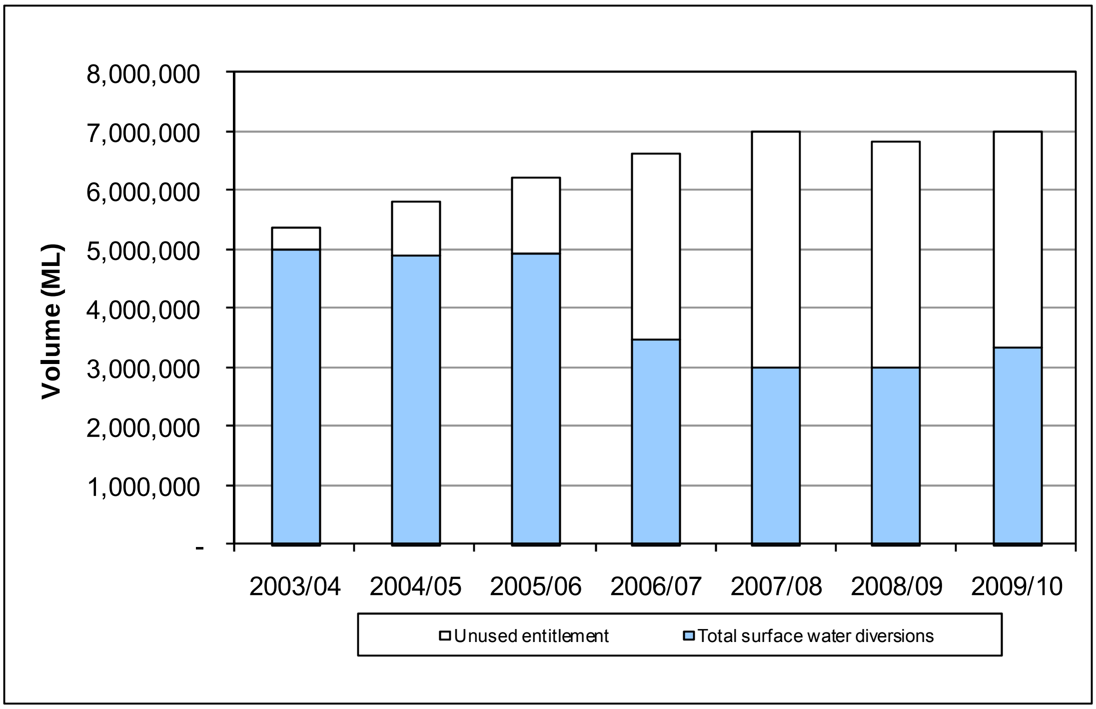
(5) Water taken under the Wimmera and Glenelg rivers bulk entitlement cannot be split into each river basin and is therefore included only under the Wimmera basin for reporting purposes in this table.

n/a: Not applicable.

Figure 3-5 shows the volume of water diverted under surface water entitlements, over the past seven years. The volume of entitlements differs for the reasons outlined in Section 3.2. For the first three years, the volume diverted under these entitlements remained largely stable as most irrigation seasonal allocations remained at or around 100% or more and urban restrictions were lower and isolated to specific regions in the state.

As a result of the ongoing drought, water availability continued to remain below the volume available historically, and the total surface water diversions in 2009–10 was below that recorded until 2005–06. However, the total volume of water diverted in 2009–10 increased by 358,303 ML (11%) compared with 2008–09. This increase is a result of the incorporation of data for the Bunyip basin, as well as increased diversions in a number of other basins.

Figure 3-5 Surface water entitlements and associated diversions



3.6 Groundwater entitlement and use

Full details of water entitlements and use from each GMA and WSPA during 2009–10 are presented in Appendix A. In summary:

- Total groundwater licensed entitlement is approximately 993,700 ML across the state.
- The total groundwater use across the state, including domestic and stock use, was approximately 438,140 ML, which is comparable to the volume used in 2008–09 (448,740 ML).
- In 2009–10 the total volume of licensed groundwater extracted from GMAs and WSPAs was approximately 309,280 ML not including unincorporated areas (UAs). This includes metered use of 275,984 ML and estimated use of 33,296 ML. This is a decrease of 14% when compared with 2008–09 (358,200 ML).
- Domestic and stock use (75,237 ML) is estimated to account for approximately 18% of total groundwater use (438, 138 ML). This is an increase from approximately 11% of total groundwater use in 2008–09. However, this increase may be due to an improved methodology for estimating numbers of domestic and stock bores in the unincorporated areas for the 2009–10 water accounts.
- In Victoria's GMAs, licensed groundwater entitlements totalled 222,408 ML, with total use of 115,418 ML consisting of 64,707 ML of metered extractions and an estimated 32,256 ML of unmetered extractions. Estimated domestic and stock use in these areas was 18,455 ML.
- Licensed groundwater entitlements in WSPAs totalled 641,850 ML, with total use of 237,153 ML consisting of 211,277 ML of metered extractions and an estimated 1,040 ML of unmetered extractions. Estimated domestic and stock use in these areas was 24,836 ML.
- Estimated groundwater entitlement in the unincorporated areas was approximately 129,447 ML, with approximately 85,568 ML extracted. This is significantly higher than 2008–09 where entitlement was approximately 113,140 ML and 49,220 ML was extracted.
- The total volume of groundwater extracted for urban use in 2009–10 was 23,200 ML, which is approximately 5.3% of the total groundwater extracted, similar to 2008–09.
- Approximately 75 towns are reliant on groundwater as either a supplementary or primary water supply. The largest of these is Greater Geelong with extraction of 14,343 ML. In 2007–08, Barwon Water initiated an investigation to source additional groundwater supplies from the Jan Juc GMA to secure a future water supply for the area. A bulk entitlement was issued on 1s July 2009 to supplement existing supplies. Groundwater extraction under the authority of the Anglesea Bulk Entitlement in 2009–10 was 1,615 ML. Figure 3-6 shows the location of towns where groundwater is used for urban water supply.
- Permanent and temporary trade of groundwater occurred across the state, with 22 permanent trades totalling 1,533 ML and 206 temporary trades totalling 17,514 ML. The majority of groundwater trading occurred in the northern region of Victoria.

Figure 3-6 Location of towns where groundwater is used for urban supply

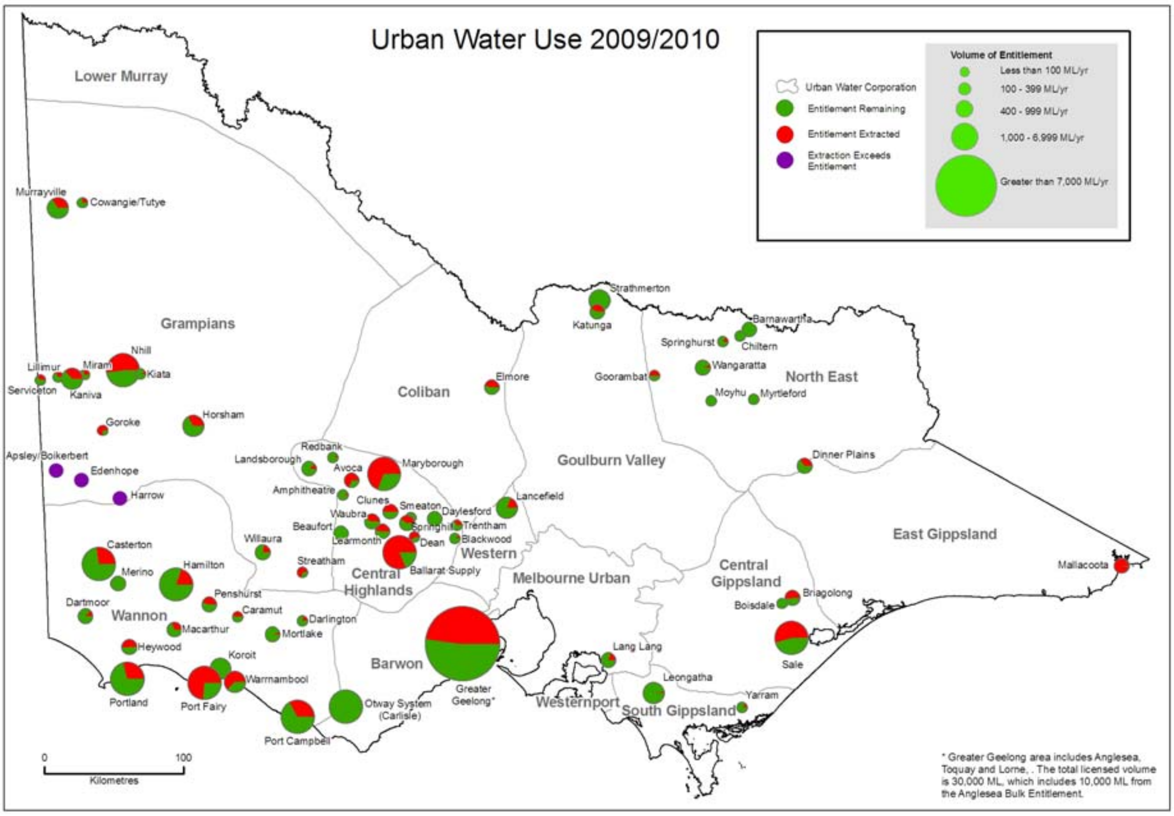
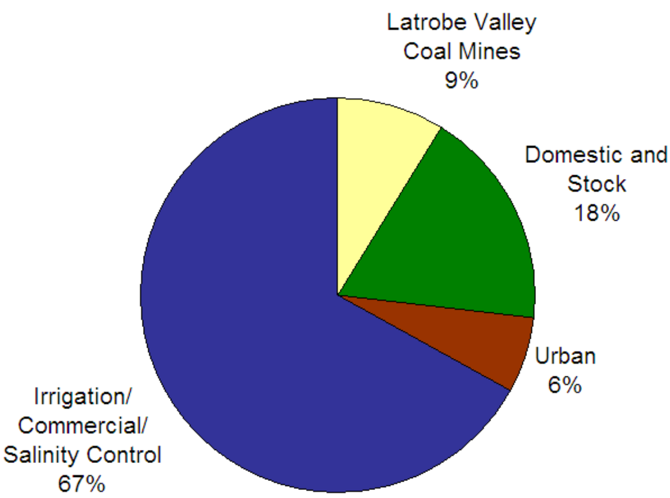


Figure 3-7 shows groundwater extraction by use in GMAs and WSPAs.

Figure 3-7 Groundwater extraction by use in GMAs and WSPAs



3.7 Water trade and movement

During 2009–10, water holders in Victoria moved water around the state and between neighbouring New South Wales and South Australia. Water holders are able to move their water using the following mechanisms:

- transfer and variation of water shares
- allocation trade

- bundled entitlement transfers.

Movement of water associated with each of these mechanisms is difficult to compare because they refer to different water products and are therefore summarised separately in this account.

3.7.1 Water share transfers and variations

Water entitlements in the regulated systems of northern Victoria were unbundled on 1 July 2007. Unbundling separates a holder's entitlement to take a volume of water from the right to use that water on land and have the water delivered. On 1 July 2008, the southern regulated systems of Thomson–Macalister and Werribee were also unbundled. Water shares (the unbundled entitlement to take an ongoing share of the water resource) can be transferred to another person (with a water share transfer) and can be associated with a different parcel of land or disassociated from land (with a water share variation).

The volume of water shares transferred or varied in Victoria during 2009–10 is summarised in Table 3-9.

This table shows movement of water shares according to where they are intended to be used rather than where they are sourced. The source of water shares now rarely changes, however the use may change frequently as holders chose to move their water.

Table 3-9 Water share transfers and variations 2009–10 [1,2]

Location	High-reliability water shares			Low- and spill-reliability water shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Murray	480,308	645,692	-165,384	40,709	55,954	-15,246
Ovens	1,869	1,968	-99	903	926	-23
Broken	1,270	8,864	-7,594	284	1,831	-1,547
Goulburn	70,998	114,394	-43,396	37,243	48,103	-10,860
Campaspe	1,931	8,555	-6,625	1,264	1,755	-491
Loddon	20,395	49,478	-29,083	14,612	16,049	-1,437
Non Water Users [3] (Northern Victoria)	259,232	58,427	200,806	45,362	17,828	27,534
Non Water Users [3] (Southern Victoria)	340	0	340	50	0	50
Thomson/Macalister	16,220	16,559	-340	7,869	7,919	-50
Werribee	742	742	0	356	356	0
All Victoria 2009–10	**853,305**	**904,680**	**-51,375**	**148,650**	**150,721**	**-2,071**
All Victoria 2008–09	334,679	334,679	0	136,384	136,384	0

Notes:
(1) This table summarises all water share transfers and variations recorded in the Victorian Water Register during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.
(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water and land sale are also included in this table. Variations may not involve a change of ownership.
(3) When water shares are disassociated from land they are classified as being in the non-water-user category.

The volume of high-reliability water shares purchased in the northern basins was 836 GL compared with only 17 GL in the south. Water markets in northern Victoria are more developed than the south where there is a larger volume of entitlements, more irrigators and a longer history of trading water.

The bulk of the trading activity was undertaken in the Murray basin, however the non-water users in Northern Victoria were also very active in the water market during 2009–10. The continued disassociation of water shares from land leads to classification in the non-water user category.

3.7.2 Allocation trade

In the unbundled systems, water-share holders can buy and sell allocation (seasonal allocation made against water shares) through a trade of allocation. The volume of allocation trade in Victoria during 2009–10 is summarised in Table 3-10. This table shows allocation trade according to where the water is stored or sourced, rather than where it is intended to be used. This is appropriate because a trade of allocation doesn't mean that the water will necessarily be used in that location in that year.

Table 3-10 Allocation trade in Victoria 2009–10 [1,2,3]

Basin	Bought (ML)	Sold(ML)	Net transfer to basin (ML)
Murray	341,691	377,423	-35,732
Ovens	782	782	0
Broken	728	783	-55
Goulburn	330,546	280,989	49,557
Campaspe	3,844	3,955	-111
Loddon	20	42	-22
Thomson/Macalister	12,145	12,145	0
Werribee	68	68	0
New South Wales	64,430	125,360	-60,930
South Australia	64,379	17,838	46,541
All Victoria 2009–10	**818,631**	**819,384**	**-753**
All Victoria 2008–09	605,401	605,401	0

Notes:

(1) This table shows allocation trade statistics from the Victorian Water Register for all trading zones (regulated, unregulated and groundwater). This table is for approved trades only. Some trades were still in progress at year end and will be finalised in 2010–11.

(2) Additional allocation trade was recorded in the Victorian Water Register that is not included in this table because they relate to temporary transfers of bundled entitlements. These allocation trades included trade of surface water entitlements which are included in Table 3-11 and of groundwater trade that is included in Appendix C.

(3) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

A total of 819 GL of allocation was traded on the Victorian water market during 2009–10. This included 677 GL of trade in northern Victoria and 12 GL in southern Victoria. Overall Victoria was a net seller of allocation, exporting a small volume of allocation to New South Wales and South Australia. This was a significant increase in the volume of trade compared to 2008–09.

3.7.3 Surface water bundled entitlement transfers

Despite most irrigation entitlements in Victoria now being unbundled, there are still a number of bundled entitlements (that is entitlements where the right to take and use water are not separated) in existence. Bundled entitlement holders are able to transfer part or all of their entitlement on either a permanent or temporary basis. The volume of permanent and temporary transfers of surface water bundled entitlement during 2009–10 is summarised in Table 3-11.

The temporary market for bundled entitlement was more active than the permanent, with over 2,000 ML transferred on a temporary basis compared with 429 ML of permanent transfers. Most transfers occurred in the Kiewa basin in the north, and the South Gippsland basin in the south.

Table 3-11 Surface water bundled entitlement transfers 2009–10 (1)

Basin	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin	Bought (ML)	Sold (ML)	Net transfer to basin
Goulburn (2)	82	82	0	20	25	-5
Broken(2)	0	0	0	0	0	0
Campaspe(2)	0	0	0	0	0	0
Loddon(2)	0	0	0	0	0	0
Murray(2)	4	4	0	70	87	-17
Ovens(2)	27	27	0	392	490	-98
Kiewa(2)	82	82	0	222	222	0
Avoca	0	0	0	0	0	0
Mallee	0	0	0	0	0	0
Wimmera	0	0	0	0	0	0
East Gippsland	0	0	0	0	0	0
Snowy	0	0	0	64	64	0
Tambo	0	0	0	0	0	0
Mitchell	40	40	0	90	90	0
Latrobe	0	0	0	0	0	0
Thomson	2	2	0	279	279	0
South Gippsland	124	124	0	119	119	0
Bunyip	58	58	0	159	159	0
Yarra	0	0	0	0	0	0
Maribyrnong	0	0	0	0	0	0
Werribee	0	0	0	0	0	0
Moorabool	0	0	0	1	1	0
Barwon	0	0	0	333	333	0
Corangamite	0	0	0	15	15	0
Otway Coast	0	0	0	0	0	0
Hopkins	0	0	0	355	355	0
Portland Coast	0	0	0	0	0	0
Glenelg	10	10	0	7	7	0
Millicent Coast	0	0	0	0	0	0
All Victoria 2009–10	**429**	**429**	**0**	**2126**	**2246**	**-120**

Notes:

(1) This table shows the volume of permanent and temporary transfers of bundled entitlement during 2009–10.

(2) Temporary transfers of bundled entitlement in the northern Victorian basins were recorded in the Victorian Water Register as allocation trades between unregulated zones during 2009–10. These transfers were recorded as allocation trades, however they have been included in this table rather than Table 3-10 because they are surface water bundled entitlement transfers and should be compared with similar transactions. Data for all permanent transfers and for temporary transfers in the other basins have been provided from water corporation records.

Urban water businesses that participated in the water market in 2009–10 were Central Highlands Water, Coliban Water, Goulburn Valley Water, GWMWater and North East Water. Most of urban water business participation was in the temporary rather than permanent market. Coliban Water was the most active in terms of the number and volume of trades, purchasing over 14 GL (net) of temporary water in 88 different transactions. Central Highlands Water was another significant market participant player, selling close to 4 GL (net) of temporary water in 41 transactions. Details of trades are reported in the Victorian Water Accounts for each of the bulk entitlements held by water businesses.

Groundwater trade information is reported in Appendix C. In 2009–10, a volume of 1,533 ML was permanently traded while temporary trades accounted for 17,514 ML. Trades occurred in groundwater areas managed by Goulburn Murray Water, Southern Rural Water and Grampians Wimmera Mallee Water.

3.8 Recycled water

The total volume of 398,973 ML of wastewater produced in 2009–10 was higher than the 377,212 ML produced in 2008–09. The volume of water recycled by Victoria's water businesses for use external to treatment plants in 2009–10 decreased compared to 2008–09. The recycled volume was 94,810 ML, which represents a reduction of 1,800 ML. The volume recycled represents 24% of the total volume available for reuse at the end of the wastewater treatment process. An additional 19,951 ML was recycled for use within the wastewater treatment process, which increases the proportion of recycled water to 29% of wastewater available for recycling. The volumes and percentages used in the following paragraphs only refer to recycled water supplied for use external to the treatment plants.

In 2009–10, the volume of water recycled by the Eastern Treatment Plant was 20,496 ML, which was a decrease on the 22,262 ML recycled in 2008–09. Under the Eastern Irrigation Scheme, Melbourne Water sells Class C recycled water to private sector operator TopAq, which further treats the water to Class A standard and delivers the water to horticultural, recreational and industrial users.

The volume of water recycled by the Western Treatment Plant reduced from 54,847 ML in 2008–09 to 54,322 ML in 2009–10. This decrease is largely attributable to a reduction in the volume sold to Melbourne retailers, decreasing from 13,879 ML in 2008–09 to 12,785 ML in 2009–10.

Including the treatment plants operated by the Melbourne metropolitan retailers, the volume of water recycled in Melbourne was 63,774 ML or 21%. The percentage of recycled water is higher outside Melbourne where weather conditions, the availability of land and access to potential purchasers (that is, agricultural producers) are more favourable. Excluding the wastewater recycled in Melbourne, the remainder of the state recycled 31%, or 31,036 ML, of the wastewater available for reuse. This is slightly lower than 2008–09 (31,197 ML).

Table 3-12 Volume of wastewater recycled in 2009–10

Basin[1]	Total volume of wastewater produced	Volume recycled excluding within process (ML)	% of wastewater recycled excluding within process	Volume recycled within process (ML)	% of wastewater recycled including within process
Murray	7,718	4,121	53%	0	53%
Kiewa	282	96	34%	0	34%
Ovens	2,195	835	38%	0	38%
Broken	213	213	100%	0	100%
Goulburn	6,734	6,153	91%	0	91%
Campaspe	1,932	1,525	79%	0	79%
Loddon	6,945	4,511	65%	0	65%
Avoca	121	121	100%	0	100%
Mallee	n/a	n/a	n/a	n/a	n/a
Wimmera	1,428	1,428	100%	0	100%
East Gippsland	28	28	100%	0	100%
Snowy	243	243	100%	0	100%
Tambo	481	481	100%	0	100%
Mitchell	1,343	1,343	100%	0	100%
Thomson	314	277	88%	0	88%
Latrobe	21,711	717	3%	0	3%
South Gippsland	4,748	303	6%	4	6%
Bunyip	135,800	8,432	6%	15,106	17%
Yarra	9,557	467	5%	1,923	25%
Maribyrnong	2,803	1,275	45%	622	68%
Werribee	156,970	58,556	37%	257	37%
Moorabool	n/a	n/a	n/a	n/a	n/a
Barwon	24,519	1,754	7%	1,950	15%
Corangamite	1,961	300	15%	22	16%
Otway Coast	1,491	265	18%	63	22%
Hopkins	5,421	557	10%	4	10%
Portland Coast	2,558	143	6%	0	6%
Glenelg	1,424	631	44%	0	44%
Millicent Coast	35	35	100%	0	100%
Total 2009–10	**398,973**	**94,810**	**24%**	**19,951**	**29%**
Total 2008–09	**377,212**	**96,636**	**26%**	**18,898**	**31%**

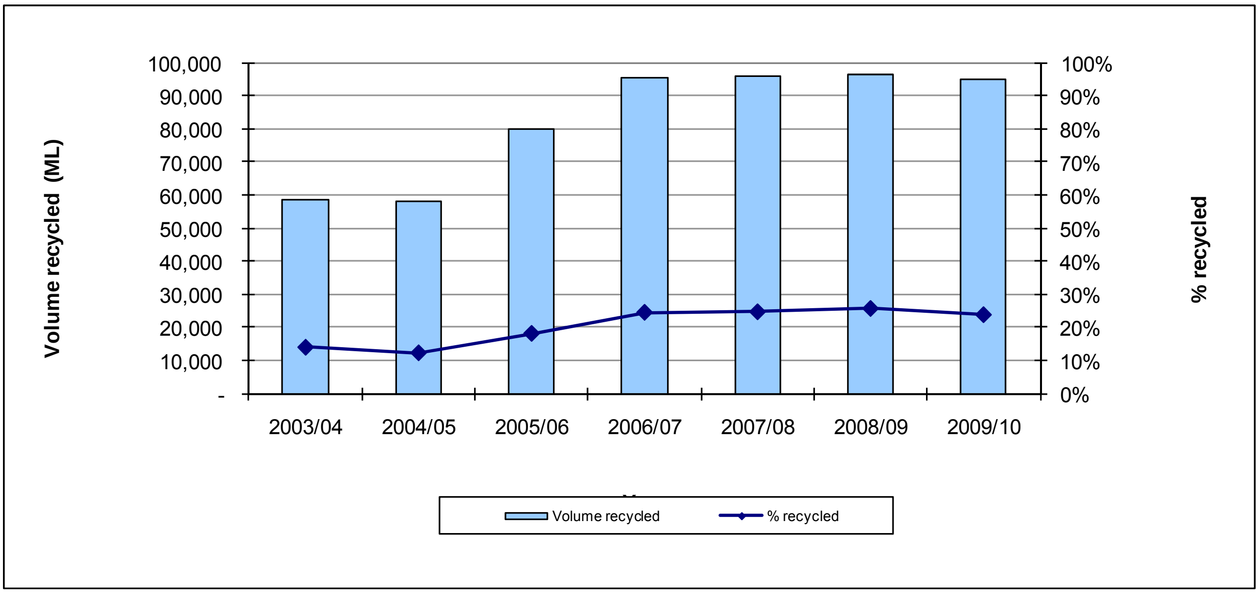
Notes:

(1) Recycled water is reported in the river basin where the wastewater is treated. For example, most of the wastewater treated in the Werribee and Bunyip river basins comes from other river basins.

n/a: Not applicable as there are no wastewater treatment plants within the basin.

Figure 3-8 shows the trend in recycled water over the past seven years. In 2003–04 and 2004–05, the volume recycled was slightly less than 60,000 ML, with Melbourne contributing 20,000 ML to 25,000 ML. In the next two years, as demand for recycled water increased due to the drought and more recycling schemes came online, the volume of water recycled grew substantially, as did the percentage recycled. As noted above, Melbourne recycled more than 65,000 ML in 2009–10 – three times the volume it recycled in 2003–04. Regional Victoria has continued to reuse around 31% of the wastewater it produces, which, depending on the volumes entering the treatment plants, has ranged from around 29,000 ML to 38,000 ML per annum. The volume and percentage recycled in 2009–10 was slightly less than that recycled in the previous year.

Figure 3-8 Recycled water volume and percentage 2003–04 to 2009–10 (excluding recycled water used 'within process')



3.9 Conclusions

Victoria's water entitlement system comprises well-defined rights to water and markets to reallocate water between users. The total volume of water defined in entitlements in Victoria in 2009–10 was 7,884,729 ML.

The volume of Victoria's surface water, groundwater and recycled water in 2009–10 was approximately 15,000,000 ML. The majority of this was surface water, of which 13,294,100 ML was available across the state. This is roughly half the long-term annual average streamflow and represents a significant increase compared to 2008–09.

Diversions under surface water consumptive entitlements increased in 2009–10 to 3,304,450 ML. This reflects approximately half of the total surface water entitlement.

Irrigation remained by far the highest category of water use in the state, comprising 72% of all water use. This is despite irrigators being severely restricted in a number of systems for a number of months of the 2009–10 period.

Increased allocations in the large irrigation districts of northern Victoria compared to previous years ensured the water market was again very active in 2009–10. During this period, the majority of water share transfers and variations were from the Murray and Goulburn basins. There was a net transfer of 165,384 ML of high-reliability water shares and 15,246 ML of flow- and spill-reliability water shares from the Murray basin, with 43,396 ML and 10,860 ML of high- and low-reliability transfer respectively from the Goulburn basin. The volume of high-reliability water shares transferred or varied in the northern basins was 576 GL compared with only 17 GL in the south. A total of 819 GL of allocation was traded on the Victorian water market during 2009–10. This included 677 GL of trade in northern Victoria and 12 GL in southern Victoria. Overall Victoria was a net seller of allocation, exporting a small volume of allocation to New South Wales and South Australia.

Groundwater use across the state in 2009–10 was similar to previous years at 438,137 ML. The majority of groundwater was extracted under licences within GMAs and WSPAs.

A total of 94,810 ML of wastewater was recycled in 2009–10. This is slightly lower than the volume recycled in 2008–09. Although the volume of wastewater recycled in Melbourne was more than double the volume recycled in regional Victoria, the proportion of wastewater recycled was higher in regional Victoria.

4 Water for the environment

4.1 The environment's share of water

The Environmental Water Reserve (EWR) is the legal framework by which water is set aside to maintain the environmental values of rivers, wetlands and streams. Over the last five years, the volume of water historically recorded as EWR in many rivers has been reduced or ceased by temporarily qualifying rights to water during extreme water shortages to ensure water supplies to some townships. The major component of the EWR, above cap water, has also been reduced by the extended drought.

Rivers have naturally variable flow regimes, reflecting the rainfall and run-off within their catchments. Environmental health for rivers can be achieved through seasonal flow regimes and should not be assessed solely on the total volume of water leaving a basin.

Part 2 of the water accounts sets out the basis of the EWR for each basin. The objective of the EWR is to preserve the environmental values and health of water ecosystems. Water is set aside under the EWR through:

- entitlements for the environment – provide for a share of the available resource
- obligations on entitlements – includes the passing flows that water corporations or licensed diverters are obliged to provide out of storage or past a diversion point
- stream flow or groundwater management plans
- above-cap water – water leaving the basin, under the section titled 'Rainfall, flows and storages'. This water includes water that is left over after limits on diversions that have been reached and unregulated flows which cannot be kept in storage. Most of the EWR is above-cap water and this component is most susceptible to climate change.

Reporting of the groundwater EWR will be progressively introduced into the Victorian Water Accounts in future years.

4.2 Entitlements for the environment

In 2009–10 the Minister for Environment held 16 entitlements for the environment. The use of water held in storage under these entitlements is set out in Table 4-1. Entitlements held by the Minister for Environment that do not involve water held in storage are set out in Table 4-3. Where relevant, the use of this water is described more fully in the separate basin chapters in Part 2.

Three new environmental entitlements were created in 2009–10:

- Environmental Entitlement (Birch Creek – Bullarook System) 2009
- Environmental Entitlement (Goulburn System – Environmental Water Reserve) 2010
- Environmental Entitlement (River Murray – Environmental Water Reserve) 2010.

The Birch Creek Bullarook System entitlement entitles the Minister for the Environment to a share of flows to meet specified low flow levels. The new Goulburn System and River Murray entitlements resulted from modernisation work completed in the Goulburn Murray Irrigation System. Although these entitlements do not currently contain a volume, they will eventually allow the Minister for Environment the use of 75,000 ML of average annual water savings. These savings are being generated as the Northern Victoria Irrigation Renewal Project works are completed and audited by an independent auditor.

As set out in Table 4-1, of the entitlements in place for 2009–10, five were amended during this year. These included:

- An amendment to the Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order to create an additional 5,710 ML high-reliability water and 1,438 ML of low-reliability water to help meet Victoria's Living Murray Water obligations.
- A further amendment to the Bulk Entitlement (River Murray – Snowy Environmental Reserve) Order 2004 to create an unregulated entitlement for the River Murray of 34,300 ML and a high-reliability water entitlement for the Snowy River of 22,100 ML. This water reflected water savings achieved through the decommissioning of Lake Mokoan and new operational arrangements for the Victorian mid-Murray storages.
- An amendment to the Environmental Entitlement (Goulburn System – Living Murray) 2007 to create an additional 19,164 ML of high-reliability water and 154 ML of low-reliability water to help meet Victoria's Living Murray Water obligations.
- A further amending order to the Environmental Entitlement (Goulburn System – Living Murray) 2007 to create an additional 20,461 ML of high reliability and 15,780 ML of low-reliability water to help meet Victoria's Living Murray Water obligations.
- An amendment to the Environmental Entitlement (Campaspe River – Living Murray) 2007 to create an additional 126 ML of high-reliability water to help meet Victoria's Living Murray Water obligations.

In addition, the Bulk Entitlement (Broken System – Snowy Environmental Reserve) Conversion Order 2006 was revoked. This order was created to temporarily hold water for the Snowy River following the government's purchase of entitlement from the Burnbrae property and completion of the Tungamah Pipeline project. This water is now included in the Bulk Entitlement (Murray River – Snowy Environmental Reserve) Order 2004, which was amended in 2009–10 as listed above.

Victoria is meeting its obligations to provide improved environmental flows in the Snowy River through the establishment of environmental bulk entitlements in the Murray and Goulburn Rivers. These entitlements continue to have water added to them as water savings become available from water-saving projects such as irrigation upgrades and decommissioning Lake Mokoan, as demonstrated by a further amendment to the Bulk Entitlement (River Murray-Snowy Environmental Reserve) Order. Allocations under these entitlements are used within the Murray and Goulburn rivers to supply consumptive users, who would otherwise have been supplied through water diverted from the Snowy River. This water is then shared between the Snowy River and the Murray River to improve environmental flows.

The Barmah-Millewa Forest Environmental Water Allocation is not strictly an environmental entitlement but has many similar characteristics. It is a significant operational rule embedded in consumptive entitlements and is part of the EWR. Under arrangements approved by the Murray–Darling Basin Authority, Victoria and New South Wales contribute environmental water for the long term sustainability of the forest and wetland.

The Commonwealth is purchasing water entitlements throughout the Murray Darling Basin through their Restoring the Balance in the Murray–Darling Basin Program. In order for the Commonwealth's water to be delivered in Victoria, a trade into Victorian environmental entitlements occurs.

Table 4-1 Entitlements for the environment in storage in 2009–10 (ML)

Entitlement	Entitlement at 30 June 2010 A	2009–10 allocation B	Allocation carried over from 2008–09 C	Trade in from CEWH [1] D	Trade in from Living Murray [1] E	Donated water F	Total water available in 2009–10 B+C+D+E+F	Water used in 2009–10 G	Carried over to 2010–11 B+C+D+E+F-G
River Murray Flora and Fauna	27,600	27,600	0[2]	11,200	13,450	400	52,650	36,550	16,100
River Murray *Living Murray*									
- High reliability	5,710	5,710	0	0	-2,000[3]	0	3,710	0	3,710
- Low reliability	101,850	0	0	0	0	0	0	0	0
River Murray - Environmental Water Reserve	0	0	0	0	n/a	0	0	0	0
Wimmera and Glenelg Flora and Fauna Entitlement[4]	40,560[5]	13,750	2,633[6]	0	n/a	0	16,383	9,420	6,963
Thomson River	10,000	6,927[7]	2,691[8]	0	n/a	0	9,618	3,984	5,634
Loddon River									
- High reliability	2,000	646	114[9]	0	n/a	0	760	760	0
- Low reliability	2,105	0	0	0	n/a	0	0	0	0
Yarra River	17,000	0	0	0	n/a	0	0	0	0
Tarago and Bunyip Rivers	3,000	0	0	0	n/a	0	0	0	0
Goulburn River *Living Murray*									
- High reliability	39,625	0	0	0	16,684	0	16,684	0	16,684
- Low reliability	156,980	0	0	0	11,160	0	11,160	0	11,160
Goulburn River - Environmental Water Reserve	0	0	0	0	n/a	0	0	0	0
Campaspe River *Living Murray*									
- High reliability	126	0	0	0	0	0	0	0	0
- Low reliability	5,048	0	0	0	0	0	0	0	0

Note:

(1) In 2009–10 environmental water held by the Commonwealth Environmental Water Holder (CEWH) and Living Murray allocated to Victorian sites is traded into Victorian entitlements to enable use in Victoria.

(2) Due to carryover rules in place in 2009–10, the volume carried over into 2009–10 was lost as 100% allocation was reached.

(3) This volume was traded from the River Murray Living Murray entitlement to the Victorian Murray Flora and Fauna entitlement to enable delivery to Living Murray sites in 2009–10.

(4) While the water year for Wimmera–Glenelg entitlements is from 1 November to 31 October, the figures reported in this table are for the 2009–10 financial year.

(5) This entitlement also has 34,739 ML of rules based water, see Table 4-3.

(6) This figure corrects the volume report in the 2008–09 Victorian Water Accounts.

(7) This volume consists of:

a. 2,000 ML of water allocated annually as part of the temporary qualification of rights in the Thomson system;

b. 4,187 ML of flows that have accumulated from passing-flow reductions as part of the qualification of rights; and

c. 740 ML pro-rata allocation of the 3,000 ML per year that was returned by the government from April 2010.

(8) This figure corrects the volume reported in the 2008–09 water accounts.

(9) This figure corrects the volume reported in the 2008–09 water accounts.

Under the Snowy Water Inquiry Outcomes Implementation Deed (SWIOID), releases to the Snowy each year are derived from allocations against entitlements in the preceding year. In practice, to provide adequate notice for the planning of releases, the volume for release in the coming year is derived from allocations at 15 January, and also includes any late season improvement to allocations from the previous year. Water is apportioned for release from the Snowy Scheme on the basis of one-third to the Murray River, and two-thirds to the Snowy River, subject to certain conditions, such as the payback of the Mowamba Borrowings Account.

The information on the Snowy River Entitlements in Table 4-2 has been sourced from the NSW Office of Water.

Table 4-2 Snowy River Entitlements 2009–10 (ML)

Entitlement Source	Entitlement at 31 Dec 2009 (ML)	Volume for release in 2009–10 (ML)
Victoria [(1)]	80,634	9,289
New South Wales [(2)]	136,146	53,333
Total	**216,780**	**62,621**
Apportioned to Snowy River Increased Flows		*38,000*
Apportioned to Murray River Increased Flows		*20,874*
Apportioned to Mowamba Borrowings Account		*3,747*

(1) Primarily high-reliability entitlements
(2) Primarily high-security entitlements

Table 4-3 Other entitlements for the environment in 2009–10 (ML)

Entitlement	Basin	Entitlement to Water
Silver and Wallaby Creek	Goulburn	Passing flows
Birch Creek – Bullarook System	Loddon	Passing flows
Wimmera and Glenelg Flora and Fauna Entitlement	Wimmera and Glenelg	Rules-based water, 34,739 ML

4.3 Drought conditions and environmental water

In 2009–10, Victoria endured its fourteenth year of drought. While the state has experienced droughts and wet years throughout its history, the drought that began in late 1996 is the worst on record. Following three extremely dry years, rainfall in the year from July 2009 to June 2010 brought some small relief in spring and summer to farmers, towns, waterways and wetlands.

Victoria's continuing drought demanded that water, which would under different circumstances be used for the environment, be used to ensure the continuation of supply to some urban centres which reached critically low levels of supply. Qualifications of rights, enacted by the Minister for Water, are the legal instrument through which such arrangements are made.

As part of the qualification of rights process environmental risk assessments are undertaken to identify the risks to ecological values from reduced flows. The environmental risk assessments are, where necessary, used to establish emergency monitoring and releases to mitigate impacts.

Qualifications are generally only a short term emergency management measure. Qualifications cease when there is no longer a water shortage, as declared by the Minister for Water. This can be achieved when water supplies are secured through augmentation projects or inflows are sufficient to allow storages to recover.

The EWR was reduced through nine qualifications of rights on the following rivers in 2009–10: Loddon River, Campaspe River, Moorabool River, Powlett River, Tarwin River, Thomson River, Yarra River, Broken River and Maribyrnong River.

In order to assist securing Melbourne's water supplies before the desalination plant is commissioned, the Minister for Water had qualified rights in the Yarra and Thomson Rivers in October 2007 and December 2007 respectively. On 10 March 2010, the Temporary Qualification of Rights in the Melbourne Water Supply System – Yarra March 2007 expired. However, this was immediately replaced with the Temporary Qualification of Rights in the Melbourne Water System – Yarra 2010, which meant a qualification of rights was in place on the Yarra system for all of 2009–10. The qualification of rights on the Thomson also remained in place throughout 2009–10. However, in April 2010 Melbourne moved off Stage 3a restrictions. In recognition of this the Victorian Government announced that a total of 10,000 ML of water would be returned to both the Yarra and the Thomson River. As such, 3,980 ML of water was able to be delivered down the Thomson River in May and June 2010 and 401 ML was released down the Yarra River to meet minimum environmental flows. This water was not part of allocations or use against the Thomson or Yarra entitlements in 2009–10.

Further, as part of the qualification of rights in the Thomson system, water was stored in reserve for irrigators on the Macalister River to offset the impacts of the qualification on their reliability of supply. The arrangements under this qualification meant that if this water was not required for consumptive use by May each year, it could be released to the Macalister River for environmental benefit. As such, 5,510 ML was released in the Macalister River under this arrangement in May and June 2010.

As part of the qualification of rights in the Moorabool system, which reduced passing flows, the Corangamite Catchment Management Authority negotiated with Central Highlands Water to receive an environmental emergency contingency allocation. In 2009–10 240 ML of water was released down the Moorabool to maintain water quality in remnant habitat pools. These releases, of 80 ML each, occurred in November 2009, January 2010 and March–April 2010.

As well as these qualifications, an amendment to the Wannon Water Bulk Entitlement (Hamilton) Conversion Order 1997 reduces passing-flow requirements in Grampians headwork streams to secure Hamilton's drinking supplies during severe drought scenarios until the Hamilton-Grampians pipeline is complete.

4.4 Compliance with passing-flow requirements

Each water business is required to report on whether it has complied with its obligations to pass flows at dams, weirs and other extraction points specified in bulk entitlements.

Generally a high level of compliance was reported during 2009–10 however as discussed in Section 4.3, the Minister for Water qualified rights in some systems in 2009–10 which resulted in a reduction or removal of some obligations to meet passing-flow requirements. Details are in the basin water accounts in Part 2 of this report.

Water businesses reported a number of actions were underway in 2009–10 to help improve the level of compliance reporting, including:

- installation of infrastructure and instrumentation
- improved instrumentation and monitoring specifically for passing-flow requirements
- spot water quality sampling.

4.5 Total flow at basin outlet

Table 4-4 shows the total amount of water in each basin together with the amount of water that leaves the basin after water is extracted for consumptive use. This is expressed as a proportion of the annual flow of water that would have left the basin if there were no extractions.

Given the highly variable and seasonal nature of flows in Victorian rivers and the complex demands made of them by water extractions for consumption, the total volume of water leaving a basin is not a reliable indicator of river health or other environmental benefits. While this water may have environmental benefits, it is not the entirety of water protected under the EWR. It also includes water not used under consumptive entitlements and, in some cases, water traded out of a system.

In 2009–10 the basins that experienced the lowest proportions of water leaving the basin as a percentage of total flow were the Loddon (2%), Werribee (3%), Wimmera (5%), Avoca (0%) and Moorabool (4%). These basins also had low proportions in 2008–09.

The proportion of annual flow leaving the basin was greater than 90% in 2008–09 in nine basins, which reflects an increase compared to the seven basins in 2008–09. All except the Ovens were in the south of the state.

Across the state the proportion of total flow leaving the basins has slightly reduced from the 57% in 2008–09 to 56% in 2009–10. However, the volume of water leaving the basins increased from 4,668 GL in 2008–09 to 7,495 GL in 2009–10, reflecting substantially higher basin inflows and extractions.

The total Victorian basin outflows are presented in Figure 4-1 and Table 4-3.

Figure 4-1 Basin outflows 2003–04 to 2009–10

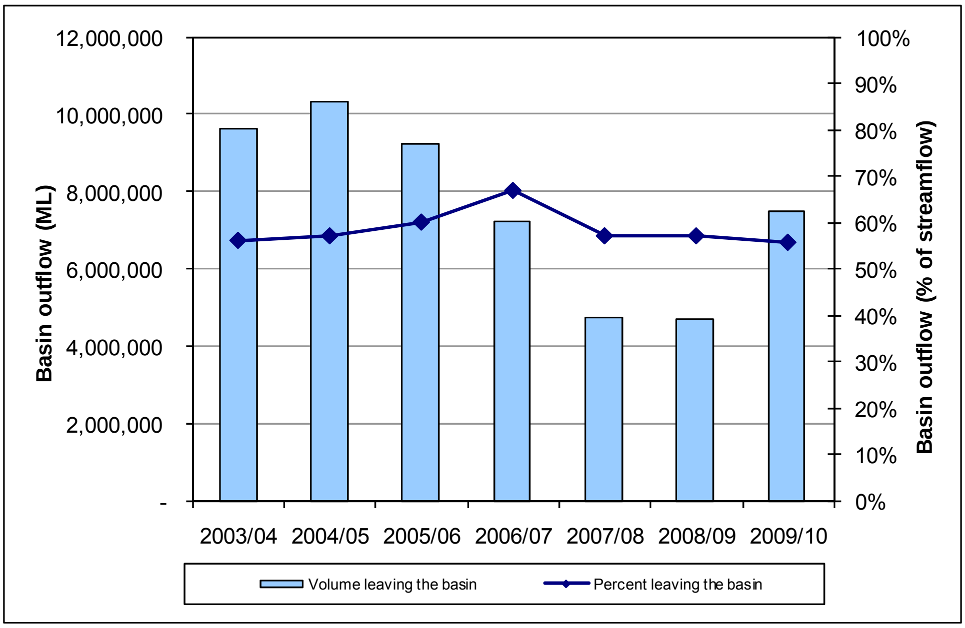


Table 4-4 Volume leaving the basin 2009–10

Basin	Outflow to	2009–10			2008–09	
		Streamflow if no extractions (ML)	Total volume leaving the basin (ML)	Proportion of total flow leaving the basin in 2009–10 (%)	Total volume leaving the basin (ML)	Proportion of total flow leaving the basin in 2008–09 (%)
Murray (1)	River Murray (South Australia)	3,199,100	802,800	25%	510,500	26%
Kiewa(2)	River Murray	525,400	485,000	92%	279,200	92%
Ovens	River Murray	936,200	873,700	93%	430,500	86%
Broken	River Murray	63,200	22,700	36%	12,900	25%
Goulburn	River Murray	1,782,700	212,100	12%	145,900	16%
Campaspe	River Murray	77,800	5,300	7%	3,500	8%
Loddon	River Murray	102,500	2,200	2%	300	1%
Avoca(3)	Lake Bael Bael and the Marshes	26,400	0	0%	0	0%
Mallee(4)	River Murray	not available	not available	not available	not available	not available
Wimmera(3)	Lakes Hindmarsh and Albacutya	76,400	4,100	5%	100	0%
East Gippsland	Bass Strait	241,800	240,300	99%	149,100	99%
Snowy (Vic. only)(5)	Bass Strait	559,000	553,300	99%	531,600	99%
Tambo	Gippsland Lakes	80,500	73,400	91%	163,400	96%
Mitchell	Gippsland Lakes	575,100	550,800	96%	340,700	93%
Thomson	Gippsland Lakes	641,800	230,700	36%	164,100	40%
Latrobe	Gippsland Lakes	520,700	369,900	71%	284,200	68%
South Gippsland	Bass Strait, Western Port	711,400	671,400	94%	409,100	90%
Bunyip	Bass Strait, Western Port, Port Phillip Bay	597,100	567,700	95%	279,600	94%
Yarra(6)	Port Phillip Bay	568,000	217,900	38%	135,400	34%
Maribyrnong	Port Phillip Bay	24,000	9,100	38%	4,000	20%
Werribee	Port Phillip Bay	22,300	600	3%	300	2%
Moorabool	Port Phillip Bay	38,900	1,700	4%	1,000	3%
Barwon	Port Phillip Bay, Bass Strait	147,800	91,300	62%	41,100	50%
Corangamite(3)	Corangamite lakes	144,100	126,600	88%	43,600	82%
Otway Coast	Bass Strait	769,700	738,900	96%	446,100	93%
Hopkins	Bass Strait	259,400	167,800	65%	121,500	73%
Portland Coast	Bass Strait	276,500	258,200	93%	121,200	85%
Glenelg	Bass Strait	330,800	217,200	66%	49,900	33%
Millicent Coast(4)	South Australia	not available	not available	not available	not available	not available
Total		**13,299,300**	**7,494,700**	**56%**	**4,668,800**	**57%**

Notes:

(1) This table includes only the Victorian component of Murray basin streamflow and Victoria's contribution to the environment's share of total flow. In this case the environment's share is taken to be Victoria's contribution to flow at the Victorian–South Australian border.

(2) Includes the NSW share of Kiewa River flows under the Murray–Darling Basin Agreement.

(3) For the purpose of this table, flow leaving the basin is taken as flow entering the terminal lakes.

(4) There are no significant streams in this basin.

(5) The total inflow is the flow entering from NSW and flows from Victorian tributaries of the Snowy River. Water extracted from the Snowy River within NSW is not included.

(6) Transfers of water into this basin are not included in the total flow.

4.6 Streamflow management plans

Streamflow management plans (SFMPs) determine how river water will be shared between consumptive uses and the environment in declared water supply protection areas in unregulated systems. Under government policy, 21 priority systems were identified for development of a SFMP. Since then, technical studies and resource appraisals have been completed, resulting in a reassessment of priorities across Victoria. These reassessments have occurred through the development of *Sustainable Water Strategies*.

In 2009–10 the Northern Region Sustainable Water Strategy was released. This stated that SFMPs would no longer be developed in the Kiewa River, King Parrot Creek, Yea River and Sevens Creek. The other priority rivers in the east and the west of the state, will be reassessed through the *Gippsland Region Sustainable Water Strategy* and the *Western Region Sustainable Water Strategy.* These strategies are due for release in 2011.

Where SFMPs will no longer be developed, local management rules will be used instead. Local management rules explain to licensees (and the broader community) the specific management arrangements for the water resource from which they extract and the rules that apply to them as users of that resource. They also explain how water will be shared in times of shortage.

In 2009–10 there were six SFMPs in effect in Victoria, all of which are located in the Yarra basin. Preparatory work continued on a number of others with the focus on rivers with high environmental values that are flow-stressed.

A precursor to the establishment of a SFMP is the declaration by the Minister for Water of a water supply protection area (WSPA) under Section 27 of the *Water Act 1989*. WSPAs protect the area's surface water resources through the development of a management plan that aims for equitable management and long term sustainability of the resource. No WSPAs were declared during 2009–10.

Work continued on developing SFMPs for Woori Yallock Creek WSPA and Little Yarra and Don Rivers WSPA as well as on the integrated groundwater and surface water management plan in the Upper Ovens WSPA.

Compliance with each approved SFMP is reported annually by the relevant water corporation to the Minister for Water and the relevant catchment management authority. Melbourne Water Corporation is responsible for the management and implementation of the six SFMPs that are in effect, and hence information regarding its compliance with the SFMPs is available from its 2009–10 annual report.

Table 4-5 lists each basin where SFMPs are under development, and reports the progress made towards the finalisation of SFMPs within them.

Table 4-5 Status of streamflow management plans

Basin	Work undertaken in 2009–10
Kiewa	Local management rules were recommended under the Northern Region Sustainable Water Strategy. Work has commenced to develop these.
Ovens River above Myrtleford	Continued development of Management Plan.
Goulburn: King Parrot Creek Yea River Sevens Creek	Local management rules were recommended under the Northern Region Sustainable Water Strategy. Work has commenced to develop these.
Thomson: Avon River	Reviewed under the draft Gippsland Region Sustainable Water Strategy
Latrobe (upper)	Reviewed under the draft Gippsland Region Sustainable Water Strategy
South Gippsland: Tarra River	Reviewed under the draft Gippsland Region Sustainable Water Strategy
Yarra: Diamond Creek, Hoddles Creek, Plenty River Pauls/Steels/Dixons Creeks, Olinda Creek and Stringybark Creek Woori Yallock Creek and Little Yarra–Dons Creeks	All approved and operational Continued development of management plan. Continued development of management plan.
Maribyrnong (upper)	Continuing work
Barwon: Main stem and tributaries to the south including Leigh River, but excluding Moorabool River	Continuing work
Otway Coast: Gellibrand River	Reviewed under the draft Western Region Sustainable Water Strategy
Hopkins: Merri River	Reviewed under the draft Western Region Sustainable Water Strategy
Upper Wimmera River	Reviewed under the draft Western Region Sustainable Water Strategy

4.7 Donations

One way in which water can be provided to the EWR is through donations of water to the environment.

Donated water may be provided to the environment through a number of means. Depending upon the nature of the transfer (including whether the transfer is permanent or temporary, and whether it is in a declared or non-declared system) this may involve the transfer of water to the Minister for Environment.

Five hundred megalitres of water were donated to the environment in 2009–10. Four hundred megalitres were used to protect drought refuges and river red gums at the Living Murray Icon Site, Hattah Lakes. One hundred megalitres were donated by community members to provide water to Little Lake Boort. This watering allowed Little Lake Boort to continue to provide important drought refuge and to act as an important community asset.

4.8 Trade in environmental water

The Minister for Environment and Climate Change may trade allocations of environmental water when they are of the opinion that this would benefit the EWR (under section 48L (2) of the *Water Act 1989*). In 2009–10 trade in environmental water occurred through the Commonwealth Government and the Living Murray program.

The Commonwealth established a Commonwealth Environmental Water Holder (CEWH) under the *Water Act 2007* (Cth) in order to recover water for the environment through water purchase and investment in infrastructure. The CEWH may eventually hold significant volumes of water in Victorian storages for environmental purposes. This water is traded into Victorian Environmental Entitlements for use in Victorian rivers and wetlands.

The CEWH delivered 11,260 megalitres to Victorian sites in 2009–10. Of this, 7,060 ML was used to help water Hattah Lakes, a Living Murray Icon Site, to provide drought refuge for plants and animals and to prevent further decline of River Red Gums. A further 50 ML was delivered to the King River to provide for refuge areas. The remaining 4,150 ML was delivered to another Living Murray Icon Site, Lindsay and Wallpolla Islands to prevent further decline of River Red Gums and to maintain drought refuges for birds, frogs, turtles and fish.

The Living Murray program, run by the Murray–Darling Basin Authority, aims to recover 500 billion litres of water to restore and protect six Icon Sites along the Murray River. In Victoria this program can provide environmental water to Barmah Forest, Gunbower Forest, Hattah Lakes and Lindsay-Wallpolla and Mulcra Islands. In 2009–10 the Living Murray program provided 10,610 ML to provide drought refuge for plants and animals and to prevent further decline in River Red gums at Gunbower Forest, Hattah Lakes and Lindsay, Wallpolla and Mulcra islands. This water came from either existing Living Murray Victorian entitlements that were traded internally, or from water traded in from interstate Living Murray entitlements.

4.9 Conclusion

This is the fourth full year of the operation of the EWR.

The ongoing drought has presented a number of challenges for the use of environmental water. As water availability was still limited in 2009–10, managing the balance between the water needs of urban and rural consumers and the environment remained a critical issue.

The environmental values of rivers, already under great stress because of continuing low inflows and over allocation have been put at greater risk by the qualifications of rights. This has lead to increased monitoring of environmental condition and a careful evaluation of priorities for use of the environment's water. Opportunities have been found to optimise the effectiveness of the reduced volumes available to the environment.

Three new environmental entitlements were established and amendments were made to a number of other environmental entitlements in 2009–10.

Basin outflows in 2009–10 were lower as a percentage of total inflows however the total volume of water leaving was greater than in 2008–09. The outflows increased from 4,669 GL in 2008–09 to 7,495 GL in 2009–10. This reflects the highest volume of outflows since 2005–06.

Ongoing development of SFMPs continued in 2009–10 and six SFMPs were in operation during this period.

Part 2:
Basin water accounts 2009–10

Part 2 presents an account of water in each of Victoria's 29 river basins during 2009–10.

Chapter 5 provides an outline of how the accounts are compiled and identifies the key assumptions and limitations of the data.

Chapters 6 to 34 report on each basin, providing:

- a basin summary, which reflects data contained within the Victorian Water Accounts as well as contextual information about what occurred in the basin in the reporting period
- the current management arrangements for water resources within the basin
- information on rainfall, inflows and storages in the basin in 2009–10
- a map of the basin
- the total water resources in each basin
- surface water, groundwater, recycled water and water for the environment in the basin
- drought contingency measures and seasonal allocations and restrictions on water use, diversions and extractions.

Alphabetical listing of Victoria's river basins

5 Overview of methodology

5.1 Introduction

This chapter outlines how the Victorian Water Accounts are constructed. It presents a number of important assumptions and limitations of the data in the accounts that should be read in conjunction with the information in each basin chapter.

The reporting unit of the accounts is the river basin – surface-water data is reported according to river basin boundaries as designated by the Australian Water Resource Council. This unit is consistent with Victoria's surface-water allocation framework which is predicated on achieving a sustainable balance between water that can be taken from the river for consumption, and the water needs of the river itself to maintain its health at a level acceptable to the community.

Some data is not aligned with river basin boundaries and this data has been treated in various ways. For example, groundwater management units (GMUs) often do not fit neatly within river basins and require a different system of reporting. Groundwater is reported within each river basin according to its surface area within the basin to give an indication of the total resource and use.

The accounts present information on the location of diversions and extractions rather than use. Diversions may include (where relevant) urban diversions, irrigation district diversions, regulated river licensed diversions, unregulated river licensed diversions, environmental water diversions and small catchment dams. Because diversions are recorded at the point of offtake, not the point of end use, they include the volume of transmission losses that may occur prior to water being delivered to customers. Diversions are usually for consumptive uses, although some diversions are for other purposes, including environmental purposes.

All information for each of the 29 basins is provided for the period 1 July 2009 to 30 June 2010. The responsibilities for water management are reported in the Victorian Water Accounts as they existed during the 2009–10 period. Any changes to responsibilities since the end of June 2010 will be reflected in subsequent water accounts.

The accounts are generally reported in megalitres (ML): one megalitre equals one million litres. Volumes of surface water and groundwater entitlements, entitlement transfers and use from surface water entitlements have been reported to the nearest megalitre as required to assess compliance. All other values in the report, such as catchment inflows, the surface-water balance and small-catchment-dam usage have been rounded to the nearest 100 ML to reflect the uncertainty in these values. Gigalitres (GL: one thousand megalitres) are only used where volumes are sufficient to express them in this way.

The *Victorian Water Accounts 2009–10* does not provide information on water quality or environmental health of waterways unless it affects water availability and use. Details of river health programs are available from the relevant catchment management authorities. An assessment of the environmental health of rivers and streams in each of Victoria's river basins is available in the *Index of stream condition: the second benchmark of Victorian river condition* (Department of Sustainability and Environment 2005, www.vicwaterdata.net). The benchmark is undertaken every five years and will be available in 2010.

5.2 Data sources

The Victorian Water Accounts are compiled from information obtained from:

- responses to specific data requests from water businesses, catchment management authorities, the Department of Sustainability and Environment, major users of water and the Murray-Darling Basin Authority (MDBA)
- water consumption and recycled water data collected from water businesses by the Essential Services Commission (ESC)
- hydrologic information from selected streamflow monitoring sites
- hydrogeologic information from selected groundwater monitoring sites
- climate information from selected rainfall and evaporation monitoring sites, provided by the Australian Bureau of Meteorology and Victorian water businesses
- estimated relationships between water use and climate or hydrologic data, which is produced by water supply system modelling
- water businesses' annual reports and related documents.

5.3 Comparison with 2008–09

This is the seventh year that the water accounts have been compiled. Water balance information for each basin in 2009–10 is presented alongside the values reported in 2008–09 for comparative purposes.

Differences between 2009–10 and previous years are, in most cases, the result of changes in climatic conditions or water use. However, as noted below, some differences are due to improvements in estimation methodologies or data collection methods. In some cases, minor errors, omissions or updates relating to the published 2008–09 data were identified in preparing the 2009–10 data. In these cases, revised 2008–09 figures have been presented with accompanying notes explaining why those figures are different to what was reported last year.

In many cases, these revisions flow through to the water balance of the relevant basin. Where a revision to a 2008–09 number has already been explained in the table that provides input into the water balance (for example a bulk entitlement table), a note has not also been included with the water balance table. Due to the catchment inflows in most cases being back-calculated based on the other terms in the water balance, any change to one of those terms will also impact the catchment inflow.

5.4 Methodology, key assumptions and limitations of data

A number of key assumptions and limitations of the data presented should be borne in mind when interpreting the accounts. Qualifications and interpretation of the data are provided, usually in the notes below each table. Notes are provided:

- where qualification of the data, or further information is warranted
- where the previous method to calculate or derive information has been revised
- to explain large or significant differences between 2009–10 values and those of the previous years
- where data is only applicable to some basins (such as streamflow management plans), in which case the affected basins contain references to the relevant items.

5.4.1 Surface water resources

Surface water is always reported in the basin from which it is extracted. However, the report usually (but not in every case) indicates if water is transferred to another basin (or basins) where it is temporarily stored or used. For example, Coliban Water has a bulk entitlement to divert water from Lake Eppalock, which is located in the Campaspe basin, and then transfer the water to Bendigo, which is located in the Loddon basin. For the purposes of the water accounts, the accounting for that water is undertaken at the point of diversion (that is the Campaspe basin) and not the point of use (the Loddon basin).

This similarly applies to Victoria's major cross-basin irrigation supply systems. Information on water supplied to the Rochester Irrigation Area, located at the downstream end of the Campaspe basin, is presented in the Goulburn basin, where its primary source of supply is located.

The metering of surface water resources is close to 100%.

5.4.2 Groundwater resources

As noted earlier in this document, the management of groundwater in Victoria is based on allocating resources within:

- groundwater management areas (GMAs)
- water supply protection areas (WSPAs)
- unincorporated areas (UAs).

Groundwater is managed not only across areas, but also at different aquifer depths. In Gippsland, for instance, groundwater is drawn from different aquifers that lie at different depths. Aquifers are nominally attributed to a different groundwater management unit (GMU) and each GMU is reported individually in the water accounts.

The concentration of bores and groundwater use varies considerably across GMUs, which often fall across more than one river basin. It is not possible to accurately apportion groundwater entitlements and use to specific river basins.

In the State Water Reports for 2003/04, 2004/05 and 2005/06, where a GMU had more than 5% of its surface area located within a given basin, it was included in the 'Compliance with licensed groundwater volumes' table and the total volume of entitlement and use was reported. For example, the Goroke GMA is located in the Millicent Coast and Wimmera basins. In the 2005/06 report, the Goroke GMA's total entitlement limit of 2,200 ML was reported in each of the two basins. Whilst this approach ensured some reporting of groundwater within basins, it also resulted in groundwater entitlements and use sometimes being reported more than once.

The accounting for groundwater was revised in 2006–07, with the same method used for the Victorian Water Accounts prepared since then. The proportion of a GMU's surface area within a given basin has been used as a proxy for the proportion of the GMU's total entitlement and use that is located within the basin. For example, Cardigan GMA spans the Corangamite basin (where 19.5% of its surface area is located), the Barwon basin (19.8%) and the Hopkins basin (60.7%). Therefore, in the Corangamite basin, all volumes for the Cardigan GMA are accounted for by multiplying the total volume (for example entitlement volume, usage et cetera) by 19%. Two exceptions are the Portland GMA and Gerangamete GMA. The Portland GMA is known to have 6,222 ML of urban licensed volume which is used to supply Portland. Therefore 100% of the Portland GMA urban licensed entitlement and metered use is allocated to the Portland Coast basin and not shared on a proportional basis with the Glenelg basin, in which the Portland GMA has 27% of its surface area. Only non-urban licensed volume and the unmetered use from these licences are allocated according to the surface area percentages. The Gerangamete GMA is known to have all its groundwater resources used for Geelong's urban supply in the Barwon basin, therefore 100% of the entitlement limit, licensed entitlement and metered use for Gerangamete GMA is allocated to the Barwon basin. It is not shared on a proportional basis with the Corangamite basin, in which Gerangamete GMA has 14% of its surface area.

It should be noted that when displayed in the report, percentages are rounded to the nearest percent, however the underlying calculation multiplies by the actual percent. In the above example, the Cardigan GMA in the Corangamite basin would show that it has 19% of its surface area within the basin, however all volumes are multiplied by 19.5%.

This method does not perfectly reflect where the entitlement and use is actually located. In the example above, it is likely that groundwater bores are not evenly distributed across the Cardigan GMA and therefore more or less than 19.5% of bores will be located within the Corangamite basin. Further, some bores are licensed to extract more water than others, which will also result in inaccuracies in the volumes reported. However, the revised methodology is likely to result in a more meaningful representation of groundwater entitlements and use in each of the basins.

As in prior years, a GMU will not be reported at all in a basin if it does not have at least 5% of its surface area within the basin. For example, in the Broken basin chapter, Table 9-8 includes the Katunga WSPA, because this groundwater management unit has more than 5% of its area within the Broken basin. The Shepparton WSPA, with 1.1% of its area within the Goulburn basin, has not been included in Table 9-8, because it is lower than the 5% threshold. In this instance, the 1.1% that is located within the Broken basin is added to the basin that holds the largest proportion of the WSPA's surface area, in this case, the Goulburn basin.

The Minister for Water declares by order published in the government gazette the total volume of groundwater that may be taken from a GMU, which is the permissible consumptive volume (PCV). The entitlement limit included in the groundwater compliance table is set at the PCV of the management unit or, where there is no gazetted PCV, it equates to the sum of all licensed entitlements for the area. This volume is also used as a proxy for the total groundwater resource in the second table presented in each basin. The total groundwater use in these tables includes both licensed usage and usage from domestic and stock bores.

As groundwater resources in UAs are largely undeveloped, resource information is not currently readily available in these areas and is not reported in each basin. A limitation of this approach is where urban groundwater use is sourced from a UA. For instance, in the Avoca basin, Avoca and Redbank are both supplied by groundwater from an UA, although there is no groundwater compliance table within the Avoca basin because there are no WSPAs or GMAs. In this instance, it was also necessary to amend Table 13-2 to show that there is groundwater available and used in the basin, although there is no groundwater compliance table.

Monitoring and measurement of groundwater resources is constantly improving. These improved measurements (for example better metering) have sometimes resulted in variances between the numbers of bores and entitlement/usage volumes in previous reports.

The numbers of domestic and stock bores recorded for each GMU include all bores registered in the Groundwater Management System that are less than 30 years old as this is the expected average life of a bore. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The methodology was slightly revised for the 2009–10 estimates to better account for domestic and stock bores in unincorporated areas. Bores that were located spatially within a GMU but did not have a constructed depth within the GMU's depth range were allocated to an unincorporated area. The numbers reported are based on the surface area percentage within the basin. As indicated above, those GMAs/WSPAs with less than 5% surface area within the basin are not reported within that specific basin.

Metering programs are now complete, with all new licences since 2004 metered and all historical licences greater than 20 ML now metered, enabling more accurate reporting.

Rounding applied to groundwater resource and total use (presented in the second table in each basin chapter) are to the nearest 10 ML for volumes less than 1,000 ML and nearest 100 ML for volumes greater than 1,000 ML.

5.4.3 Recycled water

Recycled water from towns with wastewater treatment plants has been assigned to river basins according to the point of discharge to the receiving waters. If all water from a treatment plant is reused and none is discharged to rivers or lakes, the volume is reported within the river basin where the plant is located.

Recycled water data was collected from each water business by the ESC, separated into categories including:

- volume of wastewater produced, excluding evaporation
- volume recycled for urban and industrial uses
- volume recycled for agricultural uses
- volume recycled for beneficial allocations (for example environmental flows)
- volume recycled within process
- volume discharged to the environment (ocean outfalls or inland water discharges).

The reuse information collected by the ESC is prepared by each of the relevant water businesses in accordance with the ESC's Performance Reporting Framework (which includes an audit component). Although the ESC has high level definitions of the end use categories that water businesses must report on, in some cases it is possible that certain recycling activities may be classified by different businesses under different end-use categories.

In the three editions of the *State water report*, the volume of water recycled 'within process' was included in the total volume recycled and the percentage recycled. In the 2006–07, 2007–08, 2008–09 and 2009–10 Victorian Water Accounts, the volume recycled within process has still been included in the volume recycled, but has been excluded from the percentage recycled. This methodology has been applied to be consistent with the percentages reported in the ESC's annual performance report.

5.5 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions on water use due to water scarcity or poor water quality are reported in the basin accounts according to the basin in which the restriction occurs.

For urban water corporations and metropolitan retailers, restrictions target outdoor water use. Each of these urban water businesses has developed restriction policies which are applied in accordance with the drought response plans developed for each supply system. When water restrictions are not in force, all water consumers must still abide by permanent water saving measures which are not reported in the tables for each basin. Information on restrictions is generally obtained from annual reports prepared by the relevant water corporations, supported by information collected during the data collection process.

The amount of water made available to irrigators each year is determined by seasonal water allocations. The seasonal allocation differs from urban restrictions in that every year each irrigator is allocated a share of the available resource which will vary from year to year. This seasonal allocation can be used at any time throughout the irrigation season. Water use can be further restricted via the qualification of rights. While seasonal allocations largely apply to surface water, they are being progressively introduced into groundwater management planning.

Seasonal allocations are expressed as a percentage of entitlement (water share, water right or licensed volume). They are made early in the irrigation season based on the current volume of water in storage, estimated inflows during the season and the amount of water required to provide for subsequent years. Allocations are reviewed by rural water businesses throughout the irrigation season and increased if the available water exceeds their forecasts. The initial seasonal allocations are often low because water authorities do not know until late spring how much water will be available for use. Seasonal allocations are reported for each basin with an irrigation supply system.

Restrictions on licensed diversions from unregulated streams are typically as follows:

- rostering (also referred to as Stage 1 restrictions): restricts the time or day on which water can be diverted from rivers
- Stage 2, 3 and 4 restrictions: 25%, 50% and 75% reduction in diversion rate respectively
- Irrigation ban: no water can be diverted.

5.6 Surface-water balance

A number of assumptions were made in preparing the surface-water balance for each river basin:

- Only on-stream storages greater than 1,000 ML were included in the water balance. Off-stream storages are not reported because this would otherwise double count the water that has already been diverted from rivers or extracted from groundwater. While storages that are less than 1,000 ML are important locally, they are generally insignificant relative to total storage at a river basin and statewide level. Figure x-1 in each basin includes all major storages over 1,000 ML in the basin – both on-stream and off-stream.
- The unknown item in each water balance is generally the catchment inflows. Inflows have been back-calculated as the sum of basin outflows plus diversions.
- The method of calculating in-stream 'losses', that is infiltration from streams to groundwater, flows to floodplains and evaporation, is based on the loss functions used in models such as REALM.
- Unless otherwise reported by water businesses, domestic and stock water users were assumed to divert their full entitlement volume.
- The water accounts exclude diversions from rivers under domestic and stock rights which do not require a licence. The volume associated with these rights is relatively small.

Data available for the 2009–10 accounts is presented with rainfall and evaporation reported as separate items for most major storages. In previous accounts, the net evaporation from major storages was reported which accounted for the difference between rainfall and evaporation.

Inflows to the Kiewa basin, which are shared between New South Wales and Victoria, were reported as a consolidated volume and the outflows were split between New South Wales and Victorian shares.

In the Murray basin, inflows to Lake Victoria were not recorded as inflows to the Murray basin since those flows are actually transfers from elsewhere within the basin. Over the past few years, the volume held in the Menindee Lakes has been lower than the defined threshold under which control reverts to New South Wales. During this time Victoria had no share of to the volume in the Menindee Lakes and therefore they were not included in the Murray basin inflows. The volume held in the Menindee Lakes increased above the threshold during 2009–10, and Victoria regained access to a 50 per cent share of the storage. Victoria's share of the inflows into the Menindee Lakes is included in the Murray basin inflows in this account. A release to the Murray via the Snowy hydroelectric scheme was included as an inflow or transfer to the basin because it is consistent with the water balance protocols established in the methodology.

5.7 Small catchment dams

Small catchment dams include dams used for domestic and stock purposes, which are not required to be licensed. They also include dams used for commercial and irrigation purposes, which are now required to be registered (under the *Water Act 1989*) but for which registration has not yet been completed. When registration is complete, registered dams will be included as part of the unregulated licences category in future water accounts. Small catchment dams filled by domestic and stock channel runs, such as in the Wimmera region, have been excluded.

As undertaken previously, small catchment dam information was sourced from the Department of Sustainability and Environment's Flow Stress Ranking project. During 2006–07 flows were well below average across the state and were the lowest on record in many areas. Because small catchment dams are only able to harvest flows from their upstream catchments, the dams must harvest less water when low flow conditions are prevalent. As a result, usage and the impact on inflows were adjusted to reflect the low inflows. This approach was also used for the 2008–09 account. While flows were still below average in a number of basins during 2009–10, flows were generally higher than in 2006–07 and 2008–09. As a result, the usage and impact of small catchment dams on inflows were assumed to be similar to that estimated for an 'average' year, as per the 2007–08 Victorian Water Accounts.

Small catchment dam information is presented in terms of average annual data. While the number of dams, their sizes and their uses are generally known, the volume of water that they actually use over the year is not readily available. It is therefore assumed to be similar to the estimated average annual usage.

5.8 Water entitlement transfers

The Victorian Water Register is a register of water entitlements and transactions. It was launched on 1 July 2007 and initially included entitlements in the regulated northern Victorian water systems. On July 1 2008, the Water Register was extended to include entitlements in the regulated systems of Thomson/Macalister and Werribee in southern Victoria. This register was used to obtain information on water trade in Victoria during 2009–10. The data presented is for all transfers of allocation and water shares which were finalised in 2009–10.

The 'Transfers and variations of water shares in the (catchment) basin' table represents a summary of the movement of water shares into and out of the basin delivery systems during 2009–10 for systems that have been unbundled. The 'Transfer of surface water bundled entitlements in the (catchment) basin' summarises the movement of bundled entitlements in the basin during 2009–10. These tables are applicable to basins with bundled entitlements (that is entitlements where the right to take and use water are not separated). Interstate trade occurs from a number of basins, including the Murray, Broken, Goulburn and Campaspe basins.

The 'Allocation trade in the (catchment) basin' represents an aggregate of the volume of allocation trade (seasonal allocation made against water shares).

These tables provide a quantification of Victorian transfers in the basins.

5.9 Volume diverted

Water businesses have an obligation to report on water use against their entitlements in their annual reports. These annual reports can be found on each water business's web-site. The Victorian Water Accounts present:

- the volume of surface water diverted from rivers relative to the volume in each bulk entitlement order. Licensed diversions on regulated streams are reported as part of bulk entitlements. Licensed diversions on unregulated streams are reported as a separate line item in each basin. Volumes diverted under bulk entitlements are provided by the water businesses and have not been audited to ensure compliance was actually achieved.
- the volume of groundwater extracted relative to licensed volume for a GMA or WSPA. This is reported according to the proportion of the aquifer that lies within a basin and not at the individual licence holder level, which is assessed separately by water businesses.

Where a bulk entitlement was not finalised prior to 1 July 2010, compliance against that entitlement has not been assessed in the 2009–10 water accounts and will be presented in future water accounts.

5.10 Drought contingency measures

The drought contingency measures included in the basin chapters were obtained from the questionnaires distributed to water businesses and the Department of Sustainability and Environment's Office of Water. The drought contingency measures reported are intended to highlight the most important short to medium term measures taken and do not represent an exhaustive list.

5.11 Water for the environment

Information set out in this report on water for the environment was obtained from a number of sources. These include:

- annual reports prepared by catchment management authorities and Melbourne Water
- discussion with representatives of catchment management authorities
- responses to questionnaires sent to water businesses with responsibilities for meeting passing-flow requirements under their bulk entitlements and section 51 licences
- streamflow management plan annual reports prepared by Melbourne Water

- information held by the Department of Sustainability and Environment's Sustainable Water Environment and Innovation division.

5.12 Comparison of the water accounts with other data sources

The 2009–10 water accounts have been prepared using readily available information. Water accounts for parts of Victoria are also published in the Murray-Darling Basin Authority Independent Audit Group's report on extraction cap compliance and other reports. Some of these documents may not have been finalised at the time of preparation of the water accounts and consequently the values presented in the water accounts may be subject to revision within those documents. The method of reporting may also be different: small catchment dams, for example, are reported in the water accounts but not included in diversion figures for extraction cap reporting.

Water businesses present information individually in each of their annual reports. It is important to note when comparing the water accounts with these annual reports that the water business only reports on its area of jurisdiction. For example, Goulburn-Murray Water and Lower Murray Water only report on water trading that they have each processed, and it is only by presenting the sum of trade processed by these two businesses that an accurate picture of volumes traded can be obtained for the Murray basin.

While all efforts have been taken to ensure the accuracy and completeness of data presented, the Department of Sustainability and Environment is not responsible for the results of any actions taken on the basis of information in this report, nor for any errors or omissions.

6 Murray basin (Victoria)

This chapter sets out the accounts for the Murray basin. For detailed information about how they have been compiled, refer to Chapter 5.

6.1 Murray basin summary

Inflows to the Murray basin in 2009–10 were low at 42% of the long-term average, but were 62% higher than those experienced in 2008–09.

The year began with record low reserves in the Murray system, requiring water resource managers to focus on securing essential domestic and stock supplies. By the end of the year, storages had recovered to 40% of full capacity.

Allocations in the regulated Murray system began the year at 0% for the third year in a row. The allocation for high-reliability water shares increased to 63% by the end of January 2010, and a late season improvement in Victoria's share of the Murray storages saw the allocation reach 100% on 1 April 2010.

This was the final allocation for 2009–10 as Goulburn-Murray Water shortened the irrigation season, directing all water resource improvements after this date to building up supplies for the 2010–11 season.

Since both urban and individual entitlements are linked to seasonal allocations on the regulated Murray system, it was necessary to qualify rights to ensure essential supplies could be maintained while allocations were low and before an active water market was functioning. Under the qualifications, all towns and private domestic and stock users were given access to water for essential needs. Urban water corporations were able to ease restrictions for most towns over the year as allocations improved.

The water market was again very active in 2009–10 in response to the water shortage. As in 2008–09 there was a net export of water shares from the basin, but this year there was also a net export of 35,732 ML of allocation. This compared to a net import of 169,554 ML of allocation last year.

For the third consecutive year, rural diverters on unregulated streams were placed on severe restrictions or banned for much of the year.

Groundwater users in the Katunga WSPA were restricted in 2009–10, however total groundwater use in the basin reduced compared to 2008–09 predominantly due to a reduction in extractions from the Shepparton WSPA.

6.2 Responsibilities for management of water resources

The Murray Darling Basin Authority (MDBA) is responsible for managing the water resources of the Murray Darling basin on behalf of Victoria, New South Wales, Queensland, the Australian Capital Territory and South Australia under the Murray-Darling Basin Agreement. Under the agreement, Victoria shares the volume of water stored in the basin's storages with New South Wales and holds a share of the total reservoir capacity to store and release its share of inflows. The Murray-Darling Basin Agreement also specifies the minimum volume that both states must pass along the River Murray to South Australia.

Goulburn-Murray Water is responsible for allocating water to bulk entitlement holders from Victoria's share of the water supply storages in the Murray basin.

Table 6-1 shows the responsibilities of various authorities within the Victorian-controlled parts of the Murray basin in 2009–10. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 6-1 Responsibilities for water resources management within the Murray basin (Victoria), 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Murray–Darling Basin Authority				Jointly coordinates waterway management along the River Murray and operates the River Murray supply system
River Murray Water				
Department of Sustainability and Environment				Coordinates Victoria's input to resource management associated with the River Murray
State Water New South Wales				Operates Lake Hume, Euston Weir and the Menindee Lakes on behalf of Murray Darling Basin Authority
South Australian Water Corporation				Operates Lake Victoria and several locks on behalf of Murray Darling Basin Authority
Goulburn–Murray Water	Supplies Murray Valley, Torrumbarry, Woorinen, Tresco and Nyah irrigation areas	Manages private groundwater and surface water diversions on the Victorian side of the River Murray basin upstream of Nyah		Operates Lake Dartmouth, Yarrawonga Weir (Lake Mulwala), Torrumbarry Weir and Mildura Weir on behalf of Murray–Darling Basin Authority
Lower Murray Water	Supplies Red Cliffs, Robinvale, Merbein and First Mildura Irrigation Trust irrigation areas	Manages private groundwater and surface water diversions in Sunraysia region	Supplies towns along the River Murray from Swan Hill to the South Australian border including Robinvale and Mildura	
North East Water			Supplies towns upstream of Lake Mulwala, including Wodonga and Yarrawonga	Obliged to meet passing-flow requirements
Goulburn Valley Water			Supplies towns in the Murray Valley Irrigation Area including Cobram	
Coliban Water			Supplies towns in the Torrumbarry Irrigation Area	
East Gippsland Water			Supplies Omeo and Dinner Plain	
GWMWater			Supplies towns and farms for domestic and stock water in the Northern Mallee area	
North East Catchment Management Authority				Manages waterways within the North East CMA area
Mallee Catchment Management Authority				Manages waterways within the Mallee CMA area

6.3 Rainfall, flows and storage in 2009–10

In 2009–10, rainfall in the Murray basin was generally between 80% and 150% of the long-term average. Victoria's share of catchment inflows was again low at 42% of the long-term average (of 7,618,000 ML). While still low, this was the first time in the past four years where Victoria's Murray inflows were above 30% of the long-term average.

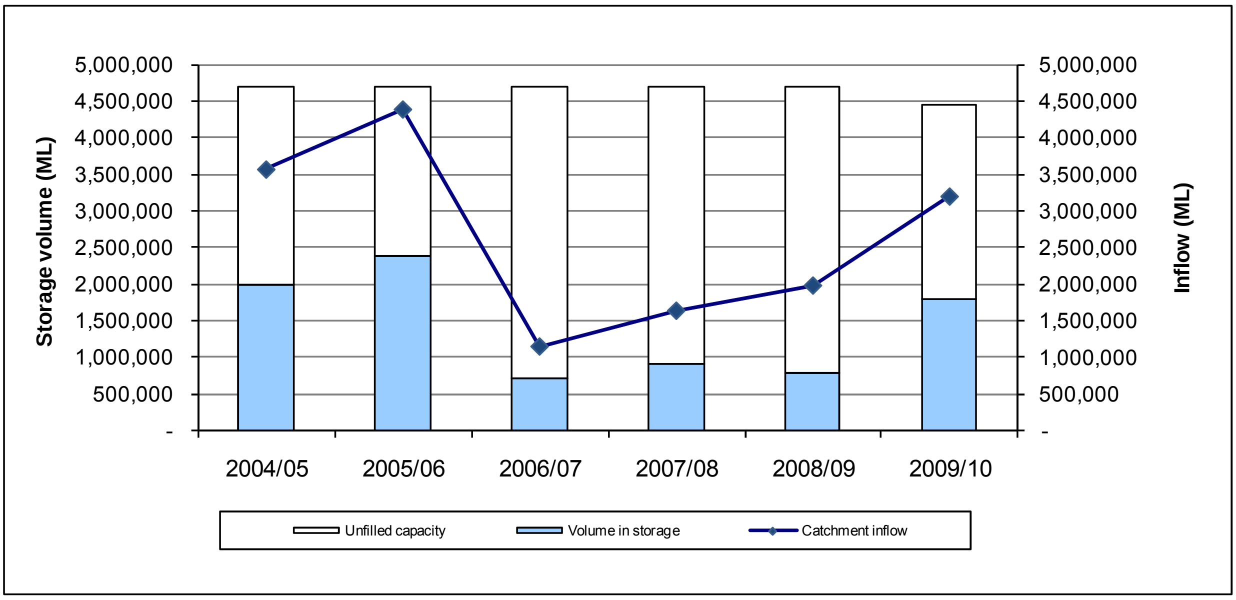
The Victorian component of water flowing from the Murray basin to South Australia was 802,800 ML in 2009–10. This represented 25% of the total inflows into the basin, compared with 26% in 2008–09.

Storage volumes for all major storages (greater than 1,000 ML capacity) in the Murray basin increased from 773,700 ML at the start of the year to 1,789,200 ML, or 40% of the total storage capacity of 4,684,100 ML. In the

Murray basin this includes Victoria’s share of Lake Hume, Lake Dartmouth, Kings Billabong, Lake Cullulleraine, Lake Victoria and the Menindee Lakes.

Only volumes for major onstream storages have been included in the water balance, and as such, Kings Billabong has not been included.

Figure 6-1 All major storages and catchment inflows in the Murray basin (Victoria)



6.4 Total water resources in the basin

Victoria’s share of the total volumes of water available and supplied from water resources in the Murray basin is shown in Table 6-2. The total surface water resource includes Victoria’s share of inflows to Lake Dartmouth, Lake Hume, Lake Victoria and the Menindee Lakes, Victoria's share of inflows from the Kiewa River, as well as outflows from other Victorian rivers (Ovens, Goulburn, Campaspe, and Loddon) and Broken Creek into the River Murray.

Table 6-2 Summary of total water resources and water use in the Murray basin (Victoria), 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	3,331,600	985,700
Groundwater(2)	123,400	43,100
Recycled water	7,720	4,120

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 6-9 and the estimated domestic and stock use as presented in Table 6-10.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

6.4.1 Infrastructure projects to improve water availability

Ongoing major infrastructure projects in the Murray basin include the Northern Victorian Irrigation Renewal Project, which commenced in 2007 and is expected to be complete in 2014. The project involves replacing existing irrigation infrastructure to improve operation efficiency, including works to reduce channel outfalls, leakage and seepage, and rationalising the distribution system.

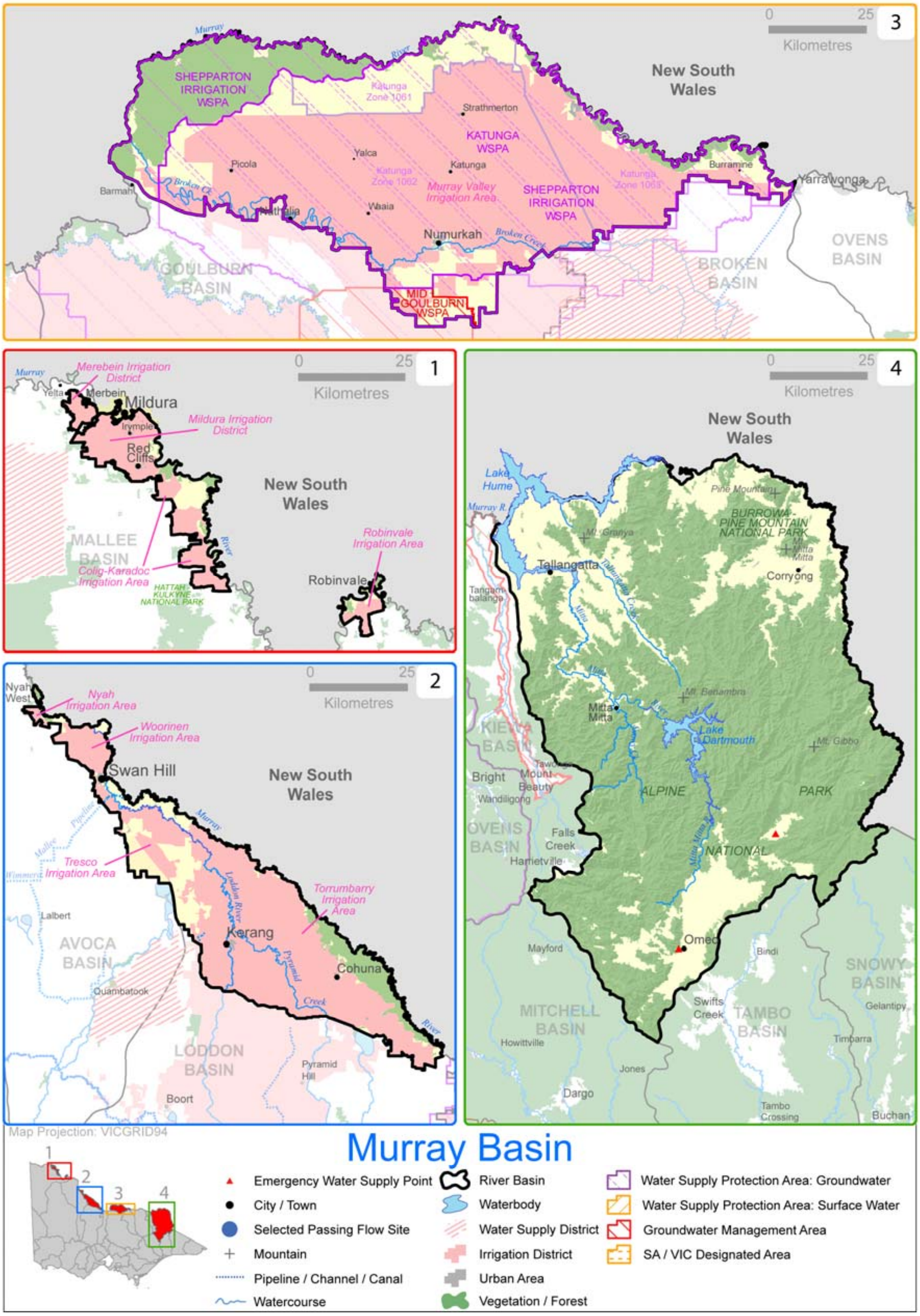
Lower Murray Water continued works on the Robinvale High pressure Irrigation Project, which involves replacing the current open channel irrigation infrastructure in the Robinvale Irrigation System with a high pressure pipeline. The project will provide an estimated 1,500 ML of water savings per annum and will be complete in November 2010.

North East Water improved the security of water supplies for Eskdale residents through the upgrade of the local supply system in 2009. The project included the construction of a pump station on the Mitta Mitta River, and a new water treatment plant, storage tank and pipe network throughout the town. North East Water assumed responsibility for supplies to Eskdale from a private community trust that ceased operation in November 2009.

As part of the Lake Mokoan decommissioning project, a mid-Murray storage system was reintroduced and became operational in March 2010 to benefit all River Murray entitlement holders. The mid-Murray storages will be operated to maximise the use of the existing storage capacity of Kow Swamp, Lake Boga, Lake Charm, and Kangaroo Lake.

6.5 Location of water resources

Figure 6-2 Map of the Murray basin (Victoria)



6.6 Surface water resources

6.6.1 Water balance

A surface-water balance for the Murray basin (Victoria) is shown in Table 6-3.

Table 6-3 Balance of surface water in the Murray basin (Victoria)

Water account component	2009–10 (ML)[1]	2008–09 (ML)[1]
Major onstream storage		
Volume in storage at start of year	772,000	892,600
Volume in storage at end of year	1,787,500	772,000
Change in storage	**1,015,500**	**(120,600)**
Inflows		
Catchment inflow[2]	3,199,100	1,977,900
Rainfall on major storages	29,500	n/a [6]
Spills from NSW share of storage	80,000	0
Return flow from irrigation	20,100	10,000
Treated wastewater discharged back to river	2,870	2,810
Sub-total	**3,331,600**	**1,990,700**
Usage		
Urban diversions	32,950	30,980
Irrigation district diversions	655,400	592,400
Licensed diversions from regulated streams	252,200	269,300
Licensed diversions from unregulated streams	2,100	4,200
Environmental water diversions	36,500	10,300
Small catchment dams	6,500	6,500
Sub-total	**985,700**	**913,700**
Losses		
Evaporation losses from major storages	243,300 [7] [8]	150,900 [6]
Evaporation from small catchment dams [3]	1,100	1,100
In-stream infiltration to groundwater, flows to floodplain and evaporation[4][5]	219,100	431,900
Sub-total	**463,500**	**583,900**
Water passed at outlet of basin		
River Murray flow to South Australia from Victoria's allocation	802,800	510,500
Spills to NSW share of storages	0	0
Ceding to NSW storages per Murray-Darling Basin Agreement	64,100	103,200

Notes:

(1) The volumes in this table may not be consistent with the MDBA's final accounts, as different methods of reporting have been used.

(2) Inflows calculated based on estimates of inflows to major storages, plus inflows from tributaries.

(3) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from total water harvested.

(4) Value estimated via back-calculation based on the difference between Victoria's share of inflows and outflows. Includes environmental diversions under surplus flow conditions.

(5) The 'instream losses' component is a balancing item which is affected by errors in all other components, however the numbers are based on the best possible information at the time of finalising the *Victorian Water Accounts 2009–2010*.

(6) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall

(7) This volume includes an estimate of evaporation from Lake Mulwala and Torrumbarry Weir based on long-term historical conditions rather than specifically for the 2009–10 reporting period.

(8) Separate estimates of rainfall and evaporation were not available for Lake Hume and Lake Dartmouth. In these locations, net evaporation was provided by the relevant authority and has been incorporated into the water balance evaporation term directly.

n/a: Not applicable.

6.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 6-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 6-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	7,200	3,600	n/a
Registered commercial and irrigation	3,400	2,900	n/a
Total	**10,600**	**6,500**	**7,600**

n/a: Information not available.

6.6.3 Water entitlement transfers

Surface water was moved into, out of and within the Murray basin during 2009–10 through water share transfers and variations, allocation trade and temporary transfer of bundled entitlement. Water share and allocation transactions make up the bulk of this movement, with only 87 ML of Murray basin bundled entitlement being transferred on a temporary basis during the year.

Table 6-5 summarises the movement of water shares into and out of the Murray basin delivery systems during 2009–10. The water share market in the Murray was one of the most active Victorian basins, due in part to the large volume of water shares located in the basin.

Table 6-5 Transfers and variations of water shares in the Murray (Vic) basin 2009–10 (1), (2)

Delivery System	High-reliability water shares			Low- and spill-reliability water shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
First Mildura irrigation district	0	0	0	0	0	0
Murray River	413,790	535,146	-121,356	6,800	10,682	-3,882
Murray Valley Irrigation Area	28,467	48,155	-19,688	15,358	21,261	-5,902
Nyah, Tresco and Woorinen	2,052	3,176	-1,124	635	929	-294
Robinvale, Red Cliffs and Merbein	0	0	0	0	0	0
Torrumbarry Irrigation Area	36,000	59,149	-23,149	17,916	23,083	-5,167
1062 Katunga Groundwater (3)	0	68	-68	0	0	0
Total 2009–10	**480,308**	**645,692**	**-165,384**	**40,709**	**55,954**	**-15,246**
Total 2008–09	135,853	160,272	-24,419	35,937	49,159	-13,222

Notes:

(1) This table summarises all recorded water share transfers and variations in the Murray basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–2011.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water or land sale are also included in this table.

(3) Whilst no water shares exist in the Katunga Groundwater Area, during 2008–09 two water shares were processed in the Victorian Water Register displaying the delivery system incorrectly. Measures were undertaken during 2009–10 to correct the fields on these water shares.

Table 6-6 summarises the trade of allocation in Victoria's share of the Murray basin during 2009–10. A total of 341,691 ML of allocation was traded into the Murray basin, including 217,029 ML traded within the basin. There was 160,394 ML of trade out of the basin, resulting in a net export from the basin of 35,732 ML.

Table 6-6 Allocation trade in the Murray (Vic) basin[1,2]

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Murray (Vic) basin	217,029	128,046
Trade from other Victorian basins	39,391	40,069
Trade to other Victorian basins	80,059	25,277
Interstate trade – inbound	85,271	169,742
Interstate trade – outbound	80,335	14,980
Total trade into the Murray (Vic) basin	**341,691**	**337,857**
Net trade into the Murray (Vic) basin	-35,732	169,554

Notes:

(1) This table summarises allocation trades approved into, out of and within the Victorian Murray basin trading zones (Zone 6 Murray – Dartmouth to Barmah, Zone 7 Murray – Barmah to SA, and Zone 6B Lower Broken Creek) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

In 2009–10, 87 ML of bundled entitlement in the Murray basin was transferred on a temporary basis. Table 6-7 summarises the movement of bundled entitlements in the Murray basin during 2009–10.

Table 6-7 Transfer of surface water bundled entitlements in the Murray Basin 2009–10

Trading zone	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Barmah to Nyah unregulated	0	0	0	0	0	0
Upper Murray main stem unregulated	0	0	0	0	0	0
Upper Murray unregulated	4	4	0	69.6	87	-17.4
Total 2009–10	**4**	**4**	**0**	**69.6**	**87**	**-17.4**
Total 2008–09	0	0	0	183	183	0

6.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 6-8.

The total volume diverted in 2009–10 increased slightly but is very similar to that of 2008–09.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Goulburn–Murray Water. Compliance with individual bulk entitlement volumes is deemed to occur in Table 6-8 if water use is not more than the maximum volume allowed to be diverted in 2009–10.

Table 6-8 Volume of water diverted under surface water entitlements in the Murray basin (Victoria)

Bulk entitlement	Bulk entitlement period (years)	Average bulk entitlement over period (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(1)
East Gippsland Water					
Omeo	1	77	-	56	Yes
Coliban Water					
River Murray	1	6,285	-	3,459	Yes
Goulburn Valley Water					
River Murray	1	5,593	-	4,681	Yes
North East Water					
Bundalong	1	51	-	13	Yes
Corryong	1	680	-	231	Yes
Cudgewa	1	29	-	-	Yes
Dartmouth	1	60	-	32	Yes
Walwa	1	61	-	22	Yes
River Murray	1	12,793	(10)(2)	7,232	Yes
Eskdale	n/a	n/a	10(2)	9	n/a
GWMWater					
River Murray	1	3,492	1,299(3)	3,453	Yes
Goulburn–Murray Water					
River Murray	1	1,540,557	-	538,334	Yes
Lower Murray Water					
River Murray – Lower Murray Urban and Rural Water – Urban	1	31,958	-	17,027	Yes
River Murray – Lower Murray Urban and Rural Water – Irrigation	1	366,625	-	328,721	Yes
River Murray – First Mildura Irrigation Trust	1	72,983	-	30,425	Yes
Melbourne Metropolitan Retailers					
River Murray(4)	1	188	-	188	Yes
Environment Minister					
River Murray – Flora and Fauna	1	27,600	-	36,500(5)	Yes
River Murray – Living Murray Initiative	1	107,560	-	0	Yes
River Murray – Snowy Environmental Reserve	1	29,794	-	12,556	Yes
Total annual volume of bulk entitlements 2009–10		**2,185,489**	**1,299**	**977,022**	
Total annual volume of bulk entitlements 2008–09		**2,095,070**	**7,212**	**902,962**	
Licensed diversions from unregulated streams 2009–10		*28,233*		*2,100*	
Licensed diversions from unregulated streams 2008–09		*29,086*		*4,200*	

Notes:

(1) Compliance with River Murray bulk entitlements is also assessed against the Murray–Darling Basin annual cap target for the Murray, Kiewa and Ovens basins. Details of this are contained in the MDBA's *Water audit monitoring report 2009–10*.

(2) North East Water transferred 10 ML from its River Murray bulk entitlement to enable a supply to the newly constructed water supply system for the Eskdale township, prior to a bulk entitlement being formalised for this system.

(3) GWMWater purchased1,299 ML of water on the temporary market in 2009–10.

(4) The Melbourne Metropolitan Retailers were granted a bulk entitlement for the River Murray system on 27 January 2010, which was later disallowed by Legislative Council on 25 June 2010.

(5) Usage is higher than the entitlement volume due to water traded into Victoria by the Commonwealth Environmental Water Holder.

n/a: Not applicable.

6.7 Groundwater resources

Licensed groundwater entitlements and use within the Murray basin is presented for 2009–10 in Table 6-9. Murray basin groundwater includes a proportion of the Katunga WSPA and the Shepparton WSPA. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

Groundwater use in the Murray basin reduced slightly in 2009–10 compared with 2008–09. Initially groundwater extraction in the Shepparton WSPA was to control salinity resulting from rising water levels, a historical legacy of vegetation removal. As the aquifer is shallow, further declines in groundwater levels within the Shepparton WSPA during 2009–10 resulted in many licensed groundwater users not having access to as much water. Some groundwater from the Shepparton WSPA requires shandying with surface water to improve the water quality.

Extractions from Katunga WSPA were restricted to 70% allocation during 2009–10 and groundwater levels are declining within the WSPA.

Table 6-9 Licensed groundwater volumes, Murray basin (Victoria) 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)(5)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Katunga WSPA (80%)	>25	33,478	47,826	24,934	-	24,934	26,427
Shepparton WSPA (31%)	<=25	72,854	72,854	15,369	-	15,369	17,674
Total(6)		**106,332**	**120,680**	**40,303**	**-**	**40,303**	**44,101**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established (for example Shepparton WSPA), in which case the licensed entitlement is used. The entitlement limit in the Katunga WSPA is represented by 70% PCV due to restrictions in place during 2009–10.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) No estimates provided. All existing licensed bores with greater than 20 ML per year entitlement have been metered.

(6) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 6-10.

Table 6-10 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	Number of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Katunga WSPA (80%)	648	1,296
Shepparton WSPA (31%)	735	1,470
Total	**1,383**	**2,766**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 6-9.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross-checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Groundwater is used to provide urban water supply to a number of towns in the Murray basin. The licensed entitlements and metered use for these supplies is presented in Table 6-11. Groundwater use for the towns of Dinner Plain, Katunga and Strathmerton reduced slightly in 2009–10 compared with 2008–09.

Table 6-11 Urban groundwater usage

Town supplied(1)	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Dinner Plain	120	42	53
Katunga	110	46	53
Strathmerton	730	0	2
Total	**960**	**88**	**108**

Notes:

(1) Barnawartha groundwater use has up to 2006–07 been reported within the Murray basin in previous Victorian Water Accounts. A review of the basin boundaries indicated that the extractions for Barnawartha are located in the Ovens basin.

6.8 Drought contingency measures

Drought contingency measures in the Murray basin in 2009–10 included:

- restricting urban and rural water use (discussed in section 6.10)
- utilising carryover
- ending the irrigation season early to build reserves for 2010–11
- the continuation of a temporary qualification of rights as detailed below in Table 6-12
- reintroduction of the Lake Boga to the Mid-Murray storages.

Carryover was an important tool for water users to individually manage through the dry conditions. Over 180,000 ML of allocation was carried over from 2008–09 in the Murray system, a volume equivalent to a 14% allocation of high-reliability water shares

For the third year in a row Goulburn-Murray Water shortened the irrigation season and announced its final seasonal allocation on 1 April 2010. All water resource improvements after this date were directed to building up reserves for the 2010–11 season.

6.9 Qualification of rights

The Murray water system was re-qualified in 2009–10, as there was a shortfall to meeting essential needs under normal allocation arrangements if dry conditions continued. The year commenced with a zero allocation and with Victoria's share of the Murray storages at just over 15%.

The qualification ensured that water corporations could supply water to towns and essential domestic and stock needs while reserves remained extremely low.

By 1 October 2009 Victoria's Murray system reserves had recovered sufficiently to announce a 29% allocation, at which time allocation arrangements were mostly restored to normal.

The only part of the qualification that remained was the clause enabling urban water corporations to carryover up to 50% of their unused entitlement from the previous year. This was consistent with the carryover provisions in place for water share holders, and was key to maintaining town supplies at the beginning of the year when allocations were zero.

Table 6-12 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Trigger for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights in the Murray Water System July 2009	1 July 2009 to 30 Jun 2010	Differential access by priority entitlements	Enabled domestic and stock users to take the volume of water necessary for essential needs (such as household purposes, fire fighting), and commercial and industrial users' were able to take water for limited purposes	20% allocation or higher for high-reliability shares on the Murray system	1 October 2009
			Enabled urban water corporations (Lower Murray Water, GWMWater, Coliban Water, Goulburn Valley Water and North East Water) to supply the essential needs of urban water users	10% allocation or higher for high-reliability shares on the Murray system	15 September 2010
		Volume carried over	Allowed entitlement holders to carry over unused water at 30 June 2009 up to 50% of entitlement minus 5% for losses	Expiry date: 30 June 2011	

6.10 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to urban customers and licensed diversions from unregulated streams are presented in Table 6-13.

No towns supplied by the regulated Murray system were subject to water restrictions more severe than Stage 3 throughout the year. Generally restrictions were eased towards the end of the year as water availability improved.

The regulated Murray system began the year with record low reserves and a 0% allocation. The allocation increased to 63% by the end of January 2010, compared with 35% at the same point during 2008–09 irrigation season. Victoria's share of the Murray systems storages further improved following flooding on the Darling River and a 100% allocation for high-reliability water shares was reached in April 2010.

Table 6-13 Seasonal allocations and restrictions on water use in Murray basin (Victoria), 2009–10

Type of restriction	Area	Nature of restriction
Urban	Cohuna, Gunbower and Leitchville	Stage 2 restrictions all year for Cohuna and Gunbower. Stage 2 restrictions for Leitchville between July 2009 and April 2010, and Stage 1 restrictions for Leitchville for May and June 2010.
	Irymple, Kerang, Koondrook, Lake Boga, Merbein, Mildura, Murrabit, Nyah, Nyah West, Piangil, Red Cliffs, Robinvale, and Swan Hill	Stage 3 restrictions from July to October 2009, and Stage 1 from November 2009 to June 2010.
	Cudgewa and Corryong	Stage 1 restrictions from July to September 2009.
	Bellbridge, Ebden and Tallangatta	Stage 1 restrictions from July 2009 to January 2010.
	Echuca	Stage 2 restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010.
Licensed diversions on unregulated streams	Sheepwash Creek (tributary of Ulupna Creek)	Stage 3 restrictions from July 2009 to June 2010.
	Murray (below Hume) tributaries, Upper Murray (above Hume) tributaries, Indigo Creek, Black Dog Creek (upper)	Irrigation ban from July 2009 to June 2010.
	Cudgewa Creek (Upper Murray)	Irrigation ban from February to June 2010.
	Nariel Creek	Stage 4 restrictions in August 2009.
	Back Creek (tributary of Little Snowy Creek)	Stage 4 restrictions from January to June 2010.
	Little Scrubby Creek	Irrigation ban from July to September 2009.
	Little Snowy Creek	Stage 4 restrictions from January to June 2010.
	Livingstone Creek	Irrigation ban from July 2009 to June 2010.
	Lockharts Creek	Irrigation ban from July to August 2009
	Scrubby Creek	Irrigation ban from July to September 2009, Stage 3 restrictions from November 2009 to June 2010.
	Waterfall (tributary of Tallangatta Creek)	Irrigation ban from December 2009 to June 2010.
Irrigation	Murray system (gravity and pumped)	Allocation began the year at 0% of high-reliability water shares and increased to 63% by February 2010, closing on a final allocation in April 2010 of 100%.
Groundwater	Katunga WSPA	Seasonal allocations applied, with use from Katunga WSPA restricted to 70% allocation.

6.11 Recycled water

Around 53% of the volume of wastewater passing through treatment plants in the basin was recycled for consumptive use (Table 6-14), mostly for agricultural purposes. This is higher than the proportion recycled in 2008–09 even though water consumption rates were similar.

Table 6-14 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Bellbridge	49	49	100%	-	49	-	-	-	-
Bundalong	-	-	0%	-	-	-	-	-	-
Cobram	285	285	100%	-	285	-	-	-	0
Cohuna	-	-	0%	-	-	-	-	-	-
Corryong	89	89	100%	-	89	-	-	-	-
Dartmouth	-	-	0%	-	-	-	-	-	-
Gunbower/ Leitchville	-	-	0%	-	-	-	-	-	-
Koondrook	18	-	0%	-	-	-	-	-	18
Koorlong	1,075	1,075	100%	-	1,075	-	-	-	-
Lake Boga	29	-	0%	-	-	-	-	-	29
Merbein	-	-	0%	-	-	-	-	-	-
Mildura	1,349	1,349	100%	-	1,349	-	-	-	-
Nathalia	41	41	99%	-	41	-	-	-	0
Numurkah	152	152	100%	-	152	-	-	-	0
Nyah/Nyah West	39	-	0%	-	-	-	-	-	39
Omeo	19	19	100%	-	19	-	-	-	-
Red Cliffs	98	98	100%	98	-	-	-	-	-
Robinvale	185	185	100%	-	185	-	-	-	-
Strathmerton	18	18	100%	-	18	-	-	-	-
Swan Hill	923	-	0%	-	-	-	-	-	923
Tallangatta	81	81	100%	-	81	-	-	-	-
Wodonga	3,240	653	20%	653	-	-	-	2,868	(281)
Yarrawonga	28	28	100%	-	28	-	-	-	-
Total 2009–10	**7,718**	**4,121**	**53%**	**751**	**3,370**	**-**	**-**	**2,868**	**728**
Total 2008–09	**7,456**	**3,387**	**45%**	**289**	**3,098**	**-**	**-**	**2,806**	**1,263**

Notes:
(1) Volume used to deliver specific environmental flow benefits.
(2) Water reused in wastewater treatment processes, for example to maintain biological processes. This value is not included in the total percent recycled, consistent with its treatment in the ESC's performance report.
(3) 'Other' refers to a change in onsite wastewater storage or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

6.12 Water for the environment

6.12.1 Environmental Water Reserve

Important environmental assets depend on the Environmental Water Reserve (EWR) in the Murray basin. The Barmah–Millewa Forest, Gunbower Forest, Hattah Lakes and Kerang Wetlands are located along the River Murray and are all internationally significant wetlands listed under the Ramsar convention and Living Murray Icon Sites. Lindsay, Wallpolla and Mulcra Islands Living Murray Icon Sites, are also dependent on the EWR in the Murray basin. These sites rely on the freshwater inputs from the River Murray to function ecologically.

In 2009–10 the Murray basin (Victoria) EWR comprised the following components:

- the Bulk Entitlement (River Murray – Flora and Fauna) Order 1999 comprised 27,600 ML high-reliability entitlements held by the Environment Minister

- the Bulk Entitlement (River Murray – Flora and Fauna) Order 1999 comprised 5,710 ML of high reliability entitlements and 100,850 ML low-reliability entitlements held by the Environment Minister on behalf of Murray Darling Basin Authority
- the Barmah–Millewa Forest Environmental Water Allocation (EWA) – a significant operational rule embedded in consumptive entitlements
- water set aside for the environment through the operation of passing flows released by Murray Darling Basin Authority as a condition of the Murray-Darling Basin Agreement
- water set aside for the environment through flow-sharing arrangements set out in North East Water's bulk entitlements from unregulated rivers
- all other water in the basin not allocated for consumptive use, that is, water above cap.

6.12.2 Entitlements for the environment

The formal entitlements for the environment in the Murray basin in 2009–10 comprised the Bulk Entitlement (River Murray – Flora and Fauna) Order 1999, which includes 27,600 ML of high-reliability water and Living Murray water including 5,710 ML of high-reliability and 100,412 ML of low-reliability entitlements held by the Environment Minister.

Water was also traded into the River Murray Bulk Entitlement from the Commonwealth Environmental Water Holder. In 2009–10, 36,550 ML was released under this bulk entitlement, which was more than the 18,166 ML released in 2008–09.

-

6.12.3 Passing-flow compliance

North East Water reported that it met all passing-flow requirements under its bulk entitlements in 2009–10.

Table 6-15 shows selected passing-flow compliance for the River Murray Flora and Fauna bulk entitlement.

Table 6-15 Selected passing-flow compliance in the Murray basin

River	Passing flow	
River Murray	Instrument where passing flows are specified	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999
	Responsible authority	Environment Minister
	Compliance point	Not applicable
	Passing-flow compliance	• Lindsay River dilution water: less than 91.3 GL per year • Barmah-Millewa Forest Water: high security entitlement 50 GL per year; lower security entitlement 25 GL per year

7 Kiewa basin

This chapter sets out the accounts for the Kiewa basin. For detailed information about how they have been compiled, refer to Chapter 5.

7.1 Kiewa basin summary

Estimated inflows in the Kiewa basin in 2009–10 were close to the long-term average for the first time in five years. North East Water's towns in the basin were subject to low-level restrictions and urban use was greater compared to 2008–09. Unregulated licensed diversions were lower than in 2008–09 as restrictions and bans continued on many streams throughout the year.

7.2 Responsibilities for management of water resources

Table 7-1 shows the responsibilities of various authorities within the Kiewa basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 7-1 Responsibilities for water resources management within the Kiewa basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Goulburn-Murray Water		Manages groundwater and surface water private diversions		
North East Water			Supplies towns across the whole basin, including Wodonga and Mount Beauty	Obliged to meet passing-flow requirements
AGL Hydro				Operates reservoirs in the upper parts of the Kiewa basin for hydropower operations Obliged to meet passing-flow requirements
North East Catchment Management Authority				Manages waterways for the whole of the Kiewa basin

7.3 Rainfall, flows and storages in 2009–10

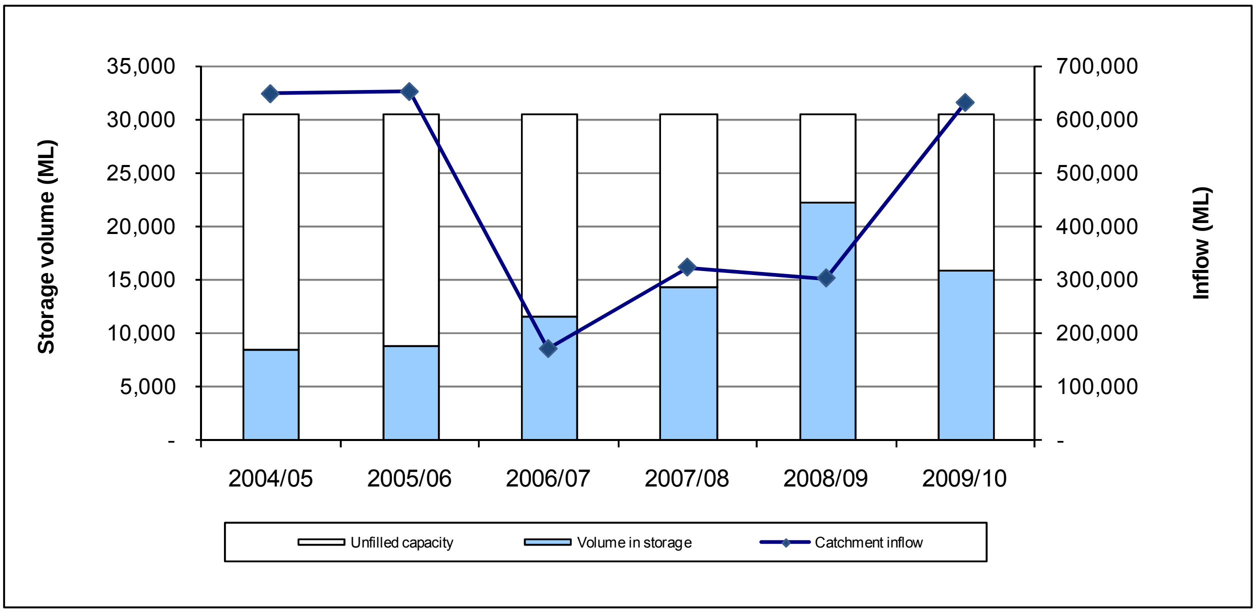
In 2009–10, rainfall in the Kiewa basin ranged between 80% of the long-term average in the lower catchment and 125% in the upper catchment. Inflows were 76% of the long-term average (of 689,000 ML). This was the first time for three years that inflows were greater than half the long-term average. Figure 7-1 illustrates the increase of inflows to the basin compared to recent years.

The volume of water flowing from the Kiewa basin into the River Murray increased to 485,000 ML in 2009–10 (including the New South Wales share of Kiewa River flows under the Murray-Darling Basin Agreement). This volume was almost double the 2008–09 outflow volume of 279,200 ML. The volume of water flowing from the Kiewa basin into the River Murray in 2009–10 represented 77% of the total inflows into the Kiewa basin, compared with 92% in 2008–09.

The volume of water in the two major on-stream storages in the basin, Rocky Valley and Lake Guy, decreased from 21,500 ML at the start of July 2009 to 15,100 ML by June 2010. Storage levels for all major storages (greater than 1,000 ML capacity) in the basin decreased from 22,100 ML in July 2009 to 15,900 ML by June 2010, or 52% of the total storage capacity of 30,470 ML.

Only volumes for major on-stream storages have been included in the water balance, and as such, major storages such as Pretty Valley Basin and Clover Pondage have not been included.

Figure 7-1 All major storages and catchment inflows in the Kiewa basin



7.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Kiewa basin are shown in Table 7-2. Only a small proportion of the surface water resources in the Kiewa basin (2%) were extracted for consumptive use.

An overview of the methodology used to derive the information presented in this chapter is set out in Chapter 5.

Table 7-2 Summary of total water resources and water use in the Kiewa basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	525,500	8,200
Groundwater (2)	1,700	100
Recycled water	280	100

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 7-7 and the estimated domestic and stock use as presented in Table 7-8.

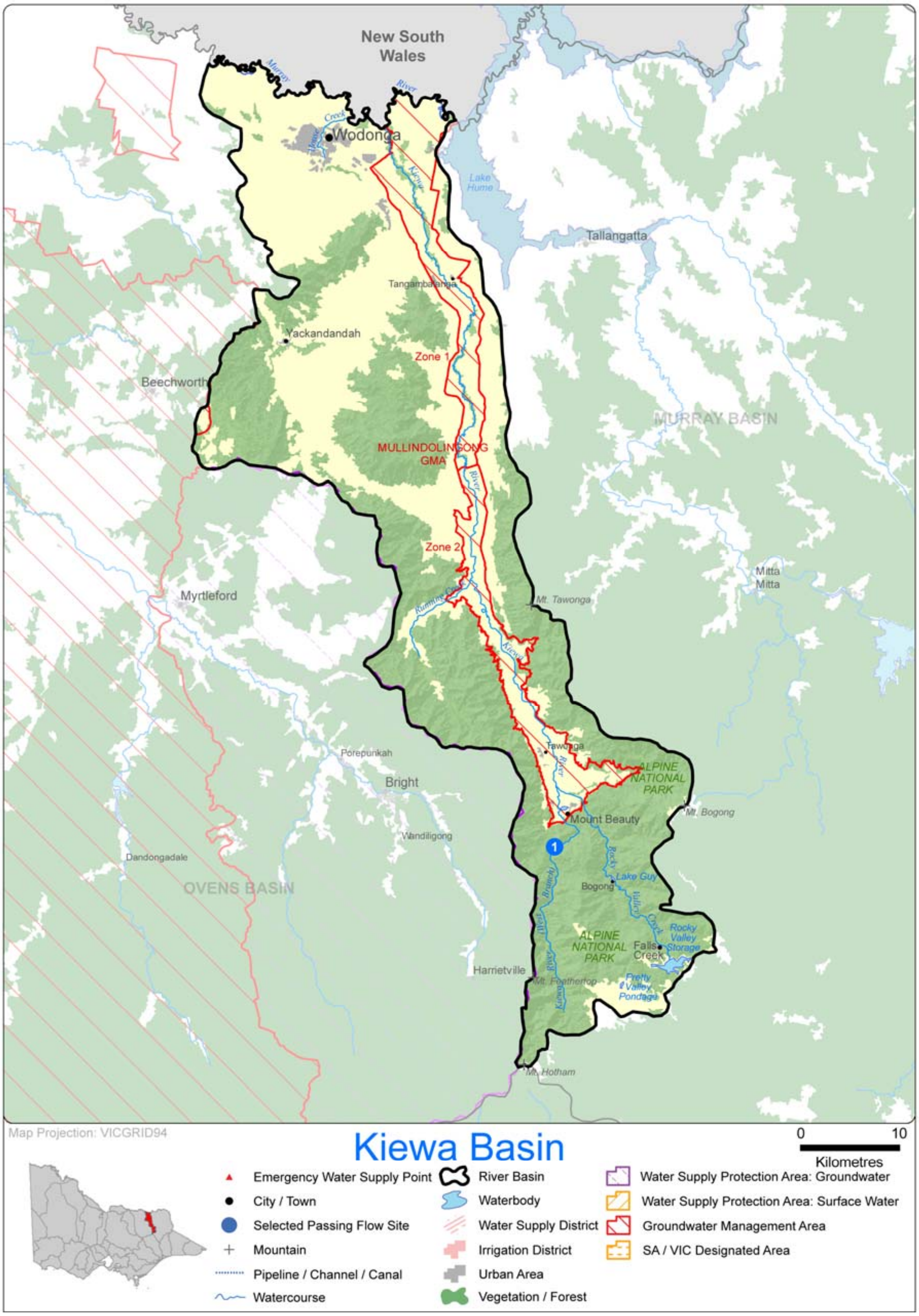
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

7.4.1 Infrastructure projects to improve water availability

North East Water completed the upgrade of Wodonga water treatment plant from a direct filtration plant to dissolved air flotation water treatment plant. This work also involved the installation of pumps and pipework from the treatment plant to users. The upgrade enabled approximately 300 ML of reclaimed water to be supplied to customers in 2009–10.

7.5 Location of water resources

Figure 7-2 Map of the Kiewa basin



7.6 Surface water resources

7.6.1 Water balance

A surface-water balance for the Kiewa basin is shown in Table 7-3. Note that only on-stream storages greater than 1,000 ML capacity have been included in the water balance.

Outflows from the Kiewa basin are shared on a 50/50 basis between Victoria and New South Wales in the Murray system.

Table 7-3 Balance of surface water in the Kiewa basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	21,500	13,500
Volume in storage at end of year	15,100	21,500
Change in storage	**(6,400)**	**8,000**
Inflows		
Catchment inflow (1)	525,400	302,300
Rainfall on major storages	0	n/a(5)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated effluent discharged back to river(2)	140	110
Sub-total	**525,500**	**302,400**
Usage		
Urban diversions	540	500
Licensed diversions from unregulated streams	3,800	4,200
Small catchment dams	3,900	3,900
Sub-total	**8,200**	**8,600**
Losses		
Evaporation losses from major storages	0	0(5)
Evaporation from small catchment dams (3)	1,100	1,100
In-stream infiltration to groundwater, flows to floodplain and evaporation (4)	37,600	5,500
Sub-total	**38,700**	**6,600**
Water passed at outlet of basin		
Kiewa basin outflow to River Murray – Victoria share	242,500	139,600
Kiewa basin outflow to River Murray – NSW share	242,500	139,600

Notes:
(1) Inflows have been back-calculated from outflows plus diversions.
(2) Includes water returned from the alpine resorts.
(3) Evaporation losses are calculated by subtracting estimated usage from the total water harvested.
(4) Losses estimated using loss functions from the Kiewa River REALM model.
(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.
n/a: Not applicable.

7.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 7-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 7-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	4,000	2,000	n/a
Registered commercial and irrigation	2,300	1,900	n/a
Total	**6,300**	**3,900**	**5,000**

n/a: Information not available.

7.6.3 Water entitlement transfers

Surface water movement in the Kiewa basin was limited to transfers of bundled entitlement within the basin. In 2009–10, 82 ML of bundled entitlement in the Kiewa basin were transferred on a permanent basis, and 222 ML on a temporary basis. Both permanent and temporary transfers have decreased when compared with 2008–09.

Table 7-5 summarises the movement of bundled entitlements in the Kiewa basin during 2009–10.

Table 7-5 Transfer of surface water bundled entitlements in the Kiewa Basin 2009–10

Trading zone	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin[1]	Bought (ML)	Sold (ML)	Net transfer to basin
Kiewa main stem unregulated	82	82	0	222	222	0
Total 2009–10	**82**	**82**	**0**	**222**	**222**	**0**
Total 2008–09	**89**	**111**	**-22**	**881**	**881**	**0**

Note:

(1) Net loss covers the additional losses incurred in extracting the water further downstream. This volume is effectively returned to the environment.

7.6.4 Volume diverted

The volume of water diverted under North East Water and AGL Hydro Limited's bulk water entitlements is shown in Table 7-6. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. Licences on unregulated streams are not fully metered and water usage is an estimate provided by Goulburn-Murray Water.

Table 7-6 Volume of water diverted under surface water entitlements in the Kiewa basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?[1]
North East Water					
Kiewa – Tangambalanga	1	179	-	-	Yes
Mount Beauty – Tawonga	1	719	-	351	Yes
Yackandandah	1	209	-	167	Yes
AGL Hydro Ltd					
Bogong Village	1	50	-	25	Yes
Kiewa – Southern Hydro Ltd [2]	1	-	-	-	Yes
Total annual volume of bulk entitlements 2009–10		**1,157**	**-**	**543**	
Total annual volume of bulk entitlements 2008–09		**1,157**	**-**	**499**	
Licensed diversions from unregulated streams 2009–10		*18,511*		*3,800*	
Licensed diversions from unregulated streams 2008–09		*18,594*		*4,200*	

Notes:

(1) Compliance with River Murray bulk entitlements is also assessed against the Murray-Darling Basin annual cap target for the Murray, Kiewa and Ovens basins. Details of this are contained in the MDBA's *Water audit monitoring report 2009–10*.

(2) The Kiewa – Southern Hydro Limited bulk entitlement held by AGL Hydro Limited is for non-consumptive purposes and therefore the volume has not been included. Any water diverted under this entitlement is returned to the watercourse.

7.7 Groundwater resources

Licensed groundwater entitlements and use for the Mullindolingong GMA in the Kiewa basin, excluding domestic and stock use, are shown in Table 7-7. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

There were no metered groundwater extractions from the Mullindolingong GMA for 2009–10. Groundwater levels in the Mullindolingong GMA had a declining trend through 2009–10.

Table 7-7 Licensed groundwater volumes, Kiewa basin 2009–10

WSPA/GMA [(1)]	GMA/WSPA depth limits[(2)] (m)	Entitlement limit[(3)] (ML/year)	Licensed entitlement[(4)] (ML/year)	Metered use (ML)	Estimated use in unmetered bores[(5)] (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Mullindolingong GMA (100%)	All depths	6,980	1,532	0	-	0	613
Total		**6,980**	**1,532**	**0**	**-**	**0**	**613**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV).

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) No estimates provided. All existing licensed bores with greater than 20 ML per year entitlement have been metered.

An estimate of domestic and stock groundwater use is provided in Table 7-8. Groundwater is not used as an additional source to supply urban customers in the Kiewa Basin.

Table 7-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores[(1)(2)]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[(3)]
Mullindolingong GMA (100%)	61	122
Total	**61**	**122**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 7-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross-checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

7.8 Drought contingency measures

The main drought contingency measures undertaken in the Kiewa basin in 2009–10 were restrictions on urban water use and diversions on unregulated streams, discussed in more detail in section 7.9.

7.9 Seasonal allocations and restrictions on water use, diversions and extractions

Water restrictions applying to urban customers and licensed diversions in the Kiewa basin during 2009–10 are shown in Table 7-9.

While urban restrictions were low, licensed diverters on many of the Kiewa's tributaries were banned for much of the year.

Table 7-9 Seasonal allocations and restrictions on water use in Kiewa basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Baranduda, Kiewa, Tangambalanga and Wodonga	Stage 1 restrictions from July to December 2009
	Yackandandah	Stage 1 restrictions from July 2009 to March 2010
Licensed diversions on unregulated streams	Basin Creek, Back Creek, Back Creek, Sheep Creek, Cherry Tree Creek, Bay Creek, Glen Creek, Hellhole Creek, Deep Creek, Kiewa River tributary, House Creek, Middle Creek, Morgans Creek, Plain Creek, Junction Creek, Nine Mile Creek, Sheepwash Creek	Irrigation ban from July 2009 to June 2010
	Running Creek	Irrigation ban from July to August 2009
	Yackandandah Creek and tributaries	Irrigation ban in July 2009, Stage 3 restrictions from November to December 2009, Irrigation ban from January to June 2010
	Kinchington Creek	Irrigation ban from July to September 2009, Stage 3 restrictions from November to December 2009, Irrigation ban from January to June 2010

7.10 Recycled water

There are four wastewater treatment plants in the Kiewa basin; with three operated by North East Water and the Dinner Plain Treatment Plant operated by East Gippsland Water. Although the volume of wastewater produced during 2009–10 reduced compared with 2008–09, the proportion of wastewater recycled decreased from 58% in 2008–09 to 34% in 2009–10. The decrease was largely due to no urban and industrial reuse from the Mount Beauty plant in 2009–10.

Table 7-10 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[(3)]
				Urban and industrial	Agriculture	Beneficial allocation [(1)]	Within process [(2)]		
Baranduda	-	-	0%	-	-	-	-	-	-
Dinner Plain	38	38	100%	-	38	-	-	-	-
Mount Beauty	185	0	0%	-	-	-	-	-	185
Yackandandah	58	58	100%	-	58	-	-	-	-
Total 2009–10 [(4)]	**282**	**96**	**34%**	**-**	**96**	**-**	**-**	**-**	**185**
Total 2008–09	**214**	**124**	**58%**	**58**	**66**	**-**	**-**	**-**	**90**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in sewage treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site effluent storage or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

(4) Recycled water returned in Table 7-3 includes returns from alpine resorts.

7.11 Water for the environment

7.11.1 Environmental Water Reserve (EWR)

Important environment assets, such as threatened remnant vegetation and the Murray Cod exist in both the West Kiewa and Lower Kiewa River reaches and are dependent on water from the EWR in the Kiewa Basin. Water from the Kiewa Basin also feeds into the Murray River helping to protect environmental assets within that basin.

In 2009–10 the Environmental Water Reserve in the Kiewa basin comprised the following components:

- water set aside for the environment through flow-sharing arrangements and the operation of passing flows released as a condition of bulk entitlements held by North East Water and AGL Hydro Limited
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

7.11.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at points in a waterway. Others detail flow-sharing arrangements, which restrict the volume of water an authority can take depending on streamflows.

North East Water reported that they met all passing-flow and flow-sharing requirements under their bulk entitlements in 2009–10.

Table 7-11 shows passing-flow rules in the Kiewa basin for the bulk entitlement compliance point in AGL Hydro's Kiewa bulk entitlement. The location of this compliance point can be seen in Figure 7-2.

Table 7-11 Selected passing-flow compliance in the Kiewa basin

River	Passing flow	
East and West Kiewa Rivers and tributaries, Bundara River and tributaries	Instrument where passing flows are specified	Bulk Entitlement (Kiewa – Southern Hydro Limited) Conversion Transfer Order 1998
	Responsible authority	AGL Hydro Ltd
	Compliance point	Mount Beauty Regulating Pondage (shown as 1 in Figure 7-2)
	Passing-flow compliance	The lesser of 100 ML per day or the daily average of the natural inflow to the waterway recorded over the previous seven days was passed at the Mount Beauty Regulating Pondage

7.11.3 Streamflow management plan

Local management rules were recommended for the Kiewa Basin under the Northern Region Sustainable Water Strategy. Work has commenced to develop these.

8 Ovens basin

This chapter sets out the accounts for the Ovens basin. For detailed information about how they have been compiled, refer to Chapter 5.

8.1 Ovens basin summary

The historically reliable Ovens basin recorded its fourth successive year of below-average inflows in 2009–10. While inflows in 2009–10 were close to double the volume received in 2008–09, they were only 53% of the long-term average.

Restriction levels for most towns were gradually reduced over the year with increased water availability, but urban water use was lower than in 2008–09.

Licensed diverters on unregulated streams used slightly less water than last year, though restrictions and bans on use were mostly only in place over the summer months. The volume of licensed extractions from regulated streams almost halved compared to 2008–09.

Licensed groundwater use in the basin also declined compared to 2008–09 as extractions from the Lower Ovens GMA and Upper Ovens WSPA continued to fall.

8.2 Responsibilities for management of water resources

Table 8-1 shows the responsibilities of various authorities within the Ovens basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 8-1 Responsibilities for water resources management within the Ovens basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Goulburn-Murray Water	Supplies primary entitlements on the regulated Ovens and King system	Manages groundwater and surface water licensed diversions		Operates Lake Buffalo and Lake William Hovell Obliged to meet passing-flow requirements
North East Water			Supplies towns including Wangaratta, Bright, Myrtleford, Beechworth and Chiltern	Obliged to meet passing-flow requirements
North East Catchment Management Authority				Manages waterways for the whole of the Ovens basin

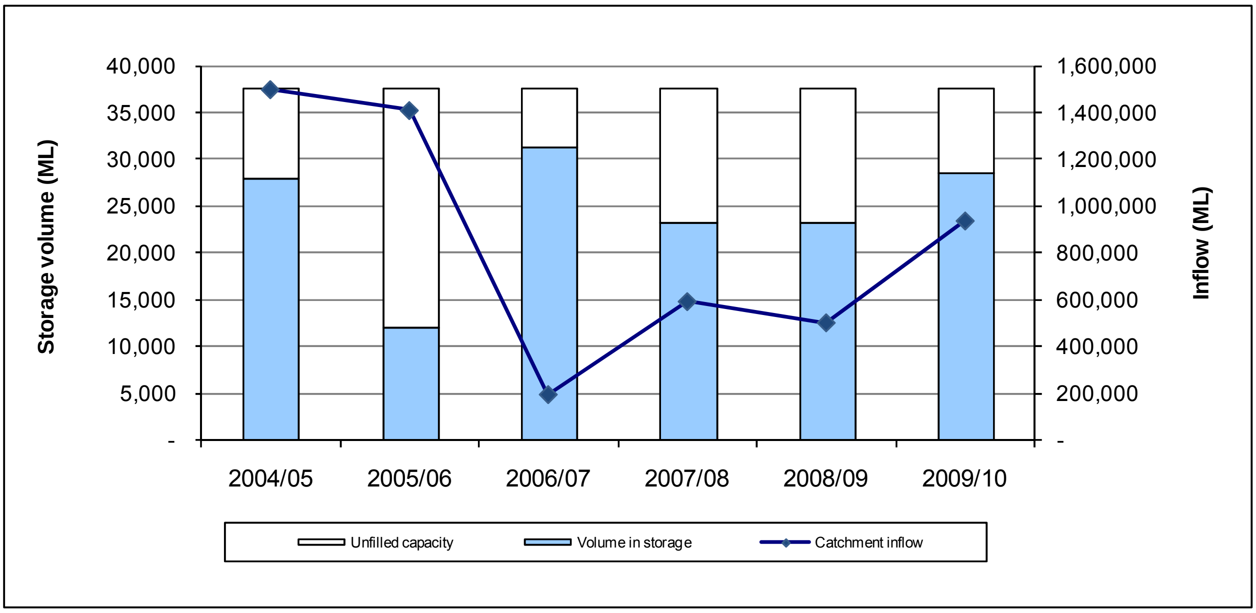
8.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall across the Ovens basin ranged between 80% of the long-term average in the lower catchment and 125% in the upper catchment. Inflows in 2009–10 were 53% of the long term annual average (1,758,000 ML), compared with 28% in 2008–09. This was the fourth successive year the Ovens basin recorded inflows well below average.

The volume of water flowing from the Ovens basin into the River Murray was 873,700 ML in 2009–10. This represented 93% of the total inflows into the basin, compared with 86% in 2008–09.

The total volume of water held in major storages in the Ovens basin was 23,300 ML at July 2009 and increased to 28,400 ML by June 2010, or 76% of capacity. Major on-stream storages include Lake Buffalo and Lake William Hovell.

Figure 8-1 All major storages and catchment inflows in the Ovens basin



8.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Ovens basin are shown in Table 8-2. The volume of surface water resources in 2009–10 increased to 942,500 ML, compared with 499,600 ML in 2008–09. While water availability increased, water use decreased by approximately 24% compared with 2008–09.

Table 8-2 Summary of total water resources and water use in the Ovens basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	942,500	36,700
Groundwater (2)	25,800	7,600
Recycled water	2,200	830

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 8-9 and the estimated domestic and stock use as presented in Table 8-10.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

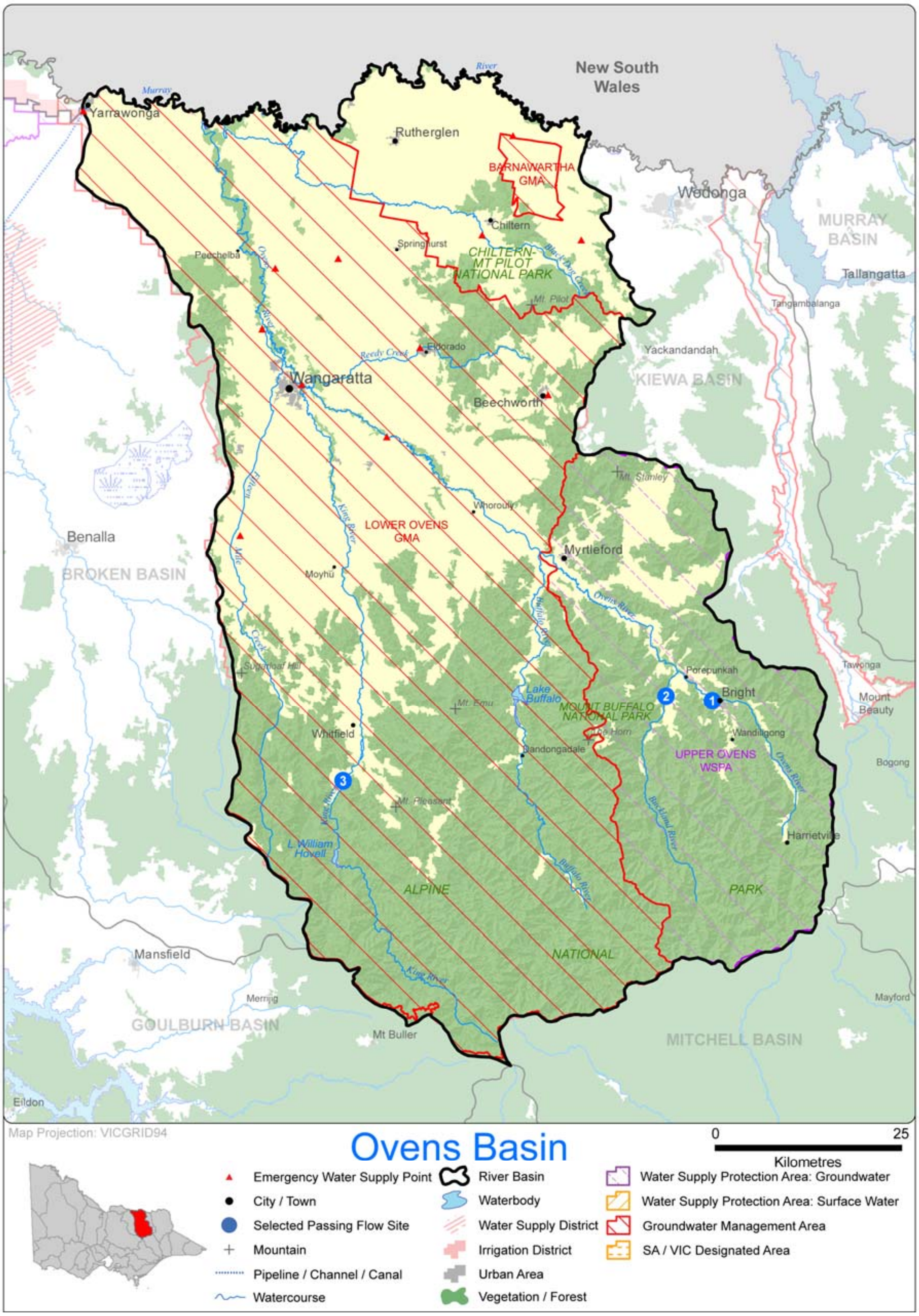
8.4.1 Infrastructure projects to improve water availability

North East Water continues work to secure supply for Bright, Porepunkah and Wandiligong. Work undertaken in 2009–10 included the site selection, storage modelling and detailed design of the Bright Off-stream Storage. It is envisaged that the project will be completed by 2012.

North East Water also continued work on the Groundwater Augmentation of the Bright Water Supply and completed drilling and installation of the monitoring bore and reticulation during the 2009–10 water year, which saw the completion of the project. This will secure the supply for Bright, Porepunkah and Wandiligong until the off-stream storage is completed.

8.5 Location of water resources

Figure 8-2 Map of the Ovens basin



8.6 Surface water resources

8.6.1 Water balance

A surface-water balance for the Ovens basin is shown in Table 8-3. Only those storages greater than 1,000 ML capacity have been included in the water balance.

Table 8-3 Balance of surface water in the Ovens basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	23,300	23,300
Volume in storage at end of year	28,400	23,300
Change in storage	**5,100**	**0**
Inflows		
Catchment inflow(1)	936,200	498,600
Rainfall on major storages	4,900	n/a(4)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated effluent discharged back to river	1,360	970
Sub-total	**942,500**	**499,600**
Usage		
Urban diversions	5,440	5,710
Licensed diversions from regulated streams	8,700	15,900
Licensed diversions from unregulated streams	6,700	7,600
Small catchment dams	15,900	15,900
Sub-total	**36,700**	**45,100**
Losses		
Evaporation losses from major storages	3,200	200(4)
Evaporation from small catchment dams(2)	4,500	4,500
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	19,300	19,300
Sub-total	**27,000**	**24,000**
Water passed at outlet of basin		
Ovens basin outflow to River Murray	873,700	430,500

Notes:
(1) Inflows have been back-calculated from outflows plus diversions.
(2) Evaporation losses are calculated by subtracting estimated usage from the total water harvested.
(3) Loss estimate is based on the average annual losses from the Ovens River REALM model.
(4) Evaporation loss from major storage reported for 2008–09 is actually net evaporation which accounts for rainfall.
n/a: Not applicable.

8.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 8-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 8-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	14,700	7,400	n/a
Registered commercial and irrigation	10,100	8,500	n/a
Total	**24,800**	**15,900**	**20,400**

n/a Information not available.

8.6.3 Water entitlement transfers

Surface water was moved into, out of and within the Ovens basin during 2009–10 through water share transfers and variations, allocation trade and permanent and temporary transfer of bundled entitlement.

Table 8-5 summarises the movement of water shares into and out of the Ovens basin delivery systems during 2009–10. There was a net export of high- and low-reliability water shares out of the basin in 2009–10.

Table 8-5 Transfers and variations of water shares in the Ovens basin 2009–10 [(1), (2)]

Delivery System	High-reliability water shares			Low- and spill-reliability water shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Ovens River	1,869	1,968	-99	903	926	-23
Total 2009–10	**1,869**	**1,968**	**-99**	**903**	**926**	**-23**
Total 2008–09	633	737	-104	211	230	-19

Notes:

(1) This table summarises all recorded water share transfers and variations in the Ovens basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water or land sale are also included in this table.

Table 8-6 summarises the trade of allocation in Victoria's share of the Ovens basin during 2009–10. A total of 782 ML of allocation was traded within the Ovens basin. No water was traded with other Victorian or interstate basins. As all the water was traded within the basin in 2009–10, there was no net movement of water into or out of the basin.

Table 8-6 Allocation trade in the Ovens basin[(1), (2)]

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Ovens basin	782	1,405
Trade from other Victorian basins	0	0
Trade to other Victorian basins	0	0
Interstate trade – inbound	0	0
Interstate trade – outbound	0	0
Total trade into the Ovens basin	**782**	**1,405**
Net trade into the Ovens basin	**0**	**0**

Notes:

(1) This table summarises allocation trades approved into, out of and within the Ovens basin trading zones (Zone 9 Ovens River) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

Table 8-7 summarises the movement of bundled entitlements in the Ovens basin in 2009–10. There was no net movement of water in to or out of the basin in this year for permanent trades, however there was a net trade out of the basin on a temporary basis over 2009–10.

Table 8-7 Transfers of surface water bundled entitlements in the Ovens basin 2009–10

Trading zone	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML) [(1)]	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Ovens and King Unregulated	27	27	0	392	490	-98
Total 2009–10	**27**	**27**	**0**	**392**	**490**	**-98**
Total 2008–09	**61**	**76**	**-15**	**480**	**480**	**0**

Note:

(1) Net loss covers the additional losses incurred in extracting the water further downstream.
This volume is effectively returned to the environment.

8.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 8-8. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. The volume diverted by North East Water for the town of Glenrowan includes 39 ML of drought reserve water in accordance with the bulk entitlement conditions.

The Ovens River system bulk entitlement held by Goulburn-Murray Water is a climatically varying cap, which changes annually depending on the prevailing conditions as outlined in the conversion order.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Goulburn-Murray Water.

Table 8-8 Volume of water diverted under surface water entitlements in the Ovens basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)(3)
North East Water					
Beechworth	1	1,100	-	451	Yes
Bright	1	704	-	618	Yes
Chiltern (4)	1	180	-	-	Yes
Glenrowan	1	90	6	93	Yes
Harrietville	1	91	-	57	Yes
Myrtleford	1	1,212	-	651	Yes
Ovens System – Moyhu, Oxley, Wangaratta – North East Water	1	7,932	-	3,524	Yes
Porepunkah	1	166	-	-	Yes
Springhurst	1	36	-	6	Yes
Whitfield	1	34	2	35	Yes
Goulburn-Murray Water					
Ovens System – Goulburn-Murray Water	1	46,868	-	8,693	Yes
Total annual volume of bulk entitlements 2009–10		**58,413**	**8**	**14,129**	
Total annual volume of bulk entitlements 2008–09		**58,413**	**-**	**21,648**	
Licensed diversions from unregulated streams 2009–10		*25,040*		*6,700*	
Licensed diversions from unregulated streams 2008–09		*24,505*		*7,600*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(3) Compliance with River Murray bulk entitlements is also assessed against the Murray-Darling Basin annual cap target for the Murray, Kiewa and Ovens basins. Details of this are contained in the MDBA's *Water audit monitoring report 2009–10*.

(4) The annual bulk entitlement volume for Chiltern includes up to 25 ML of groundwater extractions.

8.7 Groundwater resources

Licensed groundwater entitlements and use for the groundwater management units in the Ovens basin, excluding domestic and stock use, are shown in Table 8-9.

The Ovens basin contains the whole Barnawartha GMA, Upper Ovens WSPA and Lower Ovens GMA. In 2007–08 Murmungee GMA was replaced with the Upper Ovens WSPA and Lower Ovens GMA. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

There were no metered groundwater extractions from the Barnwartha GMA for 2009–10. Metered groundwater use from the Upper and Lower Ovens GMAs for 2009–10 was 3,095 ML. Groundwater levels in the area are generally stable.

Table 8-9 Licensed groundwater volumes, Ovens basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores(5) (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Barnawartha GMA (100%)	All depths	2,100	485	0	-	0	381
Upper Ovens WSPA (100%)	All depths	4,010	3,432	411	-	411	1,463
Lower Ovens GMA (100%)	All depths	25,200	17,421	2,684	-	2,684	6,825
Total		**31,310**	**21,338**	**3,095**	**-**	**3,095**	**8,669**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Entitlement volume includes domestic and stock usage in those cases where it is part of an existing licence.

(5) No estimates provided. All existing licensed bores with greater than 20 ML per year entitlement have been metered.

An estimate of domestic and stock groundwater use is provided in Table 8-10.

Table 8-10 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	Number of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Barnawartha GMA (100%)	40	80
Upper Ovens GMA (100%)	328	656
Lower Ovens GMA (100%)	1,883	3,766
Total	**2,251**	**4,502**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 8-9.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Groundwater is used within the Ovens basin for urban water supply for Barnawartha, and as a back-up urban water supply for the townships of Chiltern, Moyhu, Myrtleford and Springhurst and the city of Wangaratta. The volume of licensed entitlements and metered use for these groundwater supplies are provided in Table 8-11.

In 2009–10 no groundwater was supplied to the towns of Moyhu, Myrtleford and Chiltern. Urban groundwater supply to Barnwartha was significantly reduced in 2009–10 compared to 2008–09.

Table 8-11 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Barnawartha	293	2	88
Moyhu	15	0	0
Myrtleford	75	0	0
Springhurst	20	3	5
Wangaratta	200	12	13
Chiltern	25	0	107
Total	**628**	**17**	**213**

8.8 Drought contingency measures

Drought contingency measures in the Ovens basin in 2009–10 included restricting urban and rural water supplies (discussed in Section 8.9) and water carting.

North East Water carted water from Wangaratta to Springhurst for the whole of the 2009–10 water year due to supply and quality issues in Diddah Diddah Reservoir. It also carted water to Bundalong from Yarrawonga between July and August 2009 and during March 2010 to maintain supplies while Lake Mulwala was drawn down to low levels to improve water availability for the Murray system. Water was also carted from Wangaratta to Oxley and Moyhu in January 2010 and to Moyhu in June 2010 due to elevated turbidity in the King River which was untreatable.

8.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 8-12.

Towns located within the basin were subjected to various levels of restriction throughout the year depending on their location and availability of storage to ensure there was enough supply during the dry summer and autumn. While restriction levels were gradually reduced for most towns over the year, North East Water was required to place a number of its small towns on severe Stage 4 restrictions for some periods during the year.

Rural diverters from a number of tributaries within the basin were placed on restrictions and bans throughout the year, mostly over the summer period.

Table 8-12 Seasonal allocations and restrictions on water use in Ovens basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Bundalong	Stage 4 restrictions from July to August 2009, Stage 2 restrictions in September 2009, Stage 1 restrictions from October 2009 to January 2010, and Stage 4 restrictions from March to April 2010
	Springhurst	Stage 4 restrictions from July to August 2009, and Stage 3 restrictions from September 2009 to June 2010
	Rutherglen and Wahgunyah	Stage 1 restrictions from July to December 2009.
	Yarrawonga	Stage 2 restrictions from July to September 2009 and Stage 1 restrictions from October to December 2009
	Beechworth	Stage 2 restrictions from July to November 2009, and Stage 1 restrictions from December 2009 to January 2010
	Bright, Harrietville, Porepunkah and Wandiligong	Stage 2 restrictions for July to August 2009
	Chiltern	Stage 1 restrictions from July to December 2009
	Glenrowan	Stage 3 restrictions from July 2009, Stage 1 restrictions from August 2009 to February 2010, and Stage 2 restrictions from March to April 2010
	Whitfield	Stage 4 restrictions from July to August 2009, and Stage 1 restrictions in September 2009
	Myrtleford	Stage 1 restrictions from July to August 2009
	Barnawartha	Stage 1 restrictions from July to December 2009
Unregulated diversions	Roberts Creek	Irrigation ban from July 2009 to June 2010
	Ovens River Upper	Stage 2 restrictions in February 2010
	Barwidgee Creek, Myrtle Creek,	Irrigation ban August 2009 and February 2010
	Hodgsons Creek	Irrigation Ban from July 2009 to June 2010
	Reedy Creek (above Yellow Creek confluence)	Irrigation ban in August 2009 and from February to June 2010
	2 Mile Creek (Tributary of Buckland River), Buckland River	Irrigation ban in February 2010
	Morses Creek	Irrigation ban in August 2009, Stage 2 restrictions from February to March 2010
	Happy Valley Creek, Havilah Creek, Jackson Creek	Irrigation ban in August 2009, Stage 4 restrictions in February 2010
	Buffalo Creek	Stage 2 restrictions from February to March 2010
	Eurobin Creek	Stage 2 restrictions in February 2010
	Snowy Creek	Stage 2 restrictions from February to March 2010
	Boggy Creek	Irrigation ban from December 2009 to March 2010
	Hurdle Creek	Stage 3 restrictions in November 2009, Irrigation ban from December 2009 to March 2010, and Stage 3 restrictions from April to June 2010

8.10 Recycled water

North East Water operates all wastewater treatment plants in the Ovens basin. Approximately 38% of the wastewater passing through treatment plants in the basin in 2009–10 was recycled. This has decreased from 46% that was estimated in 2008–09.

Table 8-13 below shows the volumes of water recycled in the Ovens basin during 2009–10.

Table 8-13 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Barnawartha	20	20	100%	-	20	-	-	-	-
Beechworth	246	48	20%	-	48	-	-	198	-
Bright / Porepunkah	211	26	13%	26	-	-	-	184	-
Chiltern	1	1	100%	-	1	-	-	-	-
Myrtleford	163	-	0%	-	-	-	-	163	-
Rutherglen / Wahgunyah	114	114	100%	44	71	-	-	-	-
Wangaratta	1,440	625	43%	7	618	-	-	816	-
Total 2009–10	**2,195**	**835**	**38%**	**77**	**758**	**-**	**-**	**1,361**	**-**
Total 2008–09	**1,788**	**814**	**46%**	**210**	**605**	**-**	**-**	**974**	**(0)**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in sewage treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site effluent storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

8.11 Water for the environment

8.11.1 Environmental Water Reserve (EWR)

The Lower Ovens River, which contains heritage and icon reaches, is an important environmental asset that depends on the EWR in the Ovens basin. Water from the Ovens basin also feeds into the Murray basin, helping to maintain environmental assets within that basin. In 2009–10 the Ovens basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Goulburn-Murray Water on the regulated rivers
- water set aside for the environment through flow-sharing arrangements set out in North East Water's bulk entitlements in the unregulated rivers
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use; that is, water above cap.

In 2009–10 the Commonwealth Environmental Water Holder released 50 ML of water down the King River from Lake William Hovell to build on natural high flows and providing benefit to the Ovens and King Rivers. Goulburn-Murray Water also released water from Lake Buffalo down the Ovens River as part of planned maintenance work to the dam. North East Catchment Management Authority provided Goulburn-Murray Water with a release pattern which would benefit in-stream biota including supporting movement of Murray cod and sustained macro-invertebrates, which are important in maintaining river health.

8.11.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at points in a waterway. Others detail flow-sharing arrangements, which restrict the volume of water an authority can take depending on streamflows.

North East Water reported that they met all passing-flow requirements under their bulk entitlements in 2009–10.

Goulburn-Murray Water reported short-term non-compliance for the King River at Docker Road (one day). This non-compliance was due to fluctuations in natural flow requirements and increase in demand.

Table 8-14 shows passing-flow compliance in the Ovens basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The locations of these compliance points are presented in Figure 8-2.

Table 8-14 Selected passing-flow compliance in the Ovens basin

River	Passing flow	
Ovens River	Instrument where flow-sharing rules are specified	Bulk Entitlement (Bright) Conversion Order 2000
	Responsible authority	North East Water
	Compliance point	Bright diversion weir (shown as 1 in Figure 8-2)
	Passing-flow compliance	• All flows were passed for flows less than 2 ML per day • A minimum flow of 2 ML per day was passed for flows between 2 and 3.6 ML per day • A minimum flow of 2 ML per day plus 20% of the total of flow less 3.6 ML per day was passed for flows between 3.6 and 39.5 ML per day • 9.5 ML per day was passed for flows of 39.5 ML per day or greater
Buckland River	Instrument where flow-sharing rules are specified	Bulk Entitlement (Porepunkah) Conversion Order 1999
	Responsible authority	North East Water
	Compliance point	Porepunkah Pump Station (shown as 2 in Figure 8-2)
	Passing-flow compliance	• Half the flow was passed for flows less than 2.6 ML per day • The entire flow, less 1.3 ML per day was passed for flows of 2.6 ML per day or greater
Buffalo River, King River, confluence to River Murray	Instrument where passing flows are specified	Bulk Entitlement (Ovens System – Goulburn-Murray Water) Conversion Order 2004
	Responsible authority	Goulburn-Murray Water
	Compliance point	Catchment upstream of Cheshunt (King River between Cheshunt and Lake William Hovell) (shown as 3 in Figure 8-2)
	Passing-flow compliance	• The lesser of 20 ML per day or natural flow was passed from November to May inclusive • The lesser of 30 ML per day or natural flow was passed from June to October inclusive

8.11.3 Streamflow Management Plan

The Upper Ovens WSPA has been declared and this influences licensed entitlement trade flexibility. The associated upper Ovens River Integrated Water Management Plan was in development throughout 2009–10.

9 Broken basin

This chapter sets out the accounts for the Broken basin. For detailed information about how they have been compiled, refer to Chapter 5.

9.1 Broken basin summary

Inflows to the Broken basin were just 21% of the long-term average in 2009–10 making it the fourth consecutive year where inflows were less than 30%. The Broken system began 2009–10 with record low reserves and a zero allocation to irrigators.

As a result, water resource managers again directed attention towards securing essential domestic and stock needs through a qualification of rights and supplying carryover through contingency operations.

Carryover was again an important tool for water users to individually manage through the dry conditions. A total of 2,500 ML of allocation was carried over from 2008–09 in the Broken system, a volume equivalent to a 10% allocation of high-reliability water shares.

The allocation for high-reliability water shares reached a maximum of 17% in April 2010. Although very low this was greater than 2008–09, when no water was able to be allocated to water shares. As with all northern Victorian systems, the season ended early to build reserves for supplies in 2010–11.

Most towns in the Broken basin are supplied from the Murray or the Goulburn system. These larger systems provided urban water corporations with more options to source water and enabled them to keep restrictions at lower levels. The local supply for Benalla, from a tributary of the Broken River, was adequate for urban water restrictions to be removed in the second half of the year.

Private diverters on the unregulated tributaries were less severely restricted in 2009–10. Diversions were banned for the whole year from only one stream, while several other streams were mainly restricted at the beginning of the year and over summer.

9.2 Responsibilities for management of water resources

Table 9-1 shows the responsibilities of various authorities within the Broken basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 9-1 Responsibilities for water resources management within the Broken basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Goulburn-Murray Water	Supplies the Tungamah domestic and stock supply system	Manages groundwater and surface water licensed diversions	Provides bulk water supplies to Goulburn Valley Water(1) and North East Water	Operates Lake Mokoan(2) and Lake Nillahcootie Obliged to meet passing-flow requirements
North East Water			Supplies towns across most of the Broken basin, including Benalla	Obliged to meet passing-flow requirements
Goulburn Valley Water			Supplies towns in the west of the basin, including Dookie(1)	
Goulburn Broken Catchment Management Authority				Manages waterways for the whole of the Broken basin

Notes:

(1) Urban water systems managed by Goulburn Valley Water in the Broken basin are supplied from the Goulburn and Murray systems.

(2) Lake Mokoan was decommissioned as an active storage reservoir in February 2010.

9.3 Rainfall, flows and storages in 2009–10

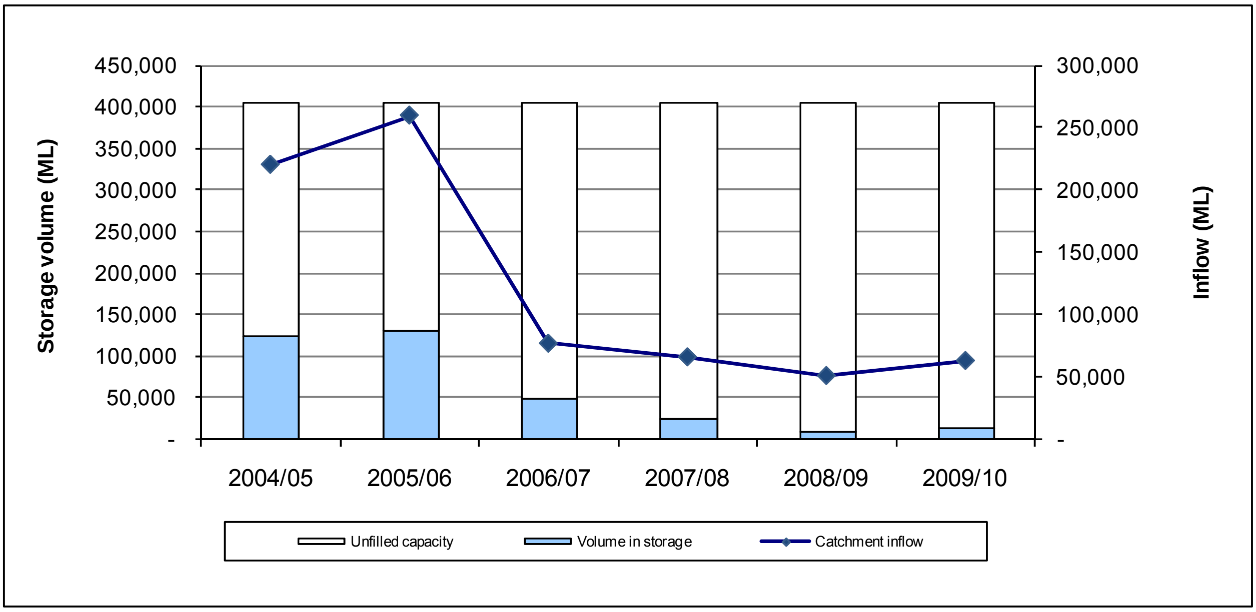
In 2009–10 rainfall across the Broken basin ranged between 80% and 125% of the long-term average. Dry catchment conditions resulted in total inflows of 21% of the long-term average (of 308,000 ML) making it the fourth consecutive year where inflows were less than 30%.

The amount of water flowing from the Broken basin into the River Murray increased to 22,700 ML in 2009–10. This represented 36% of the total inflows into the basin, an increase from 25% in 2008–09.

The volume of water held in major storages (greater than 1,000 ML capacity) in the Broken basin increased by 4,000 ML during 2009–10 to 13,200 ML, or 3% of the total storage capacity. This included Lake Mokoan, Lake

Nillahcootie and Loombah-McCall Say Reservoir. The low storage levels were the result of four consecutive years of low inflows, high levels of evaporation and releases for irrigation.

Figure 9-1 All major storages and catchment inflows in the Broken basin



9.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Broken basin are shown in Table 9-2.

Table 9-2 Summary of total water resources and water use in the Broken basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	65,200	22,300
Groundwater(2)	5,100	2,700
Recycled water	210	210

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 9-8 and the estimated domestic and stock use as presented in Table 9-9.

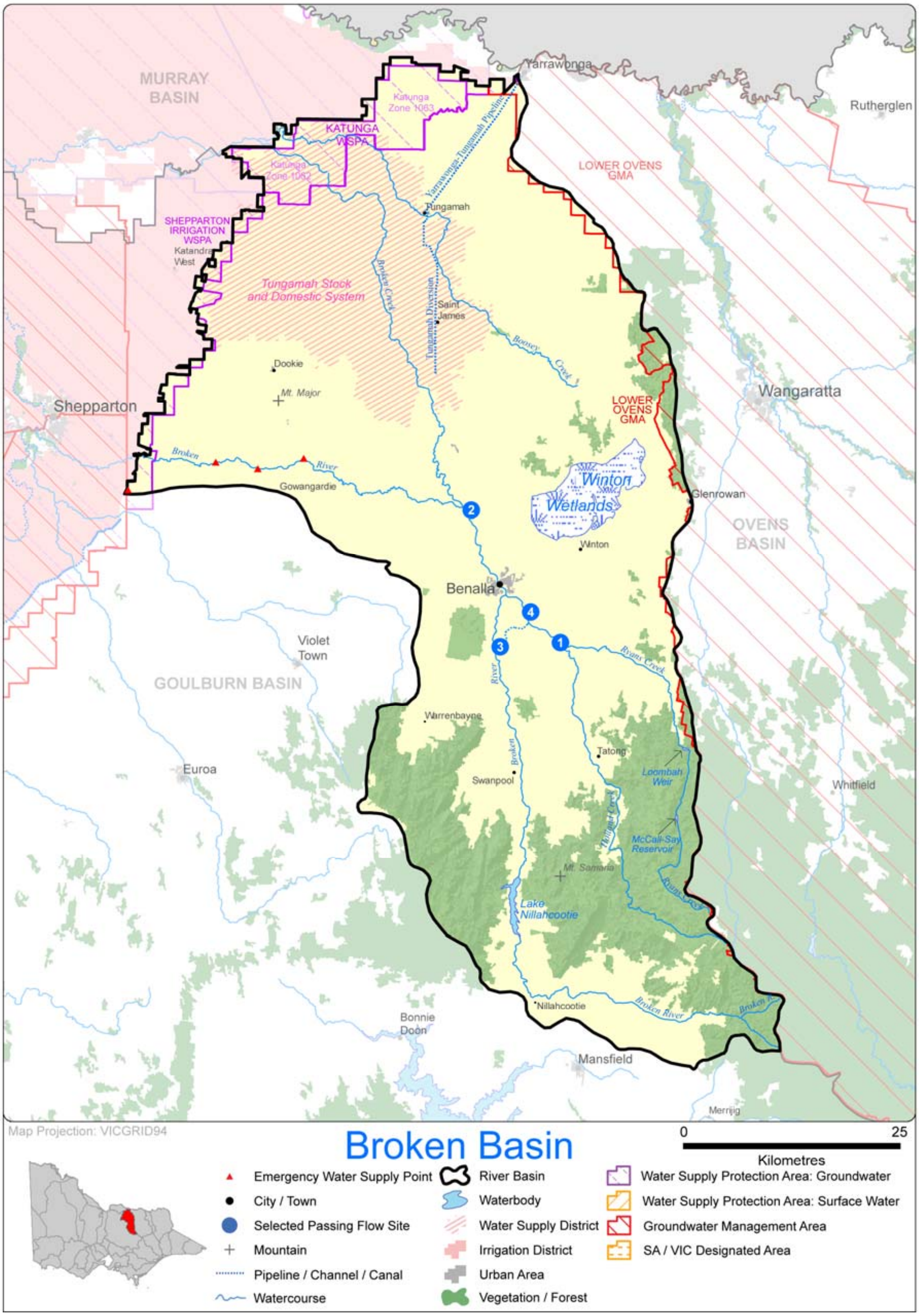
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

9.4.1 Infrastructure projects to improve water availability

Lake Mokoan was decommissioned as an active storage in February 2009 to save water lost to evaporation from the storage which was large and shallow. Works undertaken in 2009–10 include the decommissioning of the inlet channel, installation of pumps and pipes for existing lake customers, and conversion of the inlet channel to a rain rejection storage. The rain rejection storage will take flows that are released for supply to irrigators before a rain event that would mitigate the need for irrigators to use the additional water. This water is then released at the next request.

9.5 Location of water resources

Figure 9-2 Map of the Broken basin



9.6 Surface water resources

9.6.1 Water balance

A surface-water balance for the Broken basin is shown in Table 9-3. Note that only those storages greater than 1,000 ML capacity have been included in the water balance.

Table 9-3 Balance of surface water in the Broken basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	9,200	24,500
Volume in storage at end of year	13,200	9,200
Change in storage	**4,000**	**(15,300)**[(7)]
Inflows		
Catchment inflow[(1)]	63,200	51,200
Rainfall on major storages	2,000	n/a[(6)]
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated effluent discharged back to river	0	0
Sub-total	**65,200**	**51,200**
Usage		
Urban diversions	1,390	1,570
Licensed diversions from regulated streams[(2)]	4,080	8,200
Licensed diversions from unregulated streams[(3)]	1,000	200
Environmental water diversions	0	0
Small catchment dams[(4)]	15,800	15,800
Sub-total	**22,300**	**25,800**
Losses		
Evaporation losses from major storages	1,900	15,500 [(6)]
Evaporation from small catchment dams[(4)]	7,200	7,200
In-stream infiltration to groundwater, flows to floodplain and evaporation[(5)]	7,100	5,100
Sub-total	**16,200**	**27,800**
Water passed at outlet of basin		
Broken River at Gowangardie to Goulburn basin	22,400	12,400
Boosey Creek at Tungamah to Murray basin	0	200
Broken Creek at Katamatite to Murray basin	300	300

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.
(2) Includes Tungamah domestic and stock system.
(3) Licensed diversions from unregulated streams are derived from an estimate based on the total licensed volume of diversions.
(4) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.
(5) 2009–10 loss data derived from the Goulburn Simulation Model.
(6) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.
(7) The decrease in storage during 2008–09 was due to the lowering of Lake Mokoan prior to its decommission.
n/a: Not applicable.

9.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 9-4 are based on the estimates provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 9-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	15,400	7,700	n/a
Registered commercial and irrigation	9,600	8,100	n/a
Total	**25,000**	**15,800**	**23,000**

n/a Information not available.

9.6.3 Water entitlement transfers

Surface water was moved in to, out from, and within the Broken basin in 2009–10 through water share transfers and variations, and allocation trade. There was no trade of permanent or temporary bundled entitlements in 2009–10.

Table 9-5 summarises the movement of water shares into and out of the Broken basin delivery systems during 2009–10. There was a net export of both high and low-reliability water shares out of the basin in 2009–10, with approximately 7,500 ML of high reliability and approximately 1,500 ML of low-reliability water traded out of the basin in this water year. The volume of water movement in the Broken basin increased compared to 2008–09 as a result of the decommissioning of Lake Mokoan.

Table 9-5 Transfers and variations of water shares in the Broken basin 2009–10 [(1), (2)]

Delivery System	High-reliability water Shares			Low and Spill Reliability Water Shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Broken Unregulated	1,270	8,864	-7,594	284	1,831	-1,547
Total 2009–10	**1,270**	**8,864**	**-7,594**	**284**	**1,831**	**-1,547**
Total 2008–09	774	806	-32	150	156	-6

Notes:

(1) This table summarises all recorded water share transfers and variations in the Broken basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water and land sale are also included in this table.

Table 9-6 summarises the trade of allocation within the Broken basin in 2009–10. A total of 728 ML of allocation was traded within the Broken basin. No water was traded with other Victorian regions, however water was traded out of Broken basin to basins in other states. There was a net movement of 55 ML of allocation trade out of the basin in 2009–10.

Table 9-6 Allocation Trade in the Broken basin[(1), (2)]

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Broken basin	728	1,565
Trade from other Victorian basins	0	0
Trade to other Victorian basins	0	0
Interstate trade - inbound	0	0
Interstate trade - outbound	55	0
Total trade into the Broken basin	728	1,565
Net trade into the Broken basin	-55	0

Notes:

(1) This table summarises allocation trades approved into, out of and within the Broken basin trading zones (Zone 2A , 2B and 6B) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

9.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 9-7.

Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2008–09.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Goulburn-Murray Water.

The Broken River system bulk entitlement volume held by Goulburn-Murray Water is a climatically varying annual cap in which compliance is determined under the Murray-Darling Basin Commission cap compliance process.

Table 9-7 Volume of water diverted under surface water entitlements in the Broken basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?[1]
North East Water					
Loombah-McCall Say	1	2,324	-	1,389	Yes
Tungamah, Devenish and St James[2]	1	135	-	-	Yes
Goulburn-Murray Water[3]					
Broken River System [4]	1	23,493	-	4,082	Yes
Total annual volume of bulk entitlements 2009–10		**25,952**	**-**	**5,471**	
Total annual volume of bulk entitlements 2008–09		**47,599**	**-**	**10,471**	
Licensed diversions from unregulated streams 2009–10		*9,749*		*1,000*	
Licensed diversions from unregulated streams 2008–09		*9,802*		*200*	

Notes:

(1) Compliance with River Murray bulk entitlements is also assessed against the Murray-Darling Basin annual cap target for the Goulburn, Loddon and Broken basins. Details of this are contained in the MDBA's *Water audit monitoring report 2009–10*.

(2) North East Water transferred its offtake for this bulk entitlement to upstream of Benalla Weir in October 2009, but as yet does not have infrastructure in place to supply water under this entitlement. These towns were supplied via a pipeline from Yarrawonga in 2009–10.

(3) The Tungamah domestic and stock, and urban supplies bulk entitlement was revoked in 2009–10 following the completion of the Tungamah pipeline project and is no longer reported in the accounts.

(4) This bulk entitlement was amended in 2009–10 to reflect the decommissioning of Lake Mokoan.

9.7 Groundwater resources

Licensed groundwater entitlements and use for the groundwater management units in the Broken basin, excluding domestic and stock use, are shown in Table 9-8. The Broken basin contains 8% of the Katunga WSPA by surface area. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

Extractions from Katunga WSPA were restricted to 70% allocation during 2009–10. The volume extracted from the Katunga WSPA during 2009–10 was similar to that extracted in 2008–09.

Table 9-8 Licensed groundwater volumes, Broken basin 2009–10

WSPA/GMA[1]	GMA/ WSPA depth limits[2] (m)	Entitlement limit[3] (ML/year)	Licensed entitlement[4] (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)[5]	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Katunga WSPA (8%)	>25	3,510	5,014	2,614	-	2,614	2,770
Total[6]		**3,510**	**5,014**	**2,614**	**-**	**2,614**	**2,770**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water in this table represents the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used. The entitlement limit in the Katunga WSPA is represented by 70% PCV due to restrictions in place during 2009–10.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) No estimates provided. All existing licensed bores with greater than 20 ML per year entitlement have been metered.

(6) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 9-9.

Table 9-9 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	Number of domestic and stock bores[(1)(2)]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[(3)]
Katunga WSPA (8%)	68	136
Total	**68**	**136**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 9-8.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Groundwater is available as an urban water supply for Goorambat in the Broken basin. The licensed entitlements and metered use for this supply are provided in Table 9-10.

Table 9-10 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Goorambat	24	12	16
Total	**24**	**12**	**16**

9.8 Drought contingency measures

Drought contingency measures in the Broken basin in 2009–10 included:

- restricting urban and rural water use (discussed below)
- utilising carryover
- ending the irrigation season early to build reserves for 2010–11
- a temporary qualification of rights, as detailed in Section 9.9.

Carryover was an important tool for water users to individually manage through the dry conditions. A total of 2,500 ML of allocation was carried over from 2008–09 in the Broken system, a volume equivalent to a 10% allocation of high-reliability water shares.

As with all northern Victorian systems, Goulburn-Murray Water ended the irrigation season early to build reserves for supplies in 2010–11.

9.9 Qualification of rights

The Broken system was re-qualified in 2009–10 to ensure water corporations could supply essential domestic and stock needs while water reserves remained extremely low. The year commenced with a zero allocation and with Lake Nillahcootie at just 12% of capacity. There was a significant risk that there would not be enough water to run the Broken system for all of 2009–10.

To build up supplies to run the river in summer and autumn, passing flows were suspended at all sites in the water supply system, while tributary inflows sustained river flows. The only water released from the storage during this time was to supply essential domestic and stock needs and carryover. The environmental risk of the qualification was managed by G-MW, in cooperation with the GBCMA, based on the recommendations in the ecological risk assessment prepared in April 2009. Due to the extreme conditions, no water was specifically available for the environment to manage ecological risks. Consequently environmental risk was managed, to the extent possible, through domestic and stock releases, which provided some pool habitat.

Passing flows resumed on 1 February 2010, when there was enough water in storage to announce a 1% allocation for high-reliability water shares.

The qualification allowed North East Water to carryover up to 50% of its unused entitlement from the previous year, consistent with the carryover provisions in place for water share holders. However, to help maintain reserves for emergency supplies, access to any water held under its entitlement was suspended until 1 February when the 1% allocation was made.

Table 9-11 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights in the Broken Water System July 2009	1 July 2009 to 30 Jun 2010	Differential access by priority entitlements	Enabled domestic and stock users to take the volume of water necessary for essential needs (such as household purposes, fire fighting), and commercial and industrial users were able to take water for limited purposes	50% allocation or higher for high-reliability water shares on the Broken system	
			Allocation for North East Water's Tungamah, Devenish and St James bulk entitlement suspended	When the Broken system allocation is above zero	1 February 2010
			Goulburn-Murray Water's obligation to supply water to Tungamah domestic and stock customers suspended		
		Volume carried over	North East Water granted the right to carryover water that remained unused at 30 June 2009 up to 50% of entitlement minus 5% for losses	Expiry date: 30 June 2011	
		Reduced passing-flow requirements	Removed obligation of Goulburn-Murray Water to release water for passing flows on Broken River and Holland Creek	When the Broken system allocation is above zero	1 February 2010

9.10 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 9-12.

Most towns in the Broken basin are supplied from the Murray or the Goulburn system. These larger systems provided urban water corporations with more options to source water and enabled them to keep restrictions at medium to low levels. The local supply for Benalla was adequate for urban water restrictions to be removed in the second half of the year.

The Broken seasonal allocations for high-reliability water shares reaches just 17% during 2008–09. Although allocations were low, they were higher than 2008–09, when no water was able to be allocated to water shares.

Private diverters on the unregulated tributaries were again severely restricted or banned for a large part of the year.

Table 9-12 Seasonal allocations and restrictions on water use in Broken basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Benalla	Stage 1 restrictions from July to November 2009
	Katamatite	Stage 1 restrictions from July to November 2009
	Devenish, St James and Tungamah	Stage 2 restrictions from July to September 2009, and Stage 1 restrictions from October to December 2009
	Dookie	Stage 1 restrictions from October to November 2009
	Goorambat	Stage 3 restrictions from July 2009 to June 2010
	Cobram, Katunga, Nathalia, Numurkah, Picola, Strathmerton, Wunghnu, Yarroweyah	Stage 1 restrictions from July to November 2009
Regulated diversions	Broken system	Opening allocation of 0% in August 2009, increasing to 4% by February 2010, and closing at 17% in May 2010
Unregulated diversions	Boosey Creek	Irrigation ban July 2009 to June 2010
	Hollands Creek and Ryans Creek	Irrigation ban in August 2009 and from December 2009 to April 2010
	Lima East Creek and Lima creek	Irrigation ban in July 2009
Groundwater	Katunga WSPA	Seasonal allocations applied, with use from Katunga WSPA restricted to 70% allocation

9.11 Recycled water

North East Water operates the sole wastewater treatment plant in the Broken basin at Benalla. The volume of wastewater produced from the Benalla Treatment Plant reduced from 292 ML in 2008–09 to 213 ML in 2009–10. As in 2008–09, 100% of the wastewater produced in 2009–10 was recycled. Table 9-13 below details the recycling undertaken at Benalla during 2009–10.

Table 9-13 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Benalla	213	213	100%	-	213	-	-	-	-
Total 2009–10	**213**	**213**	**100%**	**-**	**213**	**-**	**-**	**-**	**-**
Total 2008–09	**292**	**292**	**100%**	**-**	**292**	**-**	**-**	**-**	**-**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in sewage treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site effluent storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

9.12 Water for the environment

9.12.1 Environmental Water Reserve (EWR)

Important environmental assets such as the Murray Cod and Trout Cod and significant areas of intact riparian and floodplain vegetation depend on the Broken basin EWR. Water from the Broken basin also feeds into the Murray basin, helping to maintain internationally significant environmental assets within that basin. These sites include Broken Creek and Lower Broken Creek which contains native fish habitat and a wetland of national significance.

In 2009–10 the Broken basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by North East Water and Goulburn-Murray Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

9.12.2 Entitlements for the environment

The Bulk Entitlement (Broken System – Snowy Environmental Reserve) Conversion Order 2006 was revoked during 2009–10. This order was created to temporarily hold water for the Snowy River following the government's purchase of entitlement from the Burnbrae property and completion of the Tungamah Pipeline project. This water is now included in the Bulk Entitlement (Murray River – Snowy Environmental Reserve) Order 2004.

9.12.3 Passing-flow compliance

Some bulk entitlements require passing-flow requirements to be met at a number of points in the basin.

North East Water reported that they met all passing-flow requirements in the Broken basin under their bulk entitlements in 2009–10.

Goulburn Murray Water reported several short-term non-compliances for the Broken River in 2009–10. Flows in the Broken River were below the required volume at Gowangardie for four days during February–March, at Broken Weir for four days during March and at Moorngag for two days in June.

Table 9-14 shows passing-flow compliance in the Broken basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The locations of these compliance points are presented in Figure 9-2.

Table 9-14 Selected passing-flow compliance in the Broken basin

River	Passing flow	
Ryan's Creek	Instrument where passing flows are specified	Bulk Entitlement (Loombah – McCall Say) Conversion Order 2001
	Responsible authority	North East Water
	Compliance point	Loombah Reservoir (shown as 1 in Figure 9-2)
	Passing-flow compliance	• The lesser of 2.75 ML per day or natural flow was passed • 3.5 KL per day was passed from February to May when the combined storage volume was greater than a specified amount at the beginning of the month
Broken River, Holland Creek	Instrument where passing flows are specified	Bulk Entitlement (Broken System – Goulburn-Murray Water) Conversion Order 2004
	Responsible authority	Goulburn-Murray Water
	Compliance point	Catchment upstream of Moorngag (Broken River upstream of Casey Weir) (shown as 2 in Figure 9-2)
	Passing-flow compliance	Failed at times to pass the lesser of 30 ML per day or natural flow from June to November inclusive
	Compliance point	Broken River between Broken Weir and Casey Weir (shown as 3 in Figure 9-2)
	Passing-flow compliance	Failed at times to pass the lesser of 22 ML per day or natural flow from December to May inclusive
	Compliance point	Holland Creek downstream of Holland Weir (shown as 4 in Figure 9-2)
	Passing-flow compliance	• Failed at times to pass the lesser of 22 ML per day or natural flow when water is diverted from Broken River and/or Holland Creek to Lake Mokoan • The prevailing flow was deemed as meeting environmental flows when water was not being diverted from Broken River and/or Holland Creek to Lake Mokoan

10 Goulburn basin

This chapter sets out the accounts for the Goulburn basin. For detailed information about how they have been compiled, refer to Chapter 5.

10.1 Goulburn basin summary

Although greater than 2008–09, inflows to the Goulburn basin in 2009–10 were 58% of the long-term average.

As with all northern Victorian systems, the season began with record low reserves and a 0% allocation and ended early to build reserves for supplies in 2010–11. The final seasonal allocation of 71% for high-reliability water shares was over double that reached in 2008–09.

The Minister for Water qualified rights on the Goulburn system to retain a portion of environmental water in storage and to ensure enough water could be supplied for essential domestic and stock needs while allocations were low.

Carryover was also important in supplementing supplies. Nearly 90,000 ML of allocation was carried over from 2008–09 by water users in the Goulburn system, equivalent to a 9% allocation of high-reliability water shares.

The water market was again very active in response to the water shortage. While there was a net export of water shares from the basin, there was a net total of nearly 50,000 ML of allocation transferred into the basin in 2009–10.

Urban customers experienced low restrictions throughout the 2009–10 year. Coliban Water's towns in the Goulburn system remained on Stage 2 restrictions for the entire year and Goulburn Valley Water was able to remove Stage 1 restrictions for most of its towns from December 2009 as allocations increased.

Licensed diverters on many streams were placed on severe restrictions for periods throughout 2009–10, particularly at the beginning of the year and over the summer months. The total volume of licensed diversions from unregulated streams almost doubled compared to 2008–09.

10.2 Responsibilities for management of water resources

Table 10-1 shows the responsibilities of various authorities within the Goulburn basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 10-1 Responsibilities for water resources management within the Goulburn basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Goulburn-Murray Water	Supplies Central Goulburn irrigation district, Rochester Irrigation Area, Shepparton Irrigation Area	Manages private groundwater pumping and surface water diversions	Delivers bulk supplies to many of Goulburn Valley Water's towns, and some of Coliban Water's towns	Operates Lakes Eildon and Nagambie, and the Waranga Basin Obliged to meet passing-flow requirements
Goulburn Valley Water			Supplies towns located in the Goulburn basin, including Shepparton, Alexandra and Seymour	Obliged to meet passing-flow requirements for towns with supply from unregulated streams
Coliban Water			Supplies towns located in the Loddon and Campaspe basins from the Goulburn basin including Bendigo	
Melbourne Water			Operates the Silver-Wallaby diversion system to Melbourne	Obliged to meet passing-flow requirements
Environment Minister				Manages release of Snowy Environmental Reserve to the Murray for irrigation use as part of arrangements to supply Snowy environmental flows, also Living Murray Environmental Entitlement
Goulburn Broken Catchment Management Authority				Manages waterways for the whole of the Goulburn basin

10.3 Rainfall, flows and storages in 2009–10

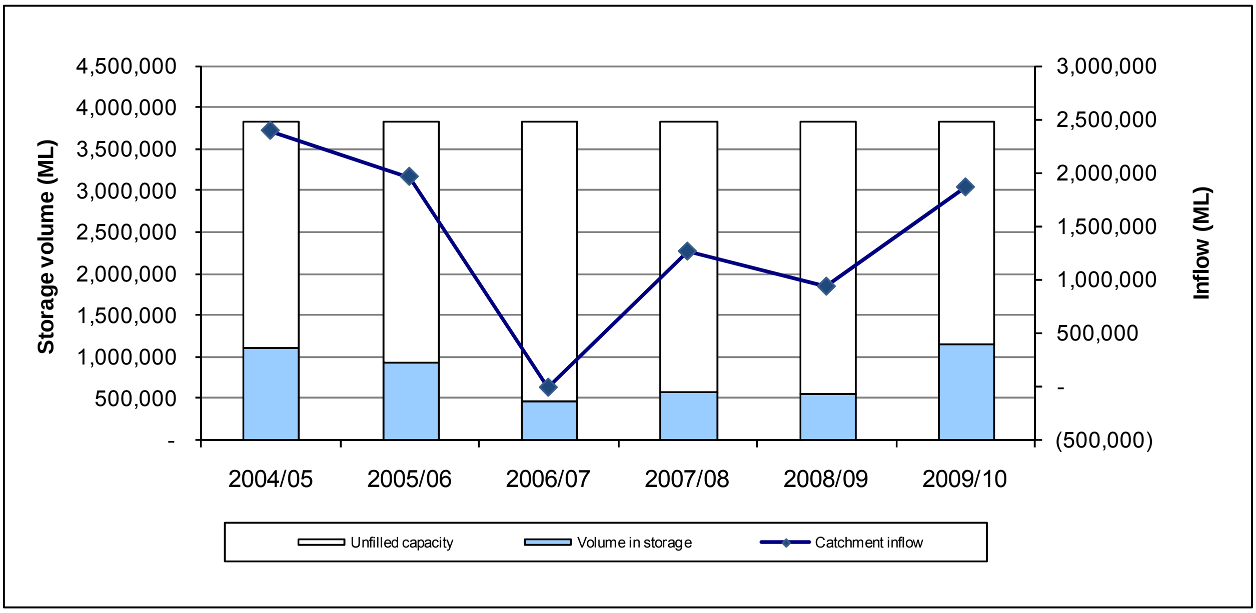
In 2009–10, rainfall across the Goulburn basin ranged between 80% and 125% of the long-term average. Inflows were moderate at 53% of the long-term average (of 3,363,000 ML).

The volume of water flowing from the Goulburn basin into the River Murray increased to 212,100 ML in 2009–10. In 2009–10 outflows from the Goulburn basin were 12% of catchment inflows, compared with 16% in the previous year.

Storage levels for all major storages (greater than 1,000 ML capacity) in the basin increased from 546,600 ML in July 2009 to 1,157,700 ML by June 2010, or 30% of the total storage capacity.

Only volumes for major on-stream storages have been included in the water balance, and as such, major storages such as Waranga Basin and Greens' Lake have not been included. The volume of water in the three major on-stream storages in the basin – Lake Eildon, Lake Nagambie (Goulburn Weir) and Sunday Creek Reservoir – increased by 484,100 ML in 2009–10 to 942,600 ML by June 2010.

Figure 10-1 All major storages and catchment inflows in the Goulburn basin



10.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Goulburn basin are shown in Table 10-2. Total use in 2009–10 increased by approximately 30% compared with 2008–09.

Table 10-2 Summary of total water resources and water use in the Goulburn basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	1,835,300	974,100
Groundwater(2)(3)	165,300	42,100
Recycled water	6,730	6,150

Notes:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 10-9 and the estimated domestic and stock use as presented in Table 10-10.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

(3) Groundwater entitlements in Shepparton are generally high as traditionally groundwater has been pumped for salinity control. The total licence entitlements may therefore not reflect the total water resource.

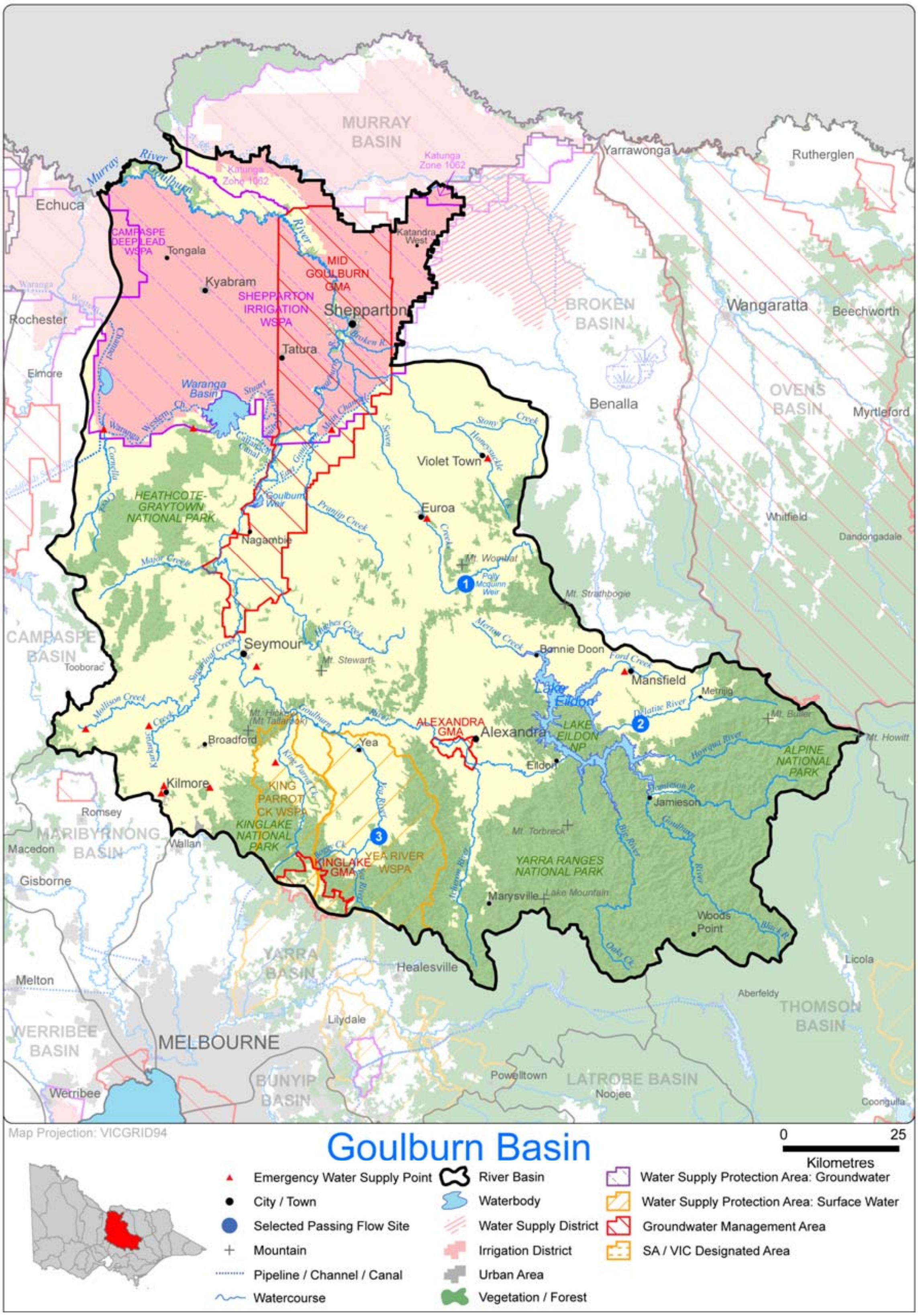
10.4.1 Infrastructure projects to improve water availability

Ongoing major infrastructure projects in the Goulburn basin include the Northern Victorian Irrigation Renewal Project, which commenced in 2007 and is expected to be completed in 2014. Works involve replacing the existing irrigation infrastructure to improve operation efficiency, including works to reduce channel outfalls, leakage and seepage, and rationalising the distribution system. During 2009–10 completed works included rationalisation works, meter installations, channel lining and installation of modernised gates.

In January 2009, Goulburn Valley Water began constructing the Upper Goulburn Water Supply Project, which will transfer treated water from Alexandra water treatment plant to Thornton and Eildon. This includes the construction of a 7 kilometre pipeline to Thornton and a 25 kilometre pipeline to Eildon.

10.5 Location of water resources

Figure 10-2 Map of the Goulburn basin



10.6 Surface water resources

10.6.1 Water balance

A surface-water balance for the Goulburn basin is shown in Table 10-3. Note that only on-stream storages with capacity greater than 1,000 ML have been included in the water balance.

Table 10-3 Balance of surface water in the Goulburn basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	458,500	498,800
Volume in storage at end of year	942,600	458,500
Change in storage	**484,100**	**(40,300)**
Inflows		
Catchment inflow(1)	1,755,100	921,000
Rainfall on major storages	57,000	n/a(5)
Inflow from Broken River at Gowangardie	22,400	12,400
Return flow from irrigation	0	0
Treated effluent discharged back to river(2)	760	320
Sub-total	**1,835,300**	**933,700**
Usage		
Urban diversions	25,480	25,530
Irrigation district diversions	844,100	647,000
Licensed diversions from regulated streams	25,100	8,800
Licensed diversions from unregulated streams	9,900	5,200
Silver and Wallaby Creeks to Yarra basin	5,300	1,200
Transfers to Melbourne via North-South pipeline	16,744	
Environmental water diversions		-
Small catchment dams(3)	47,500	47,500
Sub-total	**974,100**	**735,100**
Losses		
Evaporation losses from major storages	60,100	17,900 (5)
Losses from small catchment dams(3)	10,100	10,100
In-stream infiltration to groundwater, flows to floodplain and evaporation(4)	91,000	62,200
Sub-total	**161,200**	**90,200**
Water passed at outlet of basin		
Goulburn River to Campaspe River via Waranga Western Channel	3,800	2,800
Goulburn River outflow to River Murray	183,900	133,400
Goulburn River outflow to River Murray via Broken Creek	28,200	12,500

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Includes 180 ML of water returned to rivers within the basin from Mount Buller alpine resorts in 2009–10.

(3) Evaporation losses are calculated by subtracting estimated usage from total water harvested.

(4) Losses estimated using loss functions from the Goulburn Simulation Model (REALM).

(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

10.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 10-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 10-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	35,900	17,900	n/a
Registered commercial and irrigation	35,200	29,600	n/a
Total	**71,100**	**47,500**	**57,600**

n/a: Information not available.

10.6.3 Water entitlement transfers

Surface water movement in the Goulburn Basin in 2009–10 occurred through water share transfers and variations, allocation trade and temporary transfer of bundled entitlement.

Table 10-5 summaries transfers and variations in high-reliability and low-reliability water shares in 2009–10. During this year there was a net export of water from the basin, with 43,396 ML of high reliability, and 10,180 ML of low reliability being traded out of the basin.

Table 10-5 Transfers and variations of water shares in the Goulburn basin 2009–10 [1,2]

Delivery System	High-reliability water shares			Low- and spill-reliability water shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Central Goulburn Irrigation Area	36,643	60,961	-24,318	20,433	26,065	-5,633
Rochester Irrigation Area	15,034	26,214	-11,181	7,257	10,567	-3,310
Shepparton Irrigation Area	18,386	25,262	-6,876	9,350	10,574	-1,224
Goulburn River	936	1,957	-1,021	203	217	-14
Total 2009–10	**70,998**	**114,394**	**-43,396**	**37,243**	**47,423**	**-10,180**
Total 2008–09	50,876	84,791	-33,915	27,982	40,563	-12,581

Notes:

(1) This table summarises all recorded water share transfers and variations in the Goulburn basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water and land sale are also included in this table.

Table 10-6 summarises trades in allocation within the Goulburn basin, and with other basins in both Victoria and interstate. A total of 330,546 ML of water allocations was traded into the basin in 2009–10, with approximately two thirds of the volume traded within the basin. There was also a net import of water from interstate basins, with 56,168 ML of water entering the basin from interstate basins, compared to 48,417 ML of water being sold to interstate users. In total there was a net import of 49, 557 ML of water allocation into the basin in 2009–10.

Table 10-6 Allocation trade in the Goulburn basin [1,2]

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Goulburn basin	191,450	109,378
Trade from other Victorian basins	82,929	25,693
Trade to other Victorian basins	41,122	42,385
Interstate trade – inbound	56,168	76,193
Interstate trade – outbound	48,417	14,817
Total trade into the Goulburn basin	330,546	221,263
Net trade into the Goulburn basin	49,557	44,683

Notes:

(1) This table summarises allocation trades approved into, out of and within the Goulburn basin trading zones (Zone 1A Greater Goulburn, and Zone 3 Lower Goulburn) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

Table 10-7 summarises the movement of bundled entitlements in the Goulburn basin during 2009–10. Permanent trade in bundled water rights occurred within the Goulburn unregulated and Lower Goulburn unregulated systems in 2009–10. The temporary trade took place within the Goulburn unregulated, Lower Goulburn unregulated and Yea River unregulated systems in 2009–10. There was no net movement of bundled water rights into the Goulburn Basin in this water year for permanent trade.

Table 10-7 Transfers of surface-water bundled entitlements in the Goulburn basin 2009–10

Trading zone	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Goulburn unregulated	2	2	0	2	3	-1
King Parrot Creek unregulated	0	0	0	0	0	0
Lower Goulburn unregulated	80	80	0	16	20	-4
Yea River unregulated	0	0	0	2	2	0
Total 2009–10	82	82	0	20	25	-5
Total 2008–09	2	2	0	40	40	0

10.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 10-8. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. For multi-year entitlements, compliance is assessed based on the total volume of water diverted over the term of the entitlement. Therefore it is possible that an authority will still comply even though the volume diverted in any given year exceeds the average bulk entitlement volume.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Goulburn-Murray Water.

Table 10-8 Volume of water diverted under surface water entitlements in the Goulburn basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)(3)
Coliban Water					
Boort	1	425	-	202	Yes
Dingee	1	50	-	8	Yes
Lockington	1	130	-	84	Yes
Macorna	1	40	-	6	Yes
Mitiamo	1	60	-	23	Yes
Mysia	1	15	-	1	Yes
Pyramid Hill	1	300	-	132	Yes
Rochester	1	1,400	(238)	1,153	Yes
Goulburn Valley Water					
Alexandra	1	916	(450)	357	Yes
Bonnie Doon	1	112	-	45	Yes
Buxton	1	110	-	-	Yes
Colbinabbin	1	89	-	22	Yes
Corop	1	44	(30)	10	Yes
Dookie	1	160	-	88	Yes
Eildon	1	471	(300)	133	Yes
Euroa System	1	1,990	-	697	Yes
Girgarre	1	100	-	43	Yes
Katandra West	1	64	-	46	Yes
Kyabram	1	2,000	(800)	1,270	Yes
Longwood	1	120	-	49	Yes
Mansfield	2	1,300	-	584	Yes
Marysville	1	462	-	184	Yes
Mooroopna	1	300	-	174	Yes
Murchison	1	350	(110)	181	Yes
Nagambie	1	825	(200)	572	Yes
Pyalong	1	75	-	40	Yes
Rushworth	1	530	(160)	272	Yes
Seymour	1	5,340	(3,100)	1,914	Yes
Shepparton	1	17,970	(4,600)	11,489	Yes
Stanhope	1	200	(100)	85	Yes
Sunday Creek	10	2,238	-	2,339	No
Tatura	1	2,600	(300)	2,056	Yes
Thornton	1	120	-	43	Yes
Tongala	1	1,404	(500)	783	Yes
Upper Delatite	1	235	-	62	Yes
Violet Town	1	20	-	-	Yes
Woods Point	1	30	-	17	Yes
Yea	1	438	-	233	Yes
GWMWater					
Quambatook – Grampians Wimmera-Mallee Water	1	100	-	86	Yes
Melbourne metropolitan retailers					
Silver and Wallaby Creek	3	22,000	-	5,300	Yes
Goulburn River (6)	1	6,721	(20,800)	16,744	Yes
Environment Minister					
Goulburn System – Snowy Environmental Reserve (4)	1	16,812	-	10,592	Yes
Environmental Entitlement	1	196,605	-	-	Yes

Goulburn System – Living Murray					
Silver and Wallaby Creeks Environmental Entitlement	1	n/a	-	n/a	n/a
Goulburn-Murray Water					
Eildon – Goulburn Weir	10	1,919,000	-	869,205	Yes
AGL Hydro Ltd					
Rubicon – Southern Hydro Ltd(5)	1	0	0	0	Yes
Total annual volume of bulk entitlements 2009–10		**2,177,271**	**(10,888)**	**927,324**	
Total annual volume of bulk entitlements 2008–09		**2,139,991**	**(9,147)**	**688,991**	
Licensed diversions from unregulated streams 2009–10		*40,089*		*9,900*	
Licensed diversions from unregulated streams 2008–09		*40,259*		*5,200*	

Note:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) Compliance is also assessed against the Murray-Darling Basin annual cap target for the Goulburn, Loddon and Broken basins. Details of this are contained in the MDBA's *Water audit monitoring report 2009–10*.

(3) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(4) The volume diverted under this bulk entitlement is passed to the Murray as a substitute for Snowy River water formerly released to the Murray.

(5) The Rubicon – Southern Hydro Limited bulk entitlement held by AGL Hydro Limited is for non-consumptive purposes and therefore the volume has not been included. Any water diverted under this entitlement is returned to the watercourse.

(6) Bulk entitlement for the Goulburn River system to Melbourne Metropolitan Retailers was granted on 27 January 2010, but was disallowed by legislative council on 25 June 2010 and replaced with a supply by agreement. The temporary transfer shown was made available under the qualification of rights.

10.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Goulburn basin, excluding domestic and stock use, is presented in Table 10-9.

The Goulburn basin contains the whole Alexandra GMA and Mid-Goulburn GMA as well as parts of the Campaspe Deep Lead WSPA, Shepparton WSPA, Katunga WSPA, and Kinglake GMA. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

Reported groundwater usage in the Goulburn basin reduced in 2009–10 compared with 2008–09, largely due to decreased extraction in the Alexandra GMA, Mid-Goulburn GMA, Kinglake GMA and Shepparton WSPA.

Groundwater levels in this basin are generally declining. Extractions from the Campaspe Deep Lead WSPA were restricted to 50% allocation from July 2009 to March 2010 and 65% allocation from March 2010 to June 2010. Extractions from the Katunga WSPA were reduced to 70% allocation during 2009–10.

Table 10-9 Licensed groundwater volumes, Goulburn basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores(5) (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Alexandra GMA (100%)	All depths	1,937	1,714	238	-	238	1,211
Mid-Goulburn GMA (100%)	Zone 1070 – >25 Zone 1071 all depths	14,900	12,330	3,725	-	3,725	4,566
Kinglake GMA (81%)	All depths	1,636	1,513	164	-	164	1,121
Campaspe Deep Lead WSPA (10%)	>25	2,964	4,560	2,113	-	2,113	2,385
Katunga WSPA (11%)	>25	4,627	6,610	3,446	-	3,446	3,652
Shepparton WSPA (57%)	≤25	134,590	134,590	28,393	-	28,393	32,651
Total(6)		**160,654**	**161,317**	**38,079**	**-**	**38,079**	**45,586**

Notes:
(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.
(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.
(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established (for example Shepparton WSPA), in which case the licensed entitlement is used. The entitlement limit in the Campaspe Deep Lead WSPA and Katunga WSPA are represented by 65% and 70% PCV respectively due to restrictions in place during 2009–10. Prior to March 2010, the restriction for Campaspe Deep Lead WSPA was 50%
(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.
(5) No estimates provided. All existing licensed bores with greater than 20 ML per year entitlement have been metered.
(6) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 10-10. Groundwater does not supplement the urban water supply in the Goulburn basin.

Table 10-10 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	Number of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Alexandra GMA	20	40
Kinglake GMA	260	520
Campaspe Deep Lead WSPA	31	62
Katunga WSPA	90	180
Mid-Goulburn GMA	226	452
Shepparton WSPA	1,359	2,718
Total	**1,986**	**3,972**

Notes:
(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 10-9.
(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.
(3) Total volumes are based on the sum of management unit data prior to rounding.

10.8 Drought contingency measures

Drought contingency measures in the Goulburn basin in 2009–10 included:

- restricting urban and rural water use (discussed below in Section 10.9)
- utilising carryover
- ending the irrigation season early to build reserves for 2010–11
- the continuation of a qualification of rights as detailed below in Table 10-11.

Carryover was important in supplementing supplies in the regulated system when allocations were low. Nearly 90,000 ML of allocation was carried over from 2008–09 by water users in the Goulburn system, equivalent to a 9% allocation.

As with all Northern Victorian irrigation systems, Goulburn-Murray Water ended the irrigation season early to build reserves for 2010–11.

10.9 Qualification of rights

The Goulburn system was re-qualified in 2009–10 in response to the continuing water shortage. The year commenced with a zero allocation and with storages holding just 14.3% of capacity.

The qualifications ensured that water corporations could supply essential domestic and stock needs while reserves remained extremely low. By 1 October 2009 Goulburn system reserves had recovered sufficiently to announce a 30% allocation, at which time water users were allocated water in line with their entitlements.

Consistent with the carryover provisions in place for water share holders, the qualification allowed urban water corporations to carryover up to 50% of their unused entitlement from the previous year, minus losses. This contributed to maintaining town supplies at the beginning of the year when urban allocations were less than 100%.

To help build reserves to meet essential needs, the qualification suspended Goulburn-Murray Water's obligation to supply the East and West Loddon Waterworks District (which typically incurs high losses) while allocations were zero percent, and reduced passing flows in the Goulburn River while allocations were less than 10%.

While supplies were suspended, East and West Loddon Waterworks District customers could access water from emergency supply points on nearby operating channels. Supplies resumed on 15 September, when the first allocation was announced.

The environmental impacts of the temporarily reduced passing flows were managed in two ways:

- by the potential use of 20 GL remaining in the Goulburn water-quality reserve to address possible water quality risks in the river system. 818 ML was released from the reserve in 2009–10 to improve water quality in lower Broken Creek.
- when allocations reached 1%, the passing flows could be either reinstated or withheld in storage and released by Goulburn Broken Catchment Management Authority to best meet the needs of a recovering river system.

A scientific panel report on the ecological implications of the qualification was prepared before the start of the year, and provided guidance on objectives for environmental water releases. In partnership with Goulburn-Murray Water, Goulburn-Broken Catchment Management Authority directed these water releases to supplement baseflows in the Goulburn River and to top up flows generated from high rainfall events to mimic the pattern of natural flushing events. The qualification also allocated verified water savings from the Northern Victorian Irrigation Renewal Project and Wimmera-Mallee Pipeline Project to Melbourne, as well as 10 GL from the Goulburn Water Quality Reserve. A total of 27.7 GL was allocated for Melbourne in 2009–10.

Table 10-11 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights in the Goulburn Water System July 2009	1 July 2009 to 30 June 2010				
		Differential access by priority entitlements	Enabled domestic and stock users to take the volume of water necessary for essential needs (such as household purposes, fire fighting), and commercial and industrial users' could take water for limited purposes	20% allocation or higher for high-reliability shares on the Goulburn system	1 October 2009
		Differential access by priority entitlements	Supplies to East and West Loddon Waterworks District reduced	1% allocation or higher for high-reliability water shares on the Goulburn system	15 September 2009
		Differential access by priority entitlements	10,000 ML of water set aside (under provisions in Bulk Entitlement (Eildon – Goulburn Weir) Conversion Order 1995) for water quality releases in the Goulburn River and lower Broken Creek was made available to supply Melbourne	Expiry date: 30 June 2011	
		Differential access by priority entitlements	Obligation to supply Grampian Wimmera Mallee Water's Wimmera Mallee Water District entitlement volume suspended and reserved for urban supply	Expiry date: 30 June 2011	
		Reduced passing-flow requirements	Goulburn-Murray Water's passing-flow requirements for Goulburn River at Goulburn Weir and McCoys Bridge gauging station reduced	Expiry date: 30 June 2011	
		Differential access by priority entitlements	Passing-flow account created once allocations were greater than 1% to record volume of water that would otherwise be passed for release at the discretion of the Goulburn-Broken Catchment Management Authority within the current water year	Expiry date: 30 June 2011	
		Volume carried over	Urban corporations granted right to carry over water that remained unused at 30 June 2009 up to 50% of entitlement volume less 5% losses	Expiry date: 30 June 2011	
Further Temporary Qualification of Rights in the Goulburn Water System 2010	12 March 2010 to 30 June 2010	Access to unallocated water provided	Allow Goulburn-Murray Water to reserve modernisation water savings from Stage 1 of NVIRP for supply to Melbourne, the environment and irrigators	Expiry date: 30 June 2011	

10.10 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 10-12.

Urban customers experienced low restrictions throughout the 2009–10 year. Coliban Water's towns in the Goulburn system remained on Stage 2 restrictions for the entire year and Goulburn Valley Water was able to remove Stage 1 restrictions for most of its towns in December 2009.

The Goulburn system irrigation season began with a 0% allocation. The final seasonal allocation of 71% of high-reliability water shares was much higher than the previous year which saw a closing allocation of 33%.

Licensed diverters on many streams throughout the basin were placed on severe restrictions for part of 2009–10.

Table 10-12 Seasonal allocations and restrictions on water use in Goulburn basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Kyabram, Tatura and Tongala	Stage 1 restrictions from July to October 2009
	Woods Point	Stage 1 restrictions from July to November 2009
	Kilmore, Wandong, and Heathcote Junction	Stage 1 restrictions from July to November 2009
	Broadford and Clonbinane	Stage 1 restrictions from July to November 2009
	Euroa, Violet Town	Stage 2 restrictions from July to September 2009 and Stage 1 restrictions from October to November 2009
	Sawmill Settlement, Merrijig	Stage 1 restrictions from July to November 2009
	Mansfield	Stage 1 restrictions from July to November 2009
	Longwood	Stage 1 restrictions from July to November 2009 and from February to March 2010
	Bonnie Doon	Stage 1 restrictions from July to November 2009
	Alexandra, Eildon, Murchison, Nagambie, Rushworth, Seymour/ Mangalore, Shepparton, Mooroopna, Toolamba, Corop, Girgarre, Katandra West, and Stanhope	Stage 1 restrictions from July to November 2009
	Pyalong	Stage 1 restrictions from July to November 2009
	Marysville	Stage 1 restrictions from July to November 2009
	Thornton	Stage 1 restrictions from July to November 2009
	Yea	Stage 1 restrictions from July to November 2009
	Boort, Dingee, Lockington, Macorna, Mitiamo, Mysia, Pyramid Hill, Rochester	Stage 2 restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Waterford Park	Stage 1 restrictions from July to November 2009
	Seven Creeks	Stage 2 restrictions from July to September 2009 and Stage 1 restrictions from October to November 2009.
	Nine Mile Creek	Stage 1 restrictions from July to November 2009 and January to March 2010
	Avenel, Barmah, Buxton, Colbinabbin, Congupna, Goulburn Weir, Kirwans Bridge, Merrigum, Molesworth, Strathbogie, Tallarook, Tallygaroopna	Stage 1 restrictions from July to November 2009
Irrigation and regulated diversions	Goulburn System	Allocation began the year at 0% of entitlement, increasing to 58% in February 2010, and closing at 71% in May 2010
Unregulated diversions	Yea River and tributaries	Stage 3 restrictions from July 2009 to June 2010
	Sevens Creek	Irrigation ban from July to August 2009 and November 2009 to June 2010
	Sunday Creek	Irrigation ban from November 2009 to May 2010
	Faithfulls Creek	Irrigation ban from July to August 2009 and November 2009 to June 2010
	Hughes Creek	Irrigation ban from January to April 2010
	Stony Creek	Irrigation ban from July to September 2009 and November 2009 to June 2010
	Stevenson River and Little Stevenson River	Irrigation ban from July 2009 to April 2010
	Cummins Creek, Strath Creek, Chyser Creek, Johnstons Creek, Pheasant Creek	Irrigation ban July to September 2009
	King Parrot Creek	Irrigation ban from July to September 2009
	Wallaby Creek	Irrigation ban from July 2009 to June 2010
Groundwater	Katunga WSPA	Seasonal allocations applied, with use from Katunga WSPA restricted to 70% allocation
	Campaspe Deep Lead WSPA	Use from Campaspe Deep Lead WSPA restricted to 50% allocation

10.11 Recycled water

Goulburn Valley Water operates all wastewater treatment plants in the Goulburn basin. Approximately 97% of the volume of wastewater passing through treatment plants in the basin was recycled (Table 10-13), an increase of 5% compared with 2008–09. For most treatment plants, 100% of wastewater was recycled.

Table 10-13 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Alexandra	195	57	29%	-	57	-	-	138	(0)
Avenel	11	11	101%	-	11	-	-	-	(0)
Bonnie Doon	11	11	97%	-	11	-	-	-	0
Broadford	104	104	100%	-	104	-	-	-	(0)
Eildon	125	-	0%	-	-	-	-	125	(0)
Euroa	202	201	100%	54	147	-	-	-	1
Girgarre	-	-	0%	-	-	-	-	-	-
Kilmore	203	203	100%	-	203	-	-	-	0
Kyabram / Merrigum	262	262	100%	-	262	-	-	-	(0)
Mansfield	178	179	100%	53	126	-	-	-	(1)
Marysville	-	-	0%	-	-	-	-	-	-
Mooroopna	839	839	100%	-	839	-	-	-	(0)
Murchison	-	-	0%	-	-	-	-	-	-
Nagambie	67	67	100%	-	67	-	-	-	0
Seymour	333	333	100%	49	284	-	-	-	0
Shepparton	2,989	2,670	89%	-	2,670	-	-	319	0
Stanhope / Rushworth	-	-	0%	-	-	-	-	-	-
Tatura	919	919	100%	-	919	-	-	-	0
Tongala	221	221	100%	-	221	-	-	-	(0)
Upper Delatite	-	-	0%	-	-	-	-	-	-
Violet Town	4	4	100%	4	-	-	-	-	-
Yea	72	72	100%	28	44	-	-	-	(0)
Total 2009–10	**6,734**	**6,153**	**91%**	**188**	**5,965**	**-**	**-**	**582**	**(1)**
Total 2008–09	**6,840**	**6,646**	**97%**	**235**	**6,411**	**-**	**-**	**194**	**0**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in sewage treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site effluent storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

10.12 Water for the environment

10.12.1 Environmental Water Reserve (EWR)

Important environmental assets, such as wetlands of state significance, significant areas of intact riparian and floodplains vegetation and endangered flora and fauna species including Trout Cod and Murray Cod depend on the EWR in the Goulburn basin. Water from the Goulburn basin also feeds into the Murray Basin helping to maintain internationally significant environmental assets such as Gunbower Forest and the Kerang Wetlands within that basin. Sites on the Goulburn that rely on EWR include:

- Lower Goulburn River (below Goulburn Weir) which contains a wetland of national significance, native fish habitat and floodplain national park
- Reedy Swamp which is a regionally significant wetland that is part of Lower Goulburn National Park and contains drought refuge and significant habitat for colonial nesting birds
- Barmah Forest which is the largest river red gum forest in the world is a RAMSAR site and Living Murray Icon site, a national park and a site where native fish breed.

In 2009–10 the Goulburn basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements (regulated and unregulated systems) held by Goulburn Valley Water and Goulburn Murray Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions

- all other water in the basin not allocated for consumptive use, that is, water above cap
- the Goulburn River – Living Murray Environmental Entitlement of 39,625 ML of high-reliability water and 156,980 ML of low-reliability water held by the Environment Minister.
- the Goulburn system – Snowy Environmental Reserve bulk entitlement of 16,812 ML held by the Environment Minister
- the Goulburn River – Environmental Water Reserve, which was established in 2010
- the Silver and Wallaby Creeks Environmental Entitlement, which provides passing flow rules on Silver and Wallaby Creeks.

10.12.2 Entitlements for the environment

The formal entitlement for the environment in the Goulburn basin in 2009–10 was the Goulburn River – Living Murray Environmental Entitlement of 39,625 ML of high-reliability water and 156,980 ML of low-reliability water held by the Environment Minister. Due to the ongoing drought and low storage levels, no allocation was received for this entitlement during 2009–10 however water was obtained via trade-in from the Living Murray. This was carried over to 2010–11.

10.12.3 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

Goulburn-Murray Water reported that it complied with all passing-flow requirements in the Goulburn basin during 2008–09.

Table 10-14 shows passing-flow compliance in the Goulburn basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The location of these compliance points is presented in Figure 10-2.

Table 10-14 Selected passing-flow compliance in the Goulburn basin

River	Passing flows	
Seven Creeks	Instrument where passing flows are specified	Bulk Entitlement (Euroa System) Conversion Order 2001
	Responsible authority	Goulburn Valley Water
	Compliance point	Polly McQuinns Reservoir (shown as 1 in Figure 10-2)
	Passing-flow compliance	The lesser of 10 ML per day or observed flow was passed
Delatite River	Instrument where flow-sharing rules are specified	Bulk Entitlement (Mansfield) Conversion Order 1995
	Responsible authority	Goulburn Valley Water
	Compliance point	Upstream of Tonga Bridge Gauging Station (shown as 2 in Figure 10-2)
	Passing-flow compliance	• all flows were passed for flows less than 18 ML per day • 18 ML per day was passed for flows between 18 and 20.2 ML per day • the entire flow, less 2.2 ML per day was passed for flows between 20.2 and 30 ML per day • 27.8 ML per day was passed for flows between 30 and 32.2 ML per day • the entire flow, less 4.4 ML per day was passed for flows greater than 32.2 ML per day
Yea River	Instrument where flow-sharing rules are specified	Bulk Entitlement (Yea) Conversion Order 1997
	Responsible authority	Goulburn Valley Water
	Compliance point	Upstream of the Yea urban offtake (shown as 3 in Figure 10-2)
	Passing-flow compliance	• Half the flow was passed for flows less than 7.2 ML per day • The entire flow, less 3.6 ML per day was passed for flows greater than 7.2 ML per day

10.12.4 Streamflow management plan

Local management plans for King Parrot Creek, Yea River and Sevens Creek were recommended under the Northern Region Sustainable Water Strategy. Work has commenced to develop these.

11 Campaspe basin

This chapter sets out the accounts for the Campaspe basin. For detailed information about how they have been compiled, refer to Chapter 5.

11.1 Campaspe basin summary

Inflows in the Campaspe basin were 19% of the long-term average, leaving it again one of the most drought-affected basins in Victoria.

The severe water shortage prevented seasonal allocations being announced on both the regulated Campaspe and Coliban Rural systems. This is the third time in four years water users on the Campaspe system have not received an allocation.

The zero allocations forced water resource managers to focus on securing essential domestic and stock needs and emergency rural supplies through qualification of rights and contingency operations. Carryover was also important in supplementing supplies in the Campaspe system, as was use of the water market. In 2009–10 a net total of 3,844 ML of allocation was transferred to the Campaspe basin, while there was net export of water shares out of the basin.

As for all major northern Victorian systems, the irrigation season closed in April 2010 and all water resource improvements after this date were directed towards building supplies for the 2009–10 season.

Environmental passing flows were qualified on the Campaspe River and Coliban Rivers to retain water in Lake Eppalock and Upper Coliban storages for emergency consumptive supplies.

Most of the major towns located within the Campaspe basin, such as Heathcote, Kyneton and Malmsbury, were subjected to harsh Stage 3 and Stage 4 water restrictions over the year due to the continuing water shortage. However, towns supplied from other sources, such as the Murray and Goulburn systems, were typically subject to lower restrictions and were further eased as allocations increased throughout the year.

Severe restrictions were placed on licensed diverters on a number of unregulated streams throughout the basin again in 2009–10.

Groundwater continued to play an important role in rural supplies in the basin. Approximately 26,000 ML of groundwater was extracted by licensed users in 2009–10, accounting for around a third of total water use.

11.2 Responsibilities for management of water resources

Table 11-1 shows the responsibilities of various authorities within the Campaspe basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 11-1 Responsibilities for water resources management within the Campaspe basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Goulburn-Murray Water	Supplies Rochester irrigation district and Campaspe irrigation district	Manages groundwater and surface water licensed diversions	Provides bulk water supply to Coliban Water	Operates Lake Eppalock Obliged to meet passing-flow requirements
Coliban Water	Provides irrigation and domestic and stock supplies off the Coliban Main Channel		Supplies urban water for the majority of the Campaspe basin, including Echuca, Rochester and Kyneton	Operates Upper Coliban, Lauriston and Malmsbury Reservoirs in the upper reaches of the Campaspe basin Obliged to meet passing-flow requirements
Western Water			Supplies urban water for Woodend at the southern end of the basin	Obliged to meet passing-flow requirements
North Central Catchment Management Authority				Manages waterways in the whole of the Campaspe basin

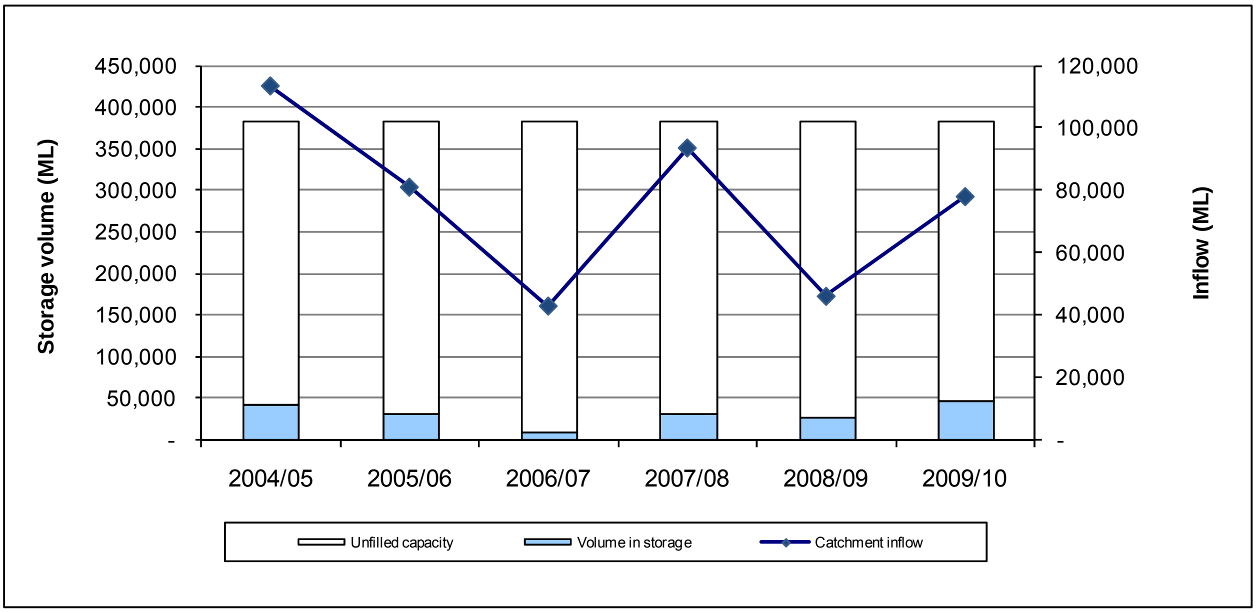
11.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall across the Campaspe basin ranged from 80% to 150% of the long-term average. Despite good rainfall, catchment inflow was just 22% of the long-term average (352,000 ML).

The amount of water flowing from the Campaspe basin into the River Murray was 5,300 ML in 2009–10. This represents 7% of the total inflows into the basin, which is less than the 8% for 2008–09.

Storage levels for all major storages (greater than 1,000 ML) in the basin increased from 24,900 ML in July 2009 to 42,800 ML (12% of capacity) by the end of June 2010. In the Campaspe basin, on-stream storages greater than 1,000 ML capacity include the Upper Coliban, Lauriston and Malmsbury Reservoirs, and Lake Eppalock.

Figure 11-1 All major storages and catchment inflows in the Campaspe basin



11.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Campaspe basin are shown in Table 11-2. The volume of available surface water in 2009–10 was higher than in 2008–09 (104,200 ML compared with 64,600 ML). Demand also increased from 2008–09 levels, even though no allocations were made available in the Campaspe and Coliban rural systems. Total groundwater usage in the Campaspe basin reduced in 2009–10 compared with 2008–09.

Table 11-2 Summary of total water resources and water use in the Campaspe basin 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	104,100	55,100
Groundwater(2)	71,600	26,300
Recycled water	1,930	1,530

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 11-8 and the estimated domestic and stock use as presented in Table 11-9.

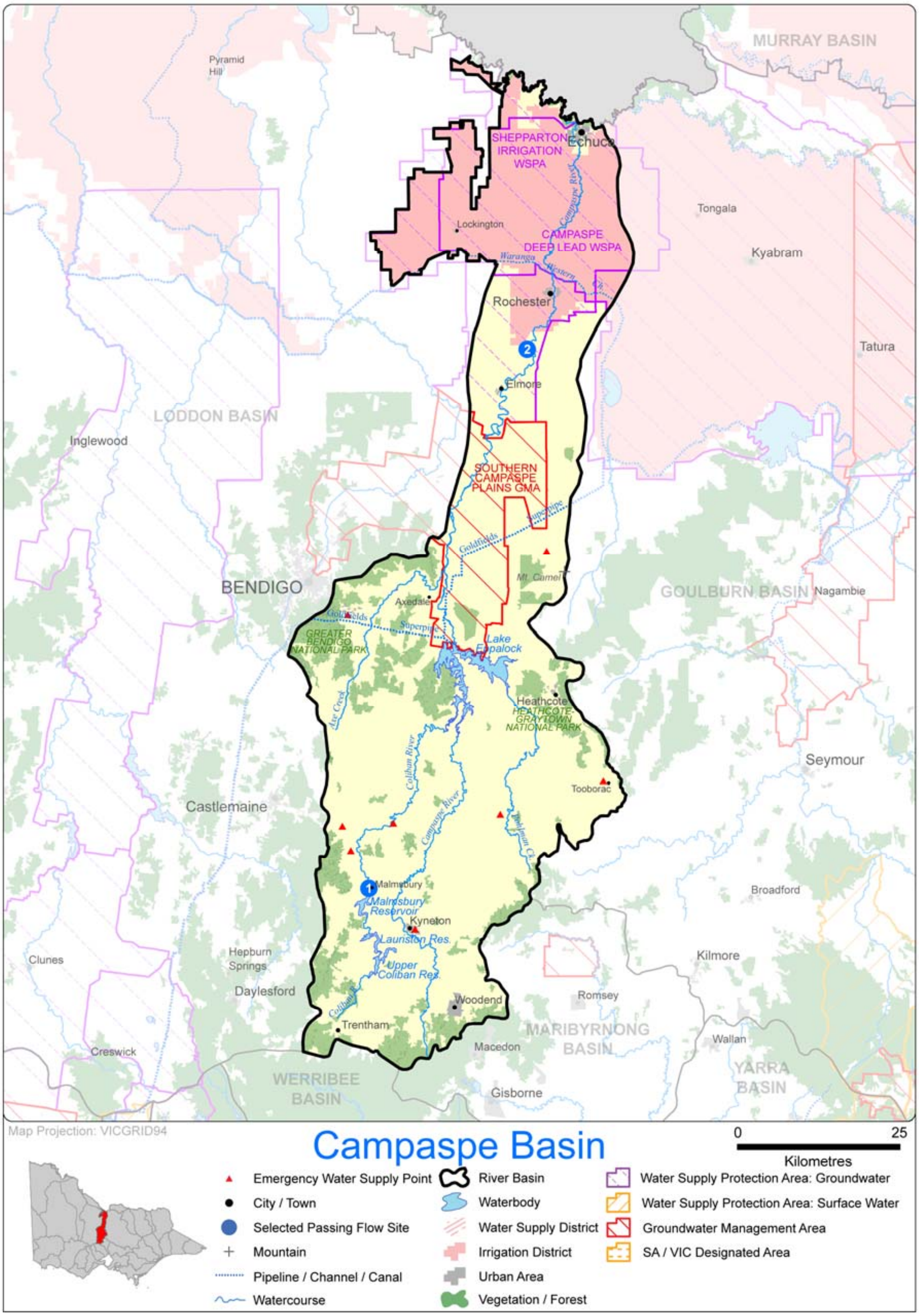
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

11.4.1 Infrastructure projects to improve water availability

No infrastructure projects were undertaken in the Campaspe basin for 2009–10.

11.5 Location of water resources

Figure 11-2 Map of the Campaspe basin



11.6 Surface water resources

11.6.1 Water balance

A surface-water balance for the Campaspe basin is shown in Table 11-3. Note that only on-stream storages with capacity greater than 1,000 ML have been included in the water balance.

Table 11-3 Balance of surface water in the Campaspe basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	24,900	28,100
Volume in storage at end of year	42,800	24,900
Change in storage	**17,900**	**(3,200)**
Inflows		
Catchment inflow[(1)]	77,800	46,100
Rainfall on major storages	4,300	n/a[(5)]
Return flow from irrigation	0	0
Transfer from Waranga Western Channel to River Murray via Campaspe River	3,790	2,780
Transfer to Campaspe basin from Waranga Western Channel	17,900	15,600
Treated wastewater discharged back to river	300	150
Sub-total	**104,100**	**64,600**
Usage		
Urban diversions	12,100	11,300
Coliban Channel rural diversions	1,900	1,600
Campaspe irrigation district diversions	1,600	1,600
Licensed diversions from regulated streams	200	500
Licensed diversions from unregulated streams	100	100
Small catchment dams[(2)]	28,800	19,100
Transfer from Campaspe Basin to White Swan Reservoir[(3)]	10,400	11,420
Sub-total	**55,100**	**45,600**
Losses		
Evaporation losses from major storages	7,000	4,000 [(5)]
Losses from small catchment dams[(2)]	14,800	14,200
In-stream infiltration to groundwater, flows to floodplain and evaporation[(4)]	4,000	500
Sub-total	**25,800**	**18,700**
Water passed at outlet of basin		
Campaspe River outflow to River Murray	5,300	3,500

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from total water harvested.

(3) Reflected as a transfer into the Barwon Basin.

(4) Losses estimated using loss functions from the Goulburn Simulation Model (REALM).

(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

11.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values provided in Table 11-4 are based on estimates provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 11-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	15,000	7,500	n/a
Registered commercial and irrigation	25,300	21,300	n/a
Total	**40,300**	**28,800**	**43,600**

n/a: Information not available.

11.6.3 Water entitlement transfers

Surface water was moved into, out of and within the Campaspe basin during 2009–10 through water share transfers and variations and allocation trade. There were no trades of temporary or permanent bundled entitlements in this water year.

Table 11-5 summarises the movement of water shares into and out of the Campaspe basin delivery systems during 2009–10. There was a net movement of water shares out of the basin in 2009–10, with 6,625 ML of high-reliability and 491 ML of low-reliability water leaving the basin.

Table 11-5 Transfers and variations of water shares in the Campaspe basin 2009–10 (1), (2)

Delivery System	High-reliability water shares			Low- and spill-reliability water shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Campaspe irrigation district	1,676	6,534	-4,858	1,133	1,219	-86
Campaspe River	255	2,022	-1,766	131	536	-405
Total 2009–10	**1,931**	**8,555**	**-6,625**	**1,264**	**1,755**	**-491**
Total 2008–09	1,518	2,716	-1,198	876	1,041	-165

Notes:

(1) This table summarises all recorded water share transfers and variations in the Campaspe basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water and land sale are also included in this table.

Table 11-6 summarises the trade of allocation in Victoria's share of the Campaspe basin during 2009–10. A total of 3,844 ML of water was traded, with a majority of that being trade with other Victorian basins. In total, 111 ML of water allocation moved out of the Campaspe basin in 2009–10.

Table 11-6 Allocation trade in the Campaspe basin (1), (2)

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Campaspe basin	534	548
Trade from other Victorian basins	1,550	2,469
Trade to other Victorian basins	3,419	596
Interstate trade – inbound	1,760	305
Interstate trade – outbound	2	0
Total trade into the Campaspe basin	**3,844**	**3,322**
Net trade into the Campaspe basin	**-111**	**2,177**

Notes:

(1) This table summarises allocation trades approved into, out of and within the Campaspe basin trading zones (Zone 4C Lower Campaspe, Zone 4A Campaspe – Eppalock to WWC) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

11.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 11-7.

Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. For multi-year entitlements, compliance is assessed based on the total volume of water diverted over the term of the entitlement. Therefore it is possible that the volume diverted in any given year may exceed the average bulk entitlement volume.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Goulburn-Murray Water.

Table 11-7 Volume of water diverted under surface water entitlements in the Campaspe basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)(3)
Coliban Water					
Axedale and Goornong(4)	1	215	(35)	73	Yes
Part Rochester(4)	10	134		0	Yes
Campaspe System – Coliban Water	3	50,260	7,379	3,141	Yes
Western Water					
Woodend	1	802	-	164	Yes
Goulburn-Murray Water					
Campaspe System	10	83,590	-	1,840	Yes
Environment Minister					
Environmental Entitlement Campaspe River – Living Murray Initiative	1	5,174	-	-	Yes
Total annual volume of bulk entitlements 2009–10		**140,175**	**7,344**	**5,218**	
Total annual volume of bulk entitlements 2008–09		**140,086**	**10,193**	**5,933**	
Licensed diversions from unregulated streams 2009–10		*8,698*		*100*	
Licensed diversions from unregulated streams 2008–09		*9,238*		*100*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) Compliance is also assessed against the Murray-Darling Basin annual cap target for the Campaspe basin. Details of this are contained in the MDBC's *Water audit monitoring report 2009–10*.

(3) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(4) Axedale, Goornong and part of Rochester bulk supplies are provided under the same bulk entitlement. Rochester is also supplied under Coliban Water's bulk entitlement from the Goulburn system. Coliban Water supplied Rochester solely from the Goulburn system in 2009–10.

11.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Campaspe basin, excluding domestic and stock use, is presented in Table 11-8.

The Campaspe basin contains part of the Campaspe Deep Lead WSPA, the Shepparton WSPA and the Southern Campaspe Plains GMA. The Southern Campaspe Plains GMA was created in 2007–08. Groundwater entitlements and use within unincorporated areas are detailed in Appendix A.

Extractions from Campaspe Deep Lead WSPA were restricted to 65% allocation during 2009–10. Groundwater levels are declining in all GMUs in this area.

Table 11-8 Licensed groundwater volumes, Campaspe basin 2009–10

WSPA/GMA[(1)]	GMA/ WSPA depth limits[(2)] (m)	Entitlement limit[(3)] (ML/year)	Licensed entitlement[(4)] (ML/year)	Metered use (ML)	Estimated use in unmetered bores[(5)] (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Campaspe Deep Lead WSPA (82%)	>25	24,495	37,684	17,466	-	17,466	19,710
Shepparton WSPA (12%)	≤25	28,148	28,148	5,938	-	5,938	6,829
Southern Campaspe Plains GMA (55%)	All depths	4,898	4,597	1,736	-	1,736	1,942
Total[(6)]		**57,540**	**70,429**	**25,140**	**-**	**25,140**	**28,481**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established (for example Shepparton WSPA), in which case the licensed entitlement is used. The entitlement limit in the Campaspe Deep Lead WSPA is represented by 65% PCV due to restrictions in place during 2009–10.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) No estimates provided. All existing licensed bores with greater than 20 ML per year entitlement have been metered.

(6) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 11-9.

Table 11-9 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	Number of domestic and stock bores[(1)(2)]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[(3)]
Southern Campaspe Plains GMA (55%)	48	95
Campaspe Deep Lead WSPA (82%)	260	520
Shepparton WSPA (12%)	284	568
Total	**592**	**1,183**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 11-8.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross-checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

In the Campaspe basin, groundwater is used as an urban water supply for the townships of Elmore and Trentham. The licensed entitlements and metered use for these groundwater supplies is provided in Table 11-10.

Table 11-10 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Elmore	284	130	179
Trentham	48	15	32
Total	**332**	**145**	**211**

11.8 Drought contingency measures

Drought contingency measures undertaken in the Campaspe basin in 2009–10 included:

- restricting urban and rural water use (discussed below)
- utilising carryover
- ending the irrigation season early to build reserves for the next irrigation season
- the continuation of a temporary qualification of rights as detailed in Table 11-11.

Carryover and the use of the water market continued to be important in supplementing supplies in the Campaspe system, as the seasonal allocation was zero for the second year in a row.

As in all major northern Victorian systems, the irrigation season closed in April 2009 and all water resource improvements after this date were directed towards building supplies for the 2010–11 season.

11.9 Qualification of rights

Rights to surface water and groundwater in parts of the Campaspe basin were re-qualified in 2009–10 to help manage through the continuing water shortage. The year commenced with zero allocations on the Campaspe and Coliban rural systems and with Lake Eppalock, the basin's largest storage, at just 6%.

On the Campaspe system, the qualification ensured that water corporations could supply essential domestic and stock needs all year as low reserves prevented an allocation.

Consistent with the carryover provisions in place for water-share holders, the qualification allowed Coliban Water to carryover up to 50% of its unused entitlement from the previous year for Axedale and Goornong, minus losses. This contributed to maintaining supplies to these towns.

The qualification also allowed Coliban Water to provide emergency water supplies, equivalent to 30% allocation, to significant commercial operators on the Coliban rural system who could not access recycled water. This maintained business viability for these users in a system where there is no ability to manage through low water allocations via carryover or trade.

To help build reserves to maintain supply for essential needs, passing flows below Malmsbury Reservoir and Lake Eppalock were ceased. Fifty per cent of withheld flows below Malmsbury were reallocated to meet Stage 4 requirements for Kyneton and Castlemaine until 1 December 2009, when these towns came off Stage 4 restrictions. The remaining withheld flows were recorded and made available for release at the direction of North Central Catchment Management Authority once specified storage triggers were met. Over summer, environmental releases were made below Malmsbury Reservoir to maintain river connectivity, pool habitat and instream water quality.

The withheld passing-flow accounts provided North Central Catchment Management Authority with the flexibility to control the timing and volume of releases to meet drought objectives, subject to water availability and delivery capacity. These objectives were determined based on the recommendations of a scientific panel investigation into the ecological implications of continuation of the qualification, which was prepared before the start of the season. In 2009–10 releases were made during the summer months below Eppalock to provide river baseflows and, freshening flows to maintain pool habitats and improve water quality when needed, downstream to Rochester. Environmental risks in the river downstream of Rochester were managed with water delivered from the Goulburn system (via the Campaspe Siphon on the Waranga Western Channel) en route to the River Murray for irrigation purposes. The re-routing of irrigation releases assisted the maintenance of pool habitat, water quality and fish movement.

Rights to water in the Campaspe Deep Lead Water Supply Protection Area were also temporarily qualified during 2009–10 to increase access to water for irrigators from 50% to 65% of their licence volume.

Table 11-11 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights in the Campaspe Water System 2009	1 July 2009 to 30 June 2011	Differential access by priority entitlements	Enabled domestic and stock users to take the volume of water necessary for essential needs (such as household purposes, fire fighting), and commercial and industrial users' were able to take water for limited purposes. Remove obligation to supply Rochester during May, June, July, August and September	50% allocation or higher for high-reliability shares on the Campaspe system	
		Reduced passing-flow requirements	Remove Coliban Water and Goulburn-Murray Water's obligations to provide minimum passing-flow requirements below Lake Eppalock and at Rochester. 1,000 ML allocated for environmental flows when the volume in storage is 6,500 ML (excluding water held in an ABA). All other withheld flows released as directed by North Central CMA when allocation is 1% or above	100% allocation for high-reliability water shares on the Campaspe system	
			Remove Coliban Water's obligation to provide minimum passing-flow requirements below Malmsbury Reservoir. Half of the volume that would have been provided is available for Stage 4 urban supplies. The other half is reserved for environmental flows on advice from NCCMA	When Stage 4 restrictions are lifted for the townships of Kyneton or water is allocated to the Coliban Rural system all withheld passing flows are available for environmental flows on advice from NCCMA	1 December 2009 (Kyneton moved to Stage 3 restrictions)
		Differential access by priority entitlements	Provision of emergency supplies of up to 30% of licensed volume to licence holders who meet specific conditions	1% allocation or higher on the Coliban Rural System	
		Volume carried over	Water held by the environment in the Eppalock Passing Flow Account at 30 June 2009 carried over into 2009–10, minus 5% for losses	Expiry date: 30 June 2011	
			Water held by the environment in the Malmsbury Passing Flow Account at 30 June 2009 carried over into 2009–10	Expiry date: 30 June 2011	
			Coliban Water granted right to carry over water that remained unused at 30 June 2009 up to 50% of entitlement volume, minus 5% for losses	Expiry date: 30 June 2011	
Temporary Qualification of Rights in the Campaspe Deep Lead Water Supply Protection Area 2010	4 March 2010 to 30 June 2010	Differential access by priority entitlements	Allocations increased from 50% to 65% to support irrigators through continuing dry period		

11.9.1 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to towns and licensed diversions on unregulated streams are shown in Table 11-12.

Most of the major towns located within the Campaspe basin, such as Heathcote, Kyneton and Malmsbury, were subjected to harsh Stage 3 and Stage 4 water restrictions over the year due to the continuing water shortage. However, towns supplied from other sources, such as the Murray and Goulburn systems, were typically subject to lower Stage 1 and Stage 2 restrictions, which were eased as allocations increased throughout the year.

The severe water shortage in the basin prevented seasonal allocations being announced on both the regulated Campaspe and Coliban rural systems in 2009–10. This is the third time in four years that water users on the Campaspe system have not received an allocation.

Severe restrictions were also placed on licensed diverters on a number of unregulated streams throughout the basin.

Table 11-12 Seasonal allocations and restrictions on water use in Campaspe basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Axedale	Stage 3 restrictions from July 2009 to June 2010
	Echuca	Stage 2 restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Rochester	Stage 2 restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Elmore	Stage 1 restrictions from July 2009 to June 2010
	Woodend	Stage 3 restrictions from July 2009 to June 2010
	Goornong	Stage 4 restrictions from July to October 2009, Stage 3 restrictions from November 2009 to June 2010
	Kyneton, Elphinsone, Malmsbury, Taradale, Tylden	Stage 4 Ex restrictions from July to November 2009, Stage 3 restrictions from December 2009 to June 2010
	Heathcote and Tooborac	Stage 3 restrictions from July 2009 to June 2010
Irrigation and regulated diversions	Campaspe irrigation district	0% allocation in the Campaspe irrigation district.
	Coliban rural supply system	0% allocation in the Coliban rural supply system, however some emergency supplies were provided (1)
Licensed diversions on unregulated streams	Wanalta Creek	Irrigation ban July 2009 to June 2010
	Campaspe River, Axe Creek, Jones Creek, Little Coliban River, Smith Creek	Irrigation ban July 2009 to June 2010
	Coliban River unregulated	Irrigation ban July 2009 to June 2010
Groundwater	Campaspe Deep Lead WSPA	Use from Campaspe Deep Lead WSPA restricted to 50% allocation

Notes:

(1) Coliban water had 0% allocation throughout the whole year. Recycled water was made available to customers on the Ascot and Axe Creek Channels which was equivalent to 40% allocation. Additionally, the Minister for Water qualified rights to water in Coliban rural systems to allow Coliban Water to provide 30% emergency supply to eligible customers.

11.10 Recycled water

Coliban Water operates all wastewater treatment plants in the Campaspe basin except the Woodend Treatment Plant, which is operated by Western Water. Around 79% of the wastewater discharged from treatment plants in the basin was recycled, mostly for agricultural use (Table 11-13).

Table 11-13 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Axedale	6	6	100%	6	-	-	-	-	-
Echuca	1,055	1,055	100%	-	1,055	-	-	-	-
Elmore	-	-	0%	-	-	-	-	-	-
Heathcote	88	88	100%	88	-	-	-	-	-
Kyneton	482	263	55%	89	174	-	-	219	-
Lockington(4)	-	-	0%	-	-	-	-	-	-
Rochester	59	59	100%	-	59	-	-	-	-
Woodend	242	54	22%	54	-	-	-	77	111
Total 2009–10	**1,932**	**1,525**	**79%**	**237**	**1,288**	**-**	**-**	**296**	**111**
Total 2008–09	**1,308**	**1,149**	**88%**	**258**	**891**	**-**	**-**	**154**	**5**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

(4) All effluent at this treatment plant is evaporated on site.

11.11 Water for the environment

11.11.1 Environmental Water Reserve (EWR)

Important environmental assets, such as the threatened riparian vegetation communities and endangered flora and fauna species including Murray Cod and Painted Snipe, depend on the EWR in the Campaspe basin. Water from the Campaspe basin also feeds into the Murray basin, helping to maintain internationally significant environmental assets such as Gunbower Forest and Kerang Wetlands within that basin.

In 2009–10 the Campaspe basin EWR comprised the following components:

- the Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007
- water set aside for environment under the temporary qualification of rights described in Table 11-11
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Coliban Water, Western Water and Goulburn-Murray Water (where qualifications did not apply)
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

An inter-valley transfer of water provided summer environmental flows for the lower Campaspe River from the Campaspe Siphon, located two kilometres north of Rochester to the Murray River. These flows were not water from the EWR, but were an alternative delivery route of consumptive water that provided an environmental benefit. This was a collaborative management response between Goulburn-Murray Water, MDBA and North Central CMA.

11.11.2 Passing-flow compliance

Bulk entitlements require passing flows to be met at a number of points in the basin.

All passing-flow requirements for the Campaspe Basin, as modified by the qualification of rights, were complied with by Goulburn-Murray Water and Coliban Water during 2009–10 .

As noted in Table 11-11, the passing-flow requirements on the Coliban River downstream of Malmsbury Reservoir were withheld during 2009–10 under a qualification of rights. While Castlemaine and Kyneton were subject to Stage 4 restrictions, 50% of the water reserved by this action was held in Malmsbury Reservoir for later release to target environmental objectives. Once restrictions for these towns were eased to Stage 3, all reserved passing flows were held in Malmsbury reservoir for the environment.

The qualification also removed Goulburn-Murray Water's obligation to provide passing-flow requirements on the Campaspe River. A proportion of water saved from this action was held in Lake Eppalock for later release to help mitigate environmental risks.

Table 11-14 shows passing-flow compliance in the Campaspe basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest.

11.11.3 Environmental entitlements

The environment's formal entitlements in the Campaspe basin in 2009–10 comprised the Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007.

Table 11-14 Selected passing-flow compliance in the Campaspe basin

River	Passing flows	
Coliban River and its tributaries to confluence with Campaspe River	Instrument where passing flows are specified	Bulk Entitlement (Campaspe System – Coliban Water) Conversion Order 1999
	Responsible authority	Coliban Water
	Compliance point	Malmsbury Reservoir (shown as 1 in Figure 11-2))
	Passing-flow compliance	The requirement to pass the lesser of 8 ML per day or natural inflow was waived in 2009–10 under a qualification of rights
Campaspe River	Instrument where passing flows are specified	Bulk Entitlement (Campaspe System – Goulburn Murray Water) Conversion Order
	Responsible authority	Goulburn-Murray Water
	Compliance point	Between Lake Eppalock and Campaspe Weir pool (shown as 2 in Figure 11-2)

	Passing-flow compliance	Passing-flow requirements listed below were qualified during 2009–10, with Goulburn-Murray Water meeting the qualified requirements.
		• 1 July to 30 November inclusive:
		• if Lake Eppalock volume is less than 150,000 ML, the lesser of 10 ML per day or natural inflow
		• if Lake Eppalock volume is between 150,001 ML and 200,000 ML, the lesser of 50 ML per day or natural inflow
		• if Lake Eppalock volume is between 200,001 ML and 250,000 ML, the lesser of 80 ML per day or natural inflow
		• if Lake Eppalock volume is greater than 250,001 ML:
		  • in January, March, May, June and December, the lesser of 90 ML per day or natural inflow
		  • in February and April, the lesser of 80 ML per day or natural inflow
		  • in July and November, the lesser of 150 ML per day or natural inflow
		  • in August, September and October, the lesser of 200 ML per day or natural inflow

12 Loddon basin

This chapter sets out the accounts for the Loddon basin. For detailed information about how they have been compiled, refer to Chapter 5.

12.1 Loddon basin summary

The Loddon basin was one of the most drought-affected basins in Victoria in 2009–10. The year began with record low reserves and inflows only reached 25% of the long-term average. This was the fifth consecutive year inflows in the Loddon have been below 30% of the long-term average.

The severe water shortage prevented seasonal allocations being announced on both the regulated Loddon and Bullarook systems and forced the Minister for Water to qualify rights to ensure the essential needs of towns and domestic and stock users supplied by these systems could be provided for. Towns on these systems were subsequently placed on severe restrictions to keep demands at manageable levels.

As with all the major northern Victorian systems, concerns around the lack of storage recovery resulted in Goulburn-Murray Water ending the irrigation season early and directing water resource improvements after April 1 towards the 2010–11 season.

Central Highlands Water was required to keep Maryborough on Stage 4 restrictions as it continued to experience severe water shortages.

Bendigo and Castlemaine source water supplies from the Campaspe basin, and were also severely affected by low inflows to their storages. Coliban Water was able to maintain Stage 3 restrictions for Bendigo all year using the Goldfields Superpipe to supplement supplies with water from the Goulburn system.

Towns in the northern region of the Loddon basin, such as Boort and Pyramid Hill are supplied from the Goulburn basin. Coliban Water was able to keep these towns on Stage 2 restrictions all year as seasonal allocations increased and water became increasingly available on the market.

Licensed diverters across most of the basin were banned from taking water for the entire year.

Users in the Spring Hill WSPA and Campaspe Deep Lead WSPA were restricted again in 2009–10. Groundwater usage in the basin was lower than 2008–09, but accounted for approximately a third of total water use.

12.2 Responsibilities for management of water resources

Table 12-1 shows the responsibilities of various authorities within the Loddon basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 12-1 Responsibilities for water resources management within the Loddon basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Goulburn-Murray Water	Supplies Pyramid-Boort irrigation district and domestic and stock supplies in Normanville area	Manages groundwater and surface water licensed diversions in the basin	Provides bulk supply to Coliban Water for towns supplied from the Loddon and Campaspe systems, including Pyramid Hill, Boort and Bendigo	Operates major reservoirs including Cairn Curran, Laanecoorie and Tullaroop reservoirs
GWMWater			Provides bulk supply to Coliban Water for towns supplied from the Wimmera Mallee system (Borung, Korong Vale, Wedderburn, Wychitella)	
Central Highlands Water			Supplies towns in the southern part of the Loddon basin, including Maryborough, Daylesford, Creswick and Clunes	Obliged to meet passing-flow requirements
Coliban Water			Supplies towns in the eastern part of the Loddon basin including Bendigo and Castlemaine, Pyramid Hill and Boort	
Environment Minister				Holder of the Loddon Environmental Reserve
North Central Catchment Management Authority				Manages waterways for the whole of the Loddon basin

12.3 Rainfall, flows and storages in 2009–10

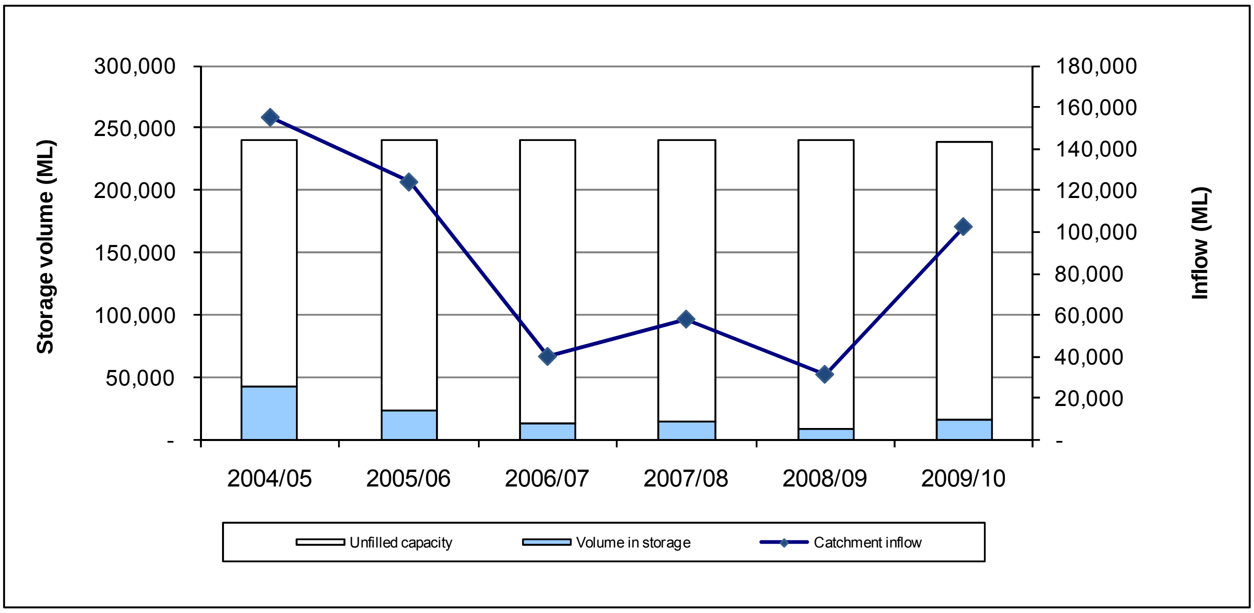
In 2009–10, rainfall across the Loddon basin ranged between 100% and 150% of the long-term average. Despite the above-average rainfall, inflows were only 27% of the long-term average of 373,000 ML.

The amount of water flowing from the Loddon basin into the Murray basin was 2,200 ML in 2009–10. This represents 2% of the total Loddon basin inflows.

The volume of water held in major storages (greater than 1,000 ML capacity) increased from 8,400 ML at the beginning of the year to 16,600 ML (7% of capacity).

Only volumes for major on-stream storages have been included in the water balance, and as such, major storages such as Spring Gully and Sandhurst Reservoir have not been included. The volume of water in the major on-stream storages in the basin – Newlyn, Tullaroop, Cairn Curran, Laanecoorie Reservoir and Hepburn Lagoon increased by 7,100 ML from 6,200 ML to 13,300 ML. Cairn Curran Reservoir, which comprises nearly two-thirds of the storage capacity in the basin, finished the year with 6,590 ML in storage (4% of capacity).

Figure 12-1 All major storages and catchment inflows in the Loddon basin



12.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Loddon basin are shown in Table 12-2. Total surface water use in 2009–10 increased by 28,200 ML compared with 2008–09, while groundwater use declined by 6,100 ML.

Table 12-2 Summary of total water resources and water use in the Loddon basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	107,200	52,900
Groundwater(2)	59,000	25,200
Recycled water	6,950	4,510

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 12-8 and the estimated domestic and stock use as presented in Table 12-9.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

12.4.1 Infrastructure projects to improve water availability

A number of infrastructure projects were completed in the Loddon basin during 2009–10.

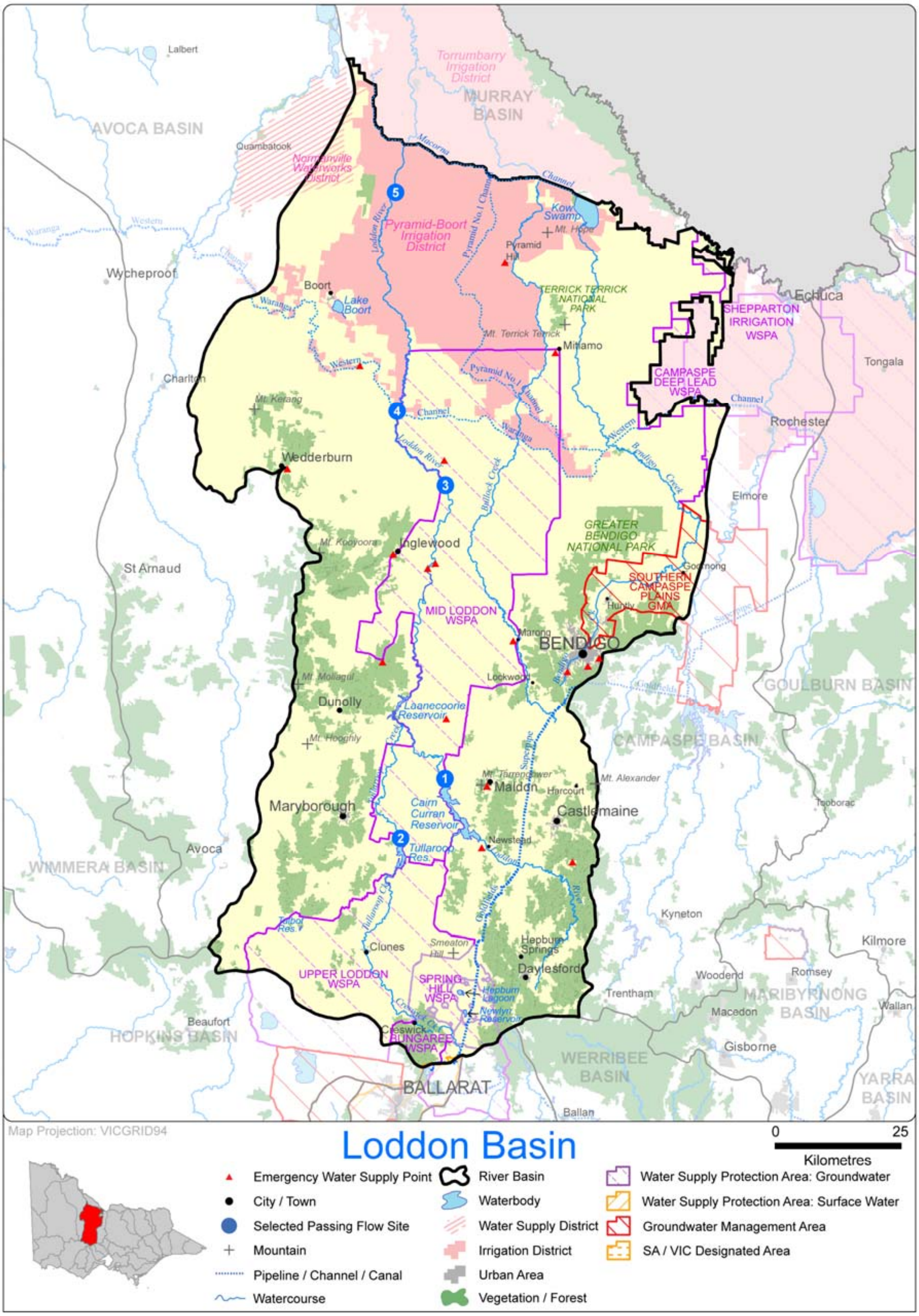
Central Highlands Water began investigations to secure additional water resources for Maryborough as part of the Maryborough Groundwater Resources Project. During 2009–10, investigations were undertaken in the Waubra area. They also continued investigating options for Lexton supply. During 2009–10 it was deemed that Lexton would be connected to Waubra and finding sources were secured. This project is due to be completed in 2012.

Central Highlands Water began the Forest Hill Bore Deepening project to lower pumps deeper into bores. This involved recasing and screening existing bores to full depth which ensured ongoing extraction capability under declining groundwater levels. Works will be completed in 2011.

Coliban Water began construction on the Bridgewater Desalination Plant to improve water quality for customers. This will be a small plant to reduce the salinity level in drinking water supply for urban customers. The project is expected to be complete in 2010–11.

12.5 Location of water resources

Figure 12-2 Map of the Loddon basin



12.6 Surface water resources

12.6.1 Water balance

A surface-water balance for the Loddon basin is shown in Table 12-3. Only those storages with capacity greater than 1,000 ML have been included in the water balance. This includes Laanecoorie, Cairn Curran, Tullaroop and Newlyn Reservoirs and Hepburn Lagoon. Diversions from regulated and unregulated streams were very low in 2009–10, continuing the trend from 2008–09.

Table 12-3 Balance of surface water in the Loddon basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	6,200	11,900
Volume in storage at end of year	13,300	6,200
Change in storage	**7,100**	**(5,700)**
Inflows		
Catchment inflow[(1)]	102,500	31,300
Rainfall on major storages	2,600	n/a [(5)]
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated effluent discharged back to river	2,130	1,200
Sub-total	**107,200**	**32,500**
Usage		
Urban diversions	1,690	1,930
Licensed diversions and irrigation diversions from regulated streams	1,100	1,200
Licensed diversions from unregulated streams	100	100
Small catchment dams[(2)]	50,000	21,500
Sub-total	**52,900**	**24,700**
Losses		
Evaporation losses from major storages	5,600	3,700 [(5)]
Losses from small catchment dams[(2)]	29,600	5,500
In-stream infiltration to groundwater, flows to floodplain and evaporation[(3)]	9,800	4,000
Sub-total	**45,000**	**13,200**
Water passed at outlet of basin		
Loddon River outflow to River Murray (Appin South)	0	0
Wandella Creek at Fairley[(4)]	n/a	n/a
Mount Hope Creek at Mitiamo	2,200	300
Bullock Creek, Calivil and Nine Mile Creek[(4)]	n/a	n/a

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses from small catchments dams are calculated by subtracting estimated usage from water harvested. The volumes reported for small catchment dams in 2006–07, 2007–08 and 2008–09 were lower as the calculation methodology used reflected the extremely dry catchment conditions experienced during those years.

(3) Losses estimated using the Goulburn Simulation Model (REALM), and exclude losses from the Loddon River downstream of Loddon Weir and the Wandella Creek system (which were not readily available).

(4) Outflows at these points are not measured.

(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

12.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 12-4 are based on the methodology outlined in Chapter 5.

Table 12-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	31,600	15,800	n/a
Registered commercial and irrigation	40,700	34,200	n/a
Total	**72,300**	**50,000**	**79,600**

n/a: Information not available.

12.6.3 Water entitlement transfers

Surface water was moved into, out of and within the Loddon basin during 2009–10 through water share transfers and variations and allocation trade. No temporary or permanent trade of bundled water entitlements occurred in 2009–10 in the Loddon basin.

Table 12-5 summarises the transfers and variations in both high-reliability and low-reliability water shares in 2009–10. In total there was a net export of water shares from the Loddon basin, with 29,083 ML of high-reliability water shares, and 1,437 ML of low-reliability water shares traded out of the basin.

Table 12-5 Transfers and variations of water shares in the Loddon basin 2009–10 (1), (2)

Delivery system	High-reliability water shares			Low- and spill-reliability water shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Pyramid-Boort	18,229	47,370	-29,141	13,795	15,310	-1,515
Loddon River	2,136	2,078	58	817	739	78
Bullarook	30	30	0	0	0	0
Total 2009–10	**20,395**	**49,478**	**-29,083**	**14,612**	**16,049**	**-1,437**
Total 2008–09	5,531	13,698	-8,168	8,758	18,181	-9,423

Notes:

(1) This table summarises all recorded water share transfers and variations in the Loddon basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water and land sale are also included in this table.

Table 12-6 summarises the trade of allocation in the Loddon basin during 2009–10. A total of 20 ML of allocation was traded into the Loddon basin, which was all traded within the basin. There was a net export of 22 ML from the basin.

Table 12-6 Allocation Trade in the Loddon basin (1), (2)

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Loddon basin	20	70
Trade from other Victorian basins	0	36
Trade to other Victorian basins	22	8
Interstate trade – inbound	0	0
Interstate trade – outbound	0	0
Total trade into the Loddon basin	20	106
Net trade into the Loddon basin	-22	28

Notes:

(1) This table summarises allocation trades approved into, out of and within the Loddon basin trading zones (Zone 1B Boort & Zone 5B Bullarook) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

12.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 12-7. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2008–09.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Goulburn-Murray Water.

Table 12-7 Volume of water diverted under surface water entitlements in the Loddon basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(1)
Central Highlands Water					
Creswick	1	500	-	390	Yes
Daylesford – Hepburn Springs	1	916	-	862	Yes
Lexton	1	45	-	13	Yes
Loddon System (part Maryborough)	1	1,200	-	-	Yes
Evansford and Talbot System (part Maryborough)	1	3,000	-	136	Yes
Bullarook System (2)	1	500	-	-	n/a
Coliban Water					
Loddon system	1	820	1	292	Yes
Goulburn-Murray Water					
Bullarook System (2)	1	1,657	-	30	Yes
Loddon	1	124,804	-	1,107	Yes
Environment Minister					
Loddon River – Environmental Reserve	1	4,105		760	Yes
Birch Creek – Bullarook System (2) (3)	1	100	-	-	n/a
Total annual volume of bulk entitlements 2009–10		**137,047**	**1**	**3,589**	
Total annual volume of bulk entitlements 2008–09		**135,107**	**6**	**3,159**	
Licensed diversions from unregulated streams 2009–10		*30,240*		*100*	
Licensed diversions from unregulated streams 2008–09		*27,949*		*100*	

Notes:

(1) Compliance is also assessed against the Murray-Darling Basin annual cap target for the Goulburn, Loddon and Broken basins – which is reported in the MDBC's *Water audit monitoring report 2009–10*.

(2) Bulk entitlements for the Bullarook system were granted on 14 January 2010.

(3) The Environmental Entitlement Birch Creek – Bullarook System provides a right to minimum passing flows and up to 100 ML of storage reserve in Newlyn Reservoir, subject to restriction rules. The volume diverted is water released from the Newlyn Reservoir reserve.

n/a: Information not available.

12.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Loddon basin, excluding domestic and stock use, is presented in Table 12-8.

The Loddon basin contains all of the Mid Loddon WSPA and Spring Hill WSPA as well as part of the Upper Loddon WSPA, Bungaree WSPA and Campaspe Deep Lead WSPA and Southern Campaspe Plains GMA. The Ellesmere GMA, which was reported in 2006–07 has been cancelled and the Southern Campaspe Plains GMA is a new management unit created in 2007–08. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

Extractions from the Campaspe Deep Lead WSPA and the Spring Hill WSPA were restricted to a 65% and 71% allocation respectively during 2009–10. Groundwater levels are generally declining in all GMUs in this area.

Table 12-8 Licensed groundwater volumes, Loddon basin 2009–10

WSPA/GMA[1]	GMA/ WSPA depth limits[2] (m)	Entitlement limit[3] (ML/year)	Licensed entitlement[4] (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)[5]	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Bungaree WSPA (10%)[6]	All depths	520	513	256	-	256	429
Campaspe Deep Lead WSPA (8%)	>25	2,501	3,847	1,783	-	1,783	2,012
Mid Loddon WSPA (100%)	All depths	37,200	34,014	14,528	-	14,528	19,422
Spring Hill WSPA (100%)	≤70 all zones except Cones (all depths)	3,068	4,909	1,524	-	1,524	2,041
Upper Loddon WSPA (76%)	All depths	10,366	10,076	3,738	-	3,738	3,848
Southern Campaspe Plains GMA (45%)	All depths	3,952	3,710	1,401	-	1,401	1,567
Total[7]		**57,607**	**57,069**	**23,230**	**0**	**23,230**	**29,319**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used. The entitlement limit in the Campaspe Deep Lead WSPA and Spring Hill WSPA are represented by 65% and 61% PCV respectively due to restrictions in place during 2009–10.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) No estimates provided. All existing licensed bores with greater than 20 ML per year entitlement have been metered.

(6) The licensed entitlement volume for Bungaree WSPA includes a 70 ML mineral water levy, gazetted 20 June 2009.

(7) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 12-9.

Table 12-9 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores[1][2]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[3]
Bungaree WSPA (10%)	28	56
Campaspe Deep Lead WSPA (8%)	27	54
Mid Loddon WSPA (100%)	380	760
Spring Hill WSPA (100%)	198	396
Upper Loddon WSPA (76%)	298	596
Southern Campaspe Plains GMA (45%)	38	76
Total	**969**	**1,938**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 12-8.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

The licensed entitlements and metered use for urban groundwater supplies in the Loddon catchment are provided in Table 12-10.

Table 12-10 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Clunes	350	175	154
Dean	30	18	25
Forest Hill	350	142	207
Learmonth	100	47	59
Waubra	100	43	34
Maryborough(1)	1,341	922	544
Smeaton(1)	48	0	n/a
Total	**2,319**	**1,347**	**1,023**

Notes:
(1) New supply in 2008–09, provided by Central Highlands Water.

12.8 Drought contingency measures

Drought contingency measures in the Loddon basin in 2009–10 included:

- restricting urban and rural water use (discussed below in section 12.9)
- water carting
- entering the water market to supplement urban water supplies
- temporary qualification of rights as detailed in Table 12-11.

Coliban Water continued to cart water from Bendigo to Raywood, Sebastian and Serpentine throughout the year to supplement local supplies impacted by the ongoing water shortage. Central Highlands Water carted water from Ballarat and Learmonth to Lexton from July to September to supplement supplies.

Coliban Water secured supplies for Bendigo and surrounding towns by transferring 17,931 ML of water via the Goldfields Superpipe from the Goulburn system to Lake Eppalock and Sandhurst Reservoir in the Campaspe system.

This water was sourced from water shares and water allocation Coliban Water had previously purchased from other systems, and was further supplemented by the purchase of 7,000 ML of water allocation in the Goulburn system in 2009–10.

As with all northern Victorian irrigation systems, Goulburn-Murray Water ended the irrigation season early to build reserves for 2010–11.

12.9 Qualifications of rights

There were three temporary qualifications of rights in place in the Loddon basin during 2009–10 due to the continuing water shortage. The year commenced with zero allocations on the Loddon and Bullarook systems and with system storages at 2% and 5% respectively.

The Loddon and Bullarook system qualifications ensured water corporations could supply essential domestic and stock needs while allocations were extremely low. The Bullarook qualification was revoked by the Minister for Water on 25 June 2010 after these emergency supply provisions were included in Goulburn-Murray Water’s bulk entitlement for this system.

Consistent with the carryover provisions in place for water-share holders, the Loddon qualification also allowed Coliban Water to carryover up to 50% of its unused entitlement from the previous year, minus losses, for towns such as Jarklin, Serpentine, Dunolly and Inglewood. This contributed to maintaining supplies to these towns while allocations were low.

To help build reserves on the Loddon system to meet essential needs, the qualification removed Goulburn-Murray Water’s obligation to supply the East Loddon Waterworks District, which typically incurs high losses. Customers in this district could access water from emergency supply points on nearby operating channels.

The qualification also suspended all passing flows in the Loddon River system, to help build reserves for emergency supplies. To manage the environmental impacts of the qualification, 600 ML was made available in storage from the environmental manager’s carryover account at the beginning of the season. Following the announcement of a 1% allocation on 15 March 2010, the environment gained access to all of its carryover and was allocated all passing flows withheld in storage after this time. Passing flows were reintroduced for Creswick Creek from 1 January 2010 when Creswick came off Stage 4 restrictions.

In partnership with Goulburn-Murray Water, North Central Catchment Management Authority directed use of the environment's available resources towards maintaining baseflows in priority reaches of the Loddon River. North Central CMA's management of the withheld passing flows in the Loddon system was based on the recommendations of a scientific panel investigation into the ecological implications of continuation of the qualification.

As the river below the Loddon weir had been dry since 2006–07 and with the potential for acid sulphate soils to increase ecological risks if wetted insufficiently, NCCMA banked the limited water available and also arranged for water to be diverted to the Boort wetlands during the year to prevent poor-quality water from flowing downstream of Loddon weir.

A third qualification was put in place for Reach 2 of the Loddon system, which is located below Tullaroop Reservoir. At the start of the year, Tullaroop Reservoir was at just 4%.

The qualification provided Central Highlands Water with access to its carryover to supply essential needs for Maryborough from 1 July to the end of October 2009, after which it had access to its regular entitlement volume from Tullaroop Reservoir.

Goulburn-Murray Water was allocated carryover to supply the essential domestic and stock needs of its customers. Triggers based on storage volumes determined how much water it was allocated.

To help build reserves, passing flows in Tullaroop Creek were suspended. To manage the environmental impacts, the environment was also allocated carryover water and storage triggers for returning extra water for environmental flows in Tullaroop Creek were included in the qualification. 875 ML was allocated under this provision, which is equivalent to 24% of the normal passing-flow volume.

North Central Catchment Management Authority used the environment's account to maintain flows in Tullaroop Creek and pool habitats for as long as possible in priority reaches where River Blackfish were known to have previously existed.

Table 12-11 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights in the Bullarook Water System	1 July 2009 to 25 June 2010	Differential access by priority entitlements	Enabled domestic and stock users to take the volume of water necessary for essential needs (such as household purposes, fire fighting), and commercial and industrial users were able to take water for limited purposes	50% allocation or higher for high-reliability shares on the Bullarook system	Qualification revoked by the Minister for Water on 25 June 2010
Temporary Qualification of Rights in the Loddon Water System July 2009	1 July 2009 to 30 June 2010	Differential access by priority entitlements	Enabled domestic and stock users to take the volume of water necessary for essential needs (such as household purposes, fire fighting), and commercial and industrial users were able to take water for limited purposes	50% allocation or higher for high-reliability shares on the Loddon system	
			Remove Goulburn-Murray Water's obligation to supply entitlements only after meeting environmental entitlement	Expiry date: 30 June 2011	
			Goulburn-Murray Water's obligation to provide East Loddon Waterworks district removed	10% allocation or higher for high-reliability shares on the Loddon system	
		Reduced passing-flow requirements	Passing-flow requirements for Creswick Creek suspended, downstream of Cosgrove Reservoir	Stage 4 restrictions removed in Creswick	1 January 2010
			Remove obligation to provide minimum passing-flow requirements and river freshening flows below Cairn Curran Dam, Laanecoorie Reservoir, Serpentine Weir and Loddon Weir. When allocations reach 1% store withheld environmental flows in the	Expiry date: 30 June 2011	

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
			LSWFA. When allocations reach 5% the withheld environmental flows can be released on advice from NCCMA		
		Differential access by priority entitlements	Create a Loddon System Withheld Flow account (LSWFA) to be used by North Central Catchment Management Authority	Expiry date: 30 June 2011	
			The maximum volume which may be stored in the deficit and reimbursement account in the Loddon River (Environmental Reserve) entitlement increased from 20,000 ML to 25,000 ML, and 6,000 ML is available for release from this account when allocations reach 100%	Expiry date: 30 June 2011	
		Volume carried over	Coliban Water granted right to carry over water that remained unused at 30 June 2009 up to 50% of entitlement volume minus 5% for losses	Expiry date: 30 June 2011	
			Water held by environment in the Loddon Weir Withheld Flows account at 30 June 2009 carried over into 2009–10, minus 5% for losses. 600 ML of this water available for release at start of the year, and the rest available for release when allocations reach 1%	Expiry date: 30 June 2011	
		Differential access by priority entitlements	Allow 2,000 ML of water to be transferred from the Loddon System Withheld Flows account to the Wetland Entitlement. Water from this entitlement may be delivered to Little Lake Boort	Expiry date: 30 June 2011	
Temporary Qualification of Rights in Reach Two of the Loddon Water System June 2009	1 July 2009 to 30 June 2010	Differential access by priority entitlements	Enabled domestic and stock users to take the volume of water necessary for essential needs (such as household purposes, fire fighting), and commercial and industrial users' were able to take water for limited purposes when Goulburn-Murray Water advises that water is available for delivery	When the Loddon system seasonal allocation is 50% or higher.	
		Differential access by priority entitlements	Remove obligation for Goulburn-Murray Water to supply Central Highlands Water with a minimum of 50% of entitlement volume for Maryborough	1 November 2009	1 November 2009
			Central Highlands Water must deliver up to 10 ML for essential needs below Tullaroop Reservoir	1 November 2009	1 November 2009
			Remove obligation for Goulburn-Murray Water to supply entitlements only after meeting environmental entitlement	When the volume of water in Tullaroop Reservoir is greater than 10,000 ML or an allocation on the Loddon system can be delivered to entitlement holders on Tullaroop Creek	
			Goulburn-Murray Water is entitled to 210 ML a year to meet its customer's essential needs from 1 November 2009	Expiry date: 30 June 2011	

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
		Volume carried over	Water allocated to Central Highlands Water, the environment, and Goulburn-Murray Water in Tullaroop Reservoir that is unused at 30 June 2009 can be carried over for use in the following year	Expiry date: 30 June 2011	
		Reduced passing-flow requirements	Environmental flows in Tullaroop Creek suspended	When the volume of water in Tullaroop Reservoir is greater than 10,000 ML and an allocation on the Loddon system can be delivered to entitlement holders on Tullaroop Creek	
		Differential access by priority entitlements	North Central Catchment Management Authority can access 875 ML if the volume in Tullaroop Reservoir on 1 November 2009 exceeds 2,460 ML, and 1,875 ML if the volume exceeds 6,560 ML	Expiry date: 30 June 2011	

12.10 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to urban customers and licensed diversions on unregulated streams are shown Table 12-12.

Central Highlands Water was required to keep Maryborough on Stage 4 restrictions as it continued to experience severe water shortages. Towns in the Loddon basin supplied by the Loddon and Wimmera-Mallee systems were also kept on Stage 4 restrictions the entire year.

Bendigo and surrounding towns were subject to Stage 3 restrictions for the entire year. Towns in the Castlemaine region began the year on Stage 4 Ex restrictions, but Coliban Water was able to ease restrictions to Stage 3 from December 2009.

Most other towns within the basin were heavily restricted in the first half of the year and reduced to lower restrictions in the second half of the year.

Licensed diverters across most of the basin were banned from taking water for a significant part of the year.

The severe water shortage prevented seasonal allocations being announced on both the regulated Loddon and Bullarook systems until late in the season when allocations less than 20% were made available.

Table 12-12 Seasonal allocations and restrictions on water use in Loddon basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Maryborough, Adelaide, Lead, Alma, Bet Bet, Bowenvale, Carisbrooke, Daisy Hill, Havelock, Majorca, Rodborough, Talbot	Stage 4 restrictions from July to October 2009, Stage 4 Ex restrictions from November 2009 to June 2010
	Creswick	Stage 4 restrictions from July to October 2009, Stage 4e restrictions from November 2009 to January 2010, Stage 3 restrictions from January to June 2010
	Learmonth, Waubra, Dean	Stage 1 restrictions from July 2009 to June 2010
	Forest Hill system (Allendale, Broomfield, Kingston, Newlyn, Smeaton, Springmont)	Stage 4 restrictions from July 2009 to June 2010
	Clunes	Stage 2 restrictions from July to December 2009 and Stage 1 restrictions from January to June 2010
	Daylesford, Hepburn Springs, Hepburn	Stage 2 restrictions from July 2009 to June 2010
	Lexton	Stage 4 restrictions from July to October 2009, and Stage 1 restrictions from November 2009 to June 2010
	Bendigo, Eaglehawk, Epsom, Huntly, Junortoun, Kangaroo Flat, Maiden Gully, Marong, Strathfieldsaye	Stage 3 restrictions from July 2009 to June 2010
	Bridgewater, Inglewood, Laanecoorie, Bealiba, Dunolly, Tarnagulla, Jarklin and Serpentine	Stage 4 restrictions from July 2009 to June 2010
	Borong, Korong Vale, Wedderburn, Wychitella	Stage 4 restrictions from July 2009 to June 2010
	Boort, Pyramid Hill, Lockington, Mysia, Mitiamo, Dingee, Macorna	Stage 2 restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Goornong	Stage 4 restrictions from July to October 2009, Stage 3 restrictions from November 2009 to June 2010
	Castlemaine, Campbells Creek, Chewton, Fryerstown, Guildford, Harcourt, Maldon, Newstead, Yape	Stage 4 restrictions from July to November 2009 and Stage 3 restrictions from December 2009 to June 2010
	Koondrook	Stage 3 restrictions for July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Murrabit	Stage 3 restrictions for July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Raywood, Sebastian	Stage 4 Ex restrictions from July 2009 to June 2010
Unregulated diversions	Leitch's Creek	Irrigation ban from December 2009 to June 2010
	Sailors Creek	Irrigation ban from December 2009 to June 2010
	Upper Loddon River (above Cairn Curran),	Irrigation ban from July to November 2009
	Barkers Creek, Lower Loddon River below Fernihurst Weir, Green Gully Creek, Joyces Creek, Muckleford Creek, Lake Meran, Wallaby Creek, Wombat Creek, Coghills Creek, McCallum Creek, Lake Meran, Campbells Creek	Irrigation ban July 2009 to June 2010

	Rocky Lead Creek, Bullock Creek above Newlyn, Back Creek, Langdons Creek above Hepburns Lagoon, Pinchgut Creek, Kangaroo Creek	Suspension of winter-fill pumping from July 2009 to June 2010
	Bullarook Creek (upper)	Irrigation ban from December 2009 to June 2010
Irrigation and regulated diversions	Loddon system	0% opening allocation in August 2009, but increasing to a final allocation of 3% in May 2010
	Bullarook Creek system – Hepburn's Lagoon	0% opening allocation, increasing to 11% in February 2010 and closing at 19% allocation in May 2010
Groundwater	Campaspe Deep Lead WSPA	Use from Campaspe Deep Lead WSPA restricted to 50% allocation
	Spring Hill WSPA	Allocations announced during 2009–10 include 100% allocation in zones 1001 and 1004, 80% allocation in zone 1002 and 50% allocation in zone 1003

12.11 Recycled water

Coliban Water and Central Highlands Water operate wastewater treatment plants in the Loddon basin. The total volume of wastewater produced during 2009–10 increased compared to that of 2008–09. The proportion of wastewater recycled during 2009–10 decreased to 65%, compared to 72% in 2008–09. This is presented in Table 12-13.

Table 12-13 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Bendigo	5,163	3,885	75%	1,226	2,659	-	-	1,278	-
Boort(4)	-	-	0%	-	-	-	-	-	-
Bridgewater / Inglewood	-	-	0%	-	-	-	-	-	-
Castlemaine	965	111	12%	111	-	-	-	854	-
Clunes	0	0	100%	-	0	-	-	-	-
Creswick	-	-	0%	-	-	-	-	-	-
Daylesford	273	273	100%	14	259	-	-	-	-
Dunolly(4)	-	-	0%	-	-	-	-	-	-
Kerang	303	-	0%	-	-	-	-	-	303
Maryborough	225	225	100%	78	148	-	-	-	0
Pyramid Hill(4)	-	-	0%	-	-	-	-	-	-
Wedderburn(4)	16	16	100%	-	16	-	-	-	-
Total 2009–10	**6,945**	**4,511**	**65%**	**1,429**	**3,082**	**-**	**-**	**2,132**	**303**
Total 2008–09	**5,424**	**3,932**	**72%**	**1,499**	**2,432**	**-**	**1**	**1,197**	**296**

Notes:
(1) Volume used to deliver specific environmental flow benefits.
(2) Water reused in sewage treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.
(3) Other refers to a change in on-site effluent storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.
(4) All effluent at these treatment plants was evaporated on-site.

12.12 Water for the environment

12.12.1 Environmental Water Reserve (EWR)

Important environmental assets, such as endangered flora and fauna species including Murray Cod and Painted Snipe and threatened riparian vegetation communities depend on the EWR in the Loddon basin. Water from the Loddon basin also feeds into the Murray basin helping to maintain internationally significant environmental assets including the Kerang Wetlands within that basin. Specifically, Gunbower Forest has Ramsar-listed wetlands, which supports 37 threatened and endangered flora and fauna species, and are rare wetland types (shallow freshwater marshes and freshwater meadows). Tullaroop Creek in the Loddon River system also has a population of regionally significant black fish.

In 2009–10 the Loddon basin EWR comprised the following components:

- The Bulk Entitlement (Loddon River – Environmental Water Reserve) Order 2005 of 2,000 ML high-reliability and 2,105 ML low-reliability water entitlements held by the Environment Minister
- The Environmental Entitlement (Birch Creek – Bullarook System) 2009, which includes passing flows and 100 ML of water in Newlyn Reservoir when high-reliability water shares are greater than 20% in the Bullarook system at the start of December.
- water set aside for the environment under the temporary qualification of rights described in Table 12-11
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Central Highlands Water and Goulburn-Murray Water (where qualifications did not apply)
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

12.12.2 Entitlements for the environment

The environment's formal entitlements in the Loddon basin in 2009–10 comprised the Bulk Entitlement (Loddon River Environmental Reserve) Order 2005 and the Environmental Entitlement (Birch Creek – Bullarook System) 2009 held by the Environment Minister. No water was released under the Birch Creek entitlement, however 760 ML of water was released down the Loddon River.

12.12.3 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

All passing-flow requirements were met in the Loddon Basin for 2009–10.

As listed in Table 12-11, a number of Loddon passing-flow requirements were qualified in 2009–10.

Table 12-14 shows passing-flow compliance in the Loddon basin for selected bulk-entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The location of these compliance points is presented in Figure 12-2.

Table 12-14 Selected passing-flow compliance in the Loddon basin

River	Passing flows	
Loddon River	Instrument where passing flows are specified	Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005
	Responsible authority	Environment Minister
	Compliance point	Loddon River, between Cairn Curran and Laanecoorie reservoirs (shown as 1 in Figure 12-2)

	Passing-flow compliance	Passing-flow requirements listed below were qualified during 2009–10, with Goulburn-Murray Water meeting the qualified requirements:
		• from November to April inclusive, the lesser of 20 ML per day or natural flow
		• from May to October inclusive, if the combined storage volume in Cairn Curran and Tullaroop reservoirs is:
		  • greater than 60,000 ML, the authority must pass 35 ML per day
		  • less than or equal to 60,000 ML, the authority must pass 20 ML per day
		• river freshening (three flows of 35 ML per day for seven consecutive days between November and April).

	Compliance point	Tullaroop Creek, between Tullaroop Dam and Laanecoorie Reservoir (shown as 2 in Figure 12-2)
	Passing-flow compliance	Passing-flow requirements listed below were qualified during 2009–10, with Goulburn-Murray Water meeting the qualified requirements: • the lesser of 10 ML per day or natural flow • river freshening (four flows of 13.5 ML per day for seven consecutive days between November and April)
	Compliance point	Loddon River, between Laanecoorie Weir and Serpentine Weir (shown as 3 in Figure 12-2)

	Passing-flow compliance	Passing-flow requirements listed below were qualified during 2009–10, with Goulburn-Murray Water meeting the qualified requirements:
		• from November to July inclusive, the lesser of 15 ML per day or natural flow
		• from August to October inclusive, if the combined storage volume in Cairn Curran and Tullaroop reservoirs is:
		  • greater than 60,000 ML, the authority must pass 52 ML per day
		  • less than or equal to 60,000 ML, the authority must pass 15 ML per day
		• river freshening (3 flows of 52 ML per day for 7 consecutive days between November and April).

	Compliance point	Loddon River, between Serpentine Weir and Loddon Weir (shown as 4 in Figure 12-2)

	Passing-flow compliance	Passing-flow requirements listed below were qualified during 2009–10, with Goulburn-Murray Water meeting the qualified requirements:
		• from November to April inclusive, the lesser of 19 ML per day or natural flow
		• from May to October inclusive, if the combined storage volume in Cairn Curran and Tullaroop reservoirs is:
		  • greater than 60,000 ML, the authority must pass 61 ML per day
		  • less than or equal to 60,000 ML, the authority must pass 19 ML per day
		• river freshening (3 flows of 61 ML per day for 7 consecutive days between November and April)

	Compliance point	Loddon River, between Loddon Weir and Kerang Weir (shown as 5 in Figure 12-2)

	Passing-flow compliance	Passing-flow requirements listed below were qualified during 2009–10, with Goulburn-Murray Water meeting the qualified requirements:
		• from November to April inclusive, cyclical over two weeks: rise from 7 to 12 ML per day in one week, followed by fall from 12 to 7 ML per day the next week
		• from May to October inclusive, if the combined storage volume in Cairn Curran and Tullaroop reservoirs is:
		  • greater than 60,000 ML, the authority must pass 61 ML per day plus flow equal to calculated in-stream loss
		  • less than or equal to 60,000 ML, the authority must pass 10 ML per day plus flow equal to calculated in-stream loss
		• river freshening (flow of 50 ML per day plus flow equal to calculated in-stream loss for 14 consecutive days between January and February).

13 Avoca basin

This chapter sets out the accounts for the Avoca basin. For detailed information about how they have been compiled, refer to Chapter 5.

13.1 Avoca basin summary

Inflows into the Avoca basin in 2009–10 were again well below the long-term average at just 26,400 ML. For yet another year, no water flowed to the basin's terminal lakes located in the north of the basin.

Most towns in the basin are either supplied by groundwater, or from surface water from the Wimmera, Glenelg and Murray basins. Most towns remained on severe Stage 3 and Stage 4 restrictions at the beginning of the year due to low water availability, but were eased to Stage 1 in October and November 2009.

The completion of the Wimmera Mallee Pipeline Project allowed water allocated to Grampians Wimmera Mallee system from the Goulburn system to be used to supply recreation water to Green Lake near Sea Lake.

Irrigation bans remained in force on unregulated streams in the Avoca basin for the entire year.

13.2 Responsibilities for management of water resources

Table 13-1 shows the responsibilities of various authorities within the Avoca basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 13-1 Responsibilities for water resources management within the Avoca basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Central Highlands Water			Supplies towns in the southern part of the Avoca basin, including Avoca and Redbank	Obliged to meet passing-flow requirements
GWMWater	Provides domestic and stock supplies to farms via Wimmera Mallee Channel system, the Northern Mallee Pipeline, the western end of the Waranga Western Channel and diversions from rivers	Manages surface water and groundwater licensing	Supplies towns in the northern part of the Avoca basin, including Quambatook, St Arnaud, Charlton and Sea Lake(1)	
Goulburn-Murray Water	Supplies water from the Goulburn basin in bulk to GWMWater for domestic and stock use via the Waranga Main Channel		Supplies water from the Goulburn basin in bulk to GWMWater for towns via the Waranga Main Channel and to Quambatook via the Normanville supply system	
North Central Catchment Management Authority				Manages waterways in the Avoca basin

Note:
(1) Water for these towns is sourced from outside the Avoca basin.

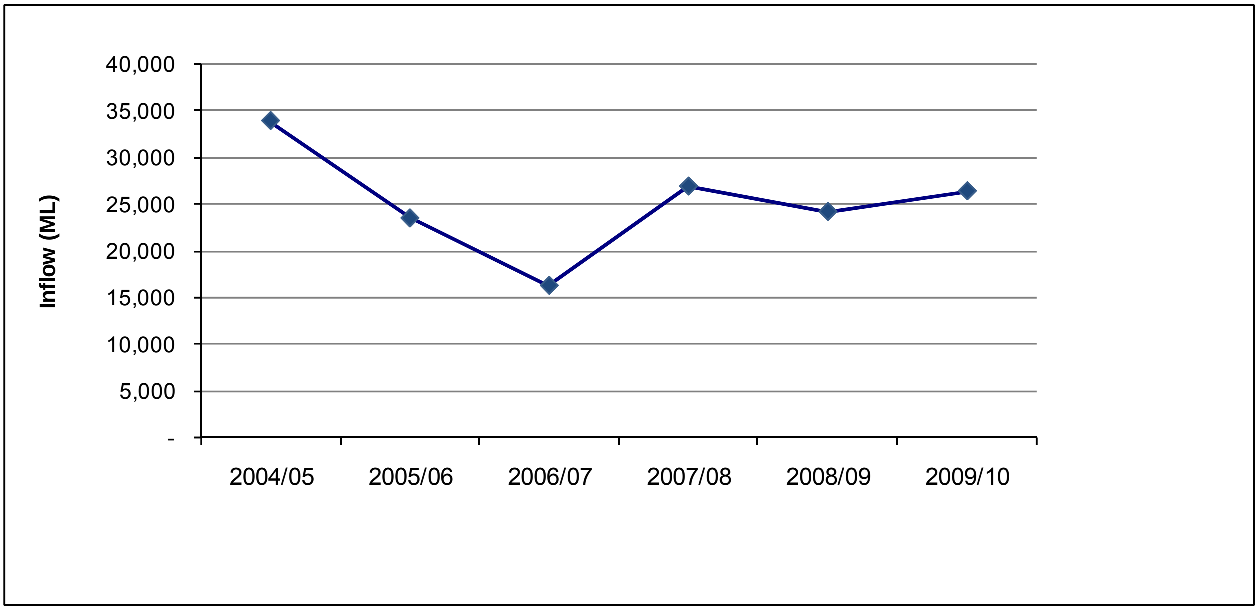
13.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall across the Avoca basin ranged between 80% and 150% of the long-term average. The ongoing drought, particularly severe in the west of the state, continued to impact streamflows, which were just 19% of the long-term average in 2009–10. Inflows were 18% of the long-term average in 2008–09.

As in 2008–09, no water flowed into the terminal lakes (Lake Bael Bael and the Marshes), which overflow to the Kerang Lakes during prolonged wet periods.

There are no storages with capacity greater than 1,000 ML in the Avoca basin.

Figure 13-1 Catchment inflows in the Avoca basin



13.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Avoca basin are shown in Table 13-2. Total surface water availability in 2009–10 increased slightly in 2009–10 compared to the previous year, while use remained the same. The total resource available for groundwater use increased slightly compared to 2008–09, however total use fell.

Table 13-2 Summary of total water resources and water use in the Avoca basin, 2009–10

Water source	Total water resource (ML)	Total use (ML)
Surface water	26,400	14,300
Groundwater(1)	540	140
Recycled water	120	120

Note:

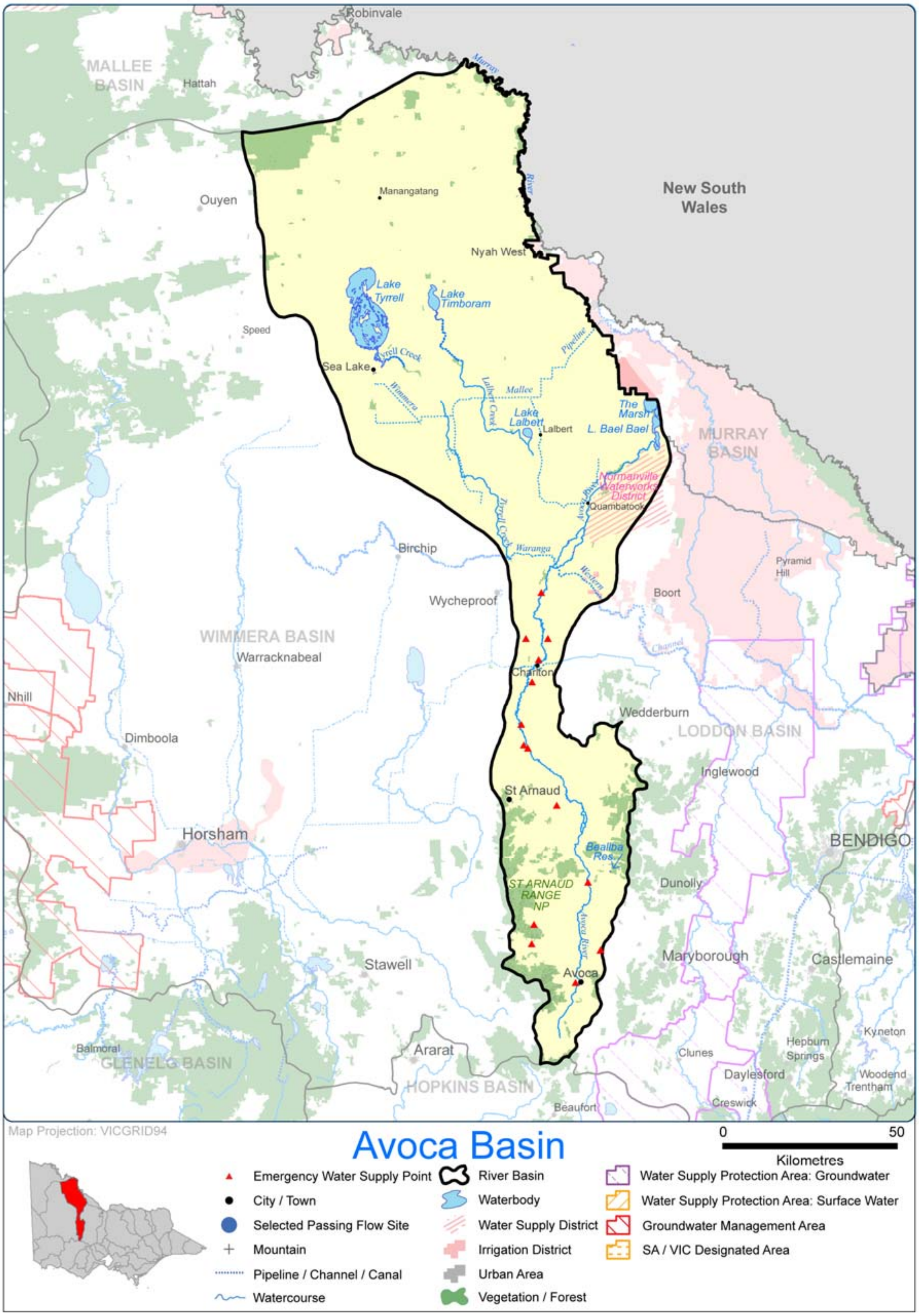
(1) Although there are no WSPAs or GMAs in the Avoca basin, the towns of Avoca and Redbank are supplied by groundwater located in an unincorporated area. The groundwater resource and use reflects the licensed volume and use for these towns.

13.4.1 Infrastructure projects to improve water availability

Central Highlands Water continued its Avoca Groundwater Desalinisation project to secure reliable drinking-quality water supply. During 2009–10, works completed included construction of water treatment facilities and a new bore. The project was due for completion in November 2010.

13.5 Location of water resources

Figure 13-2 Map of the Avoca basin



13.6 Surface water resources

13.6.1 Water balance

A surface-water balance for the Avoca basin is shown in Table 13-3. There are no storages greater than 1,000 ML in the Avoca basin. Small catchment dams are the main source of water supply in the catchment and the main source of losses in dry years.

Table 13-3 Balance of surface water in the Avoca basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage[(1)]		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow	26,400	24,200
Rainfall on major storages	0	n/a[(4)]
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	0	0
Sub-total	**26,400**	**24,200**
Usage		
Urban diversions	30	10
Licensed diversions from unregulated streams	1,600	1,600
Small catchment dams[(2)]	12,700	12,700
Sub-total	**14,300**	**14,300**
Losses		
Evaporation losses from major storages	0	0[(4)]
Losses from small catchment dams[(2)]	9,800	9,800
In-stream infiltration to groundwater, flows to floodplain and evaporation [(3)]	2,300	100
Sub-total	**12,100**	**9,900**
Water passed at outlet of basin		
Avoca River flow at Sandhill Lake Road (= outflow to terminal lakes)	0	0
Avoca River overflow from the terminal lakes to the Kerang Lakes	0	0

Notes:

(1) Excludes wetlands in the Avoca basin.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting usage from total estimated capacity.

(3) Losses represent the flow volume at the Avoca River gauge at Coonooer that did not enter the Avoca basin's terminal lakes.

(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

13.6.2 Small catchment dams

Specific information on small catchment-dam usage and losses for 2009–10 is not readily available. The values provided in Table 13-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 13-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,500	5,300	n/a
Registered commercial and irrigation	8,900	7,400	n/a
Total	**19,400**	**12,700**	**22,500**

n/a: Information not available.

13.6.3 Water entitlement transfers

There were no transfers of water entitlements within the basin or across basin boundaries in 2009–10.

13.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 13-5. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. Licensed diversions from unregulated streams are estimated based on irrigation-demand modelling and climate information.

Table 13-5 Volume of water diverted under surface water entitlements in the Avoca basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
Central Highlands Water					
Amphitheatre	1	25	-	11	Yes
Avoca(1)	1	233	-	20	Yes
Redbank(1)	1	20	-	-	Yes
Total annual volume of bulk entitlements 2009–10		**278**	**-**	**31**	
Total annual volume of bulk entitlements 2008–09		**278**	**-**	**15**	
Licensed diversions from unregulated streams 2009–10		*3,621*		*1,600*	
Licensed diversions from unregulated streams 2008–09		*3,621*		*1,600*	

Notes:
(1) Urban water supply for the townships of Redbank and Avoca was mostly sourced from groundwater in 2009–10.

13.7 Groundwater resources

There are no groundwater management areas or water supply protection areas located within the Avoca basin. Groundwater from an unincorporated area is being used to supply urban water for the townships of Avoca, Redbank, Amphitheatre and Daylesford. The licensed entitlements and metered use for these groundwater supplies is provided in Table 13-6.

Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

Table 13-6 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Avoca	200	137	152
Redbank	50	3	4
Amphitheatre	20	1	11
Daylesford	273	0	-
Total	**543**	**141**	**167**

13.8 Drought contingency measures

Drought contingency measures in the Avoca basin in 2009–10 included restricting urban and rural water use (as discussed below).

Central Highlands Water provided ongoing primary water supply from groundwater for Avoca and Redbank.

13.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 13-7.

A number of towns in the basin are either supplied by groundwater, or from surface water from the Wimmera, Glenelg and Murray basins. Some of these towns were initially on severe Stage 4 restrictions due to low water availability, with restriction eased to Stage 1 in October 2009. Restrictions were less severe for towns supplied by groundwater.

Amphitheatre and Quambatook, which are supplied from the Goulburn system, were subjected to Stage 3 and Stage 2 restrictions respectively for periods in 2009. Quambatook restrictions were eased to Stage 1 in November 2009.

Irrigation bans were in force on unregulated streams in the Avoca basin for the entire year.

Table 13-7 Seasonal allocations and restrictions on water use in Avoca basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Amphitheatre	Stage 3 restrictions from July to August 2009
	Avoca	Stage 2 restrictions from July 2009 to June 2010
	Redbank	Stage 2 restrictions from July 2009 to June 2010
	St Arnaud	Stage 4e restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Charlton	Stage 4e restrictions from July to September 2009, Stage 1 restrictions from October 2009 to June 2010
	Berriwillock, Chillingollah, Culgoa, Lalbert, Manangatang, Nandaly, Nullawil, Sea Lake, Ultima, Waitchie	Stage 3 restrictions from July to November 2009 and Stage 1 restrictions from December 2009 to June 2010
	Quambatook	Stage 2 restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010
	Nyah, Nyah West, Woorinen	Stage 3 restrictions from July to October 2009, Stage 1 restrictions from November 2009 to June 2010
Unregulated licensed diversions	Avoca River, Mosquito Creek, Lake Bael Bael, Lake Lookout, Lake Marmal, Sand Hill Lake, Tchum Lake North	Irrigation ban July 2009 to June 2010

13.10 Recycled water

GWMWater operates most wastewater treatment plants in the Avoca basin, with the exception of the Avoca plant, operated by Central Highlands Water.

The volume of wastewater produced in 2009–10 was the same as that produced in 2008–09 (121 ML), while the proportion of wastewater recycled in the Avoca basin treatment plants remained at 100%. The type of end-use shifted, so that more water was used in the urban and industrial sectors than in 2008–09, but less water was used as agricultural end use in 2009–10 than in 2008–09.

Table 13-8 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Avoca	13	13	100%	-	13	-	-	-	-
Charlton	0	-	0%	-	-	-	-	-	0
Sea Lake	25	25	100%	-	25	-	-	-	0
St Arnaud	82	82	100%	34	48	-	-	-	-
Total 2009–10	**121**	**121**	**100%**	**34**	**87**	**-**	**-**	**-**	**1**
Total 2008–09	**121**	**121**	**100%**	**24**	**97**	**-**	**-**	**-**	**0**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

13.11 Water for the environment

13.11.1 Environmental Water Reserve (EWR)

In 2009–10 the Avoca basin EWR comprised the following components:

- water set aside for the environment through flow-sharing arrangements set out in consumptive bulk entitlements held by Central Highlands Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

13.11.2 Passing-flow compliance

The Avoca River is essentially unregulated, with no significant storages in the basin. Central Highlands Water operates several small urban storages in the upper reaches and reported that it has complied with all flow-sharing requirements.

14 Mallee basin

This chapter sets out the accounts for the Mallee basin. For detailed information about how they have been compiled, refer to Chapter 5.

14.1 Mallee basin summary

Almost all surface water used in the Mallee basin is sourced from other basins. The Mallee basin relies heavily on groundwater, however extractions in 2009–10 decreased slightly compared to 2008–09.

14.2 Responsibilities for management of water resources

Table 14-1 shows the responsibilities of various authorities within the Mallee basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 14-1 Responsibilities for water resources management within the Mallee basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
GWMWater		Acts as the licensing authority for the Murrayville WSPA and all other groundwater bores in the Mallee basin(1)	Supplies water to Murrayville and Cowangie	
Lower Murray Water	Supplies water to the Millewa Waterworks District, Carwarp and Yelta			
Mallee Catchment Management Authority				Manages waterways in the whole of the Mallee basin

Note:

(1) Under agreement with Lower Murray Water.

14.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall across the basin generally ranged between 80% and 150% of the long-term average.

The Mallee basin has no well-defined streams other than the River Murray, which runs along the entire northern edge of the basin, and has only a few small tributaries at various points close to the Murray. Since the Murray surface water reporting is covered in Chapter 6, there is no surface water resource information presented in the Mallee basin.

There is no reliable estimate of surface flows in the Mallee basin to estimate the volume of water leaving the basin.

14.4 Total water resources in the basin

Table 14-2 below shows the water resources available and the water resource use in the Mallee basin during 2009–10.

Table 14-2 Summary of total water resources and water use in the Mallee basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	-	-
Groundwater(2)	14,300	6,800
Recycled water	-	-

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 14-3 and the estimated domestic and stock use as presented in Table 14-4.

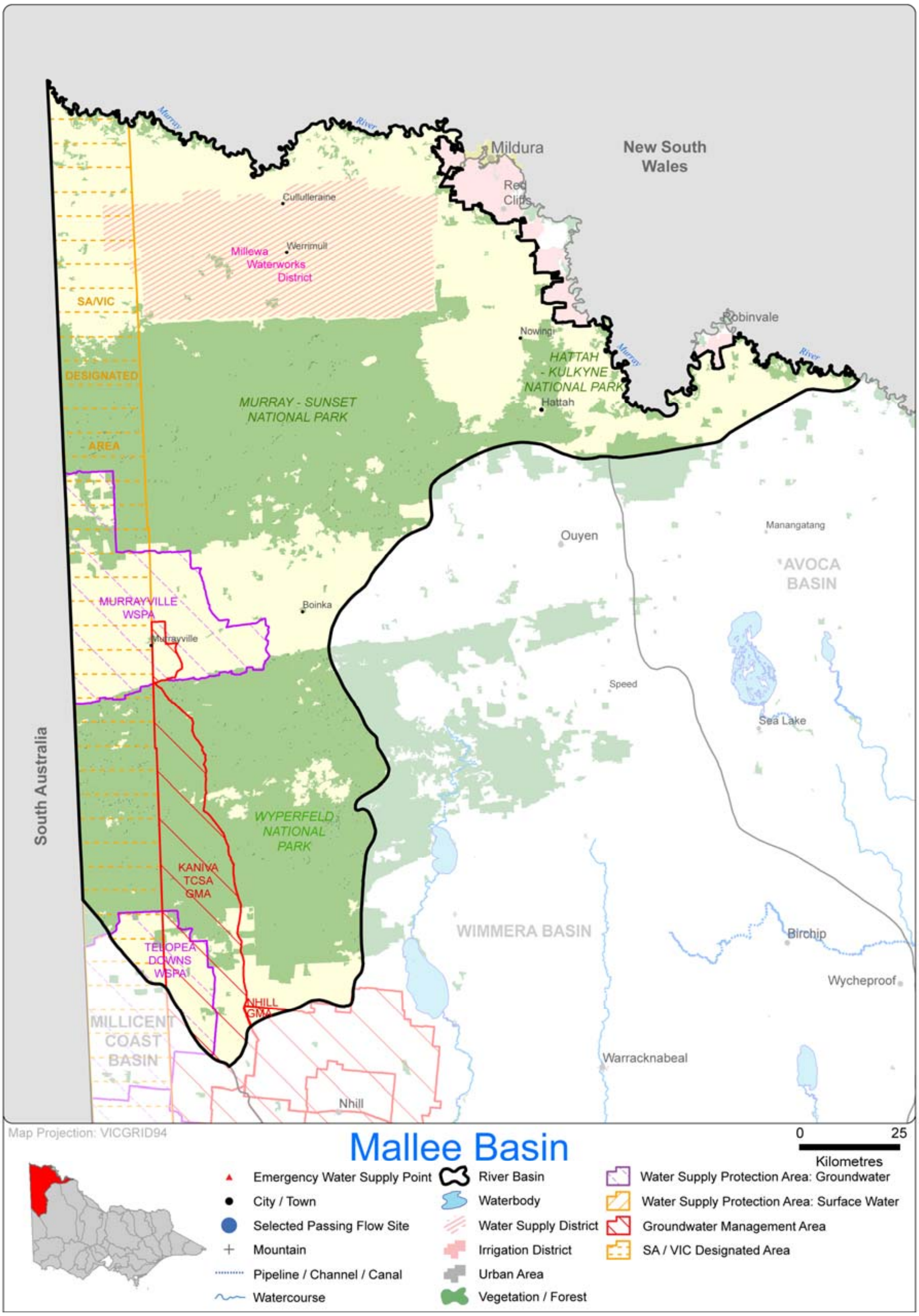
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

14.4.1 Infrastructure projects to improve water availability

GWMWater completed the Wimmera Mallee Pipeline Project in May 2010, which has replaced open earthen-channel systems with pipeline systems throughout parts of the Mallee basin. The pipeline sources water from the Wimmera-Glenelg basins.

14.5 Location of water resources

Figure 14-1 Map of the Mallee basin



14.6 Surface water resources

14.6.1 Water balance

A water balance for the Mallee basin has not been presented. All surface water supplies are sourced from outside the basin.

14.6.2 Small catchment dams

There are some small catchment dams in the Mallee basin, however there is no information on them and they are not a significant source of water to the region. Given the lack of information, the capacity of small catchment dams is assumed to be zero.

14.6.3 Water entitlement transfers

There were no transfers of water shares or allocations in the Mallee basin in 2009–10.

14.6.4 Volume diverted

There are no bulk entitlements supplied from surface water sourced from within the Mallee basin. The volume diverted under bulk entitlements for water supplied to the Mallee basin is presented in the water accounts for the adjacent river basins.

14.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Mallee basin, excluding domestic and stock use, is presented in Table 14-3.

The main water supply in the Mallee basin is groundwater. The Mallee basin contains all of the Murrayville WSPA as well as part of the Telopea Downs WSPA and Kaniva TCSA (tertiary confined sand aquifer) GMA. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

Reported groundwater usage in the Mallee basin reduced in 2009–10 compared with 2008–09. Groundwater levels in the Murrayville WSPA, Telopea Downs WSPA and Kaniva TCSA are generally stable and in line with management objectives.

Table 14-3 Licensed groundwater volumes, Mallee basin 2009–10

WSPA/GMA[(1)]	GMA/WSPA depth limits[(2)] (m)	Entitlement limit[(3)] (ML/year)	Licensed entitlement[(4)] (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Kaniva TCSA GMA (83%)	Tertiary confined sand aquifer	913	0	0	0	0	0
Murrayville WSPA (100%)	70-200	10,883	9,634	5,123	292	5,415	6,479
Telopea Downs WSPA (39%)	All depths	4,176	4,176	849	55	904	1,046
Total [(5)]		**15,972**	**13,810**	**5,972**	**347**	**6,319**	**7,525**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established (for example Telopea Downs WSPA), in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 14-4.

Table 14-4 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores[1][2]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[3]
Kaniva TCSA GMA (83%)	0	0
Murrayville WSPA (100%)	216	432
Telopea Downs WSPA (39%)	11	22
Total	**227**	**454**

Note:
(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 14-3.
(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross-checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.
(3) Total volumes are based on the sum of management unit data prior to rounding.

In the Mallee basin, groundwater is used as an urban water supply for the townships of Cowangie and Murrayville. The licensed entitlements and metered use for these groundwater supplies is provided in Table 14-5.

Table 14-5 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Cowangie	40	10	13
Murrayville	475	161	140
Total	**515**	**171**	**153**

14.8 Drought contingency measures

Drought contingency measures in the Mallee basin in 2009–10 included restrictions on urban and rural water usage (as discussed in section 14.8.1) and works to increase supply to towns. GWMWater continued to connect landowners to the Wimmera Mallee Pipeline during 2009–10.

14.8.1 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers in the Mallee Basin are shown in Table 14-6. There were no other restrictions on water use in the Mallee basin in 2009–10.

Table 14-6 Restrictions on urban water use in Mallee Basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Lower Murray Water customers (supplied from the River Murray)	Stage 3 (with exemptions) restrictions from July to November 2009, Stage 1 restrictions from November 2009 to June 2010

14.9 Recycled water

There are no wastewater treatment plants within the Mallee basin.

14.10 Water for the environment

14.10.1 Environmental Water Reserve (EWR)

In 2009–10 the Mallee basin EWR comprised water outside the allocation limit for GMAs and WSPAs.

14.10.2 Entitlements for the environment

Environmental water requirements for the Mallee Basin are delivered through River Murray entitlements. Refer to Chapter 6 for environmental water provided to Red Gums along the River Murray floodplain that includes Hattah-Kulkyne National Part, within the Mallee Basin.

14.10.3 Passing-flow compliance

As all surface water supplies are externally sourced in the Mallee basin, there are no passing-flow requirements.

15 Wimmera basin

This chapter sets out the accounts for the Wimmera basin. For detailed information regarding the manner in which they have been compiled, refer to Chapter 5.

15.1 Wimmera basin summary

At 93,200 ML, inflows to the Wimmera basin in 2009–10 were again very well below the long-term average of 316,400 ML. Although very low, (25% of the long-term average), these were almost 75% higher than those experienced in 2008–09. After beginning the year at 4% of capacity, storages in the Wimmera basin recovered by 38,900 ML to finish at 18% of capacity at the end of June 2010.

Despite the water shortage, Grampians Wimmera Mallee Water was able to secure restricted supplies to both urban and rural customers due to the fast tracking of the Wimmera Mallee Pipeline and continuation of a number of drought contingency measures.

Grampians Wimmera Mallee Water finished construction of the Wimmera Mallee Pipeline in May 2010, six years ahead of schedule. The project replaced over 17,000 kilometres of open earthen channels with an 8,800 kilometres pressurised pipeline system.

Drought response initiatives implemented during 2009–10 included the continuation of water restrictions, the provision of emergency water supplies and water carting.

Grampians Wimmera Mallee Water was able to reduce restrictions for towns supplied by the Wimmera system from Stage 4 to Stage 1 in October 2009 due to improved water availability and good progress on the Wimmera Mallee Pipeline. Coliban Water's Wimmera towns remained on Stage 4 restrictions for the whole year.

Only Landsborough, Navarre and Elmhurst, which are all supplied predominantly by groundwater, were spared the severe restriction levels

Rural customers that were yet to be connected to the Wimmera Mallee Pipeline continued to receive water through the Grampians Wimmera Mallee Water domestic water carting program until a pipeline supply was available to them.

The lack of inflows again prevented Grampians Wimmera Mallee Water from providing an allocation in the Wimmera irrigation area. Licensed diverters on unregulated streams across the basin were also banned from taking water the entire year.

15.2 Responsibilities for management of water resources

Table 15-1 shows the responsibilities of various authorities within the Wimmera basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 15-1 Responsibilities for water resources management within the Wimmera basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
GWMWater	Manages the Wimmera Mallee supply system which delivers water to farms in the Wimmera basin(1)	Manages groundwater and surface water licensed diversions	Supplies most towns in the Wimmera basin(1) Provides bulk supply to some of Coliban Water's towns located in the Loddon basin	Operates the Wimmera Mallee water supply system that includes Lakes Bellfield, Wartook, Lonsdale and Fyans and Taylors, and Pine Lakes
Central Highlands Water			Supplies Landsborough and Navarre	Obliged to meet passing-flow requirements
Coliban Water			Supplies Borung, Korong Vale, Wedderburn and Wychitella	
Goulburn-Murray Water	Provides GWMWater with bulk supplies for domestic and stock use from the Goulburn system via the Waranga Main Channel			
Wimmera Catchment Management Authority				Manages waterways in the Wimmera River catchment
North Central Catchment Management Authority				Manages waterways in the Avon and Richardson river catchments

Note:
(1) Also supplies farms and towns located in the Avoca and Mallee basins.

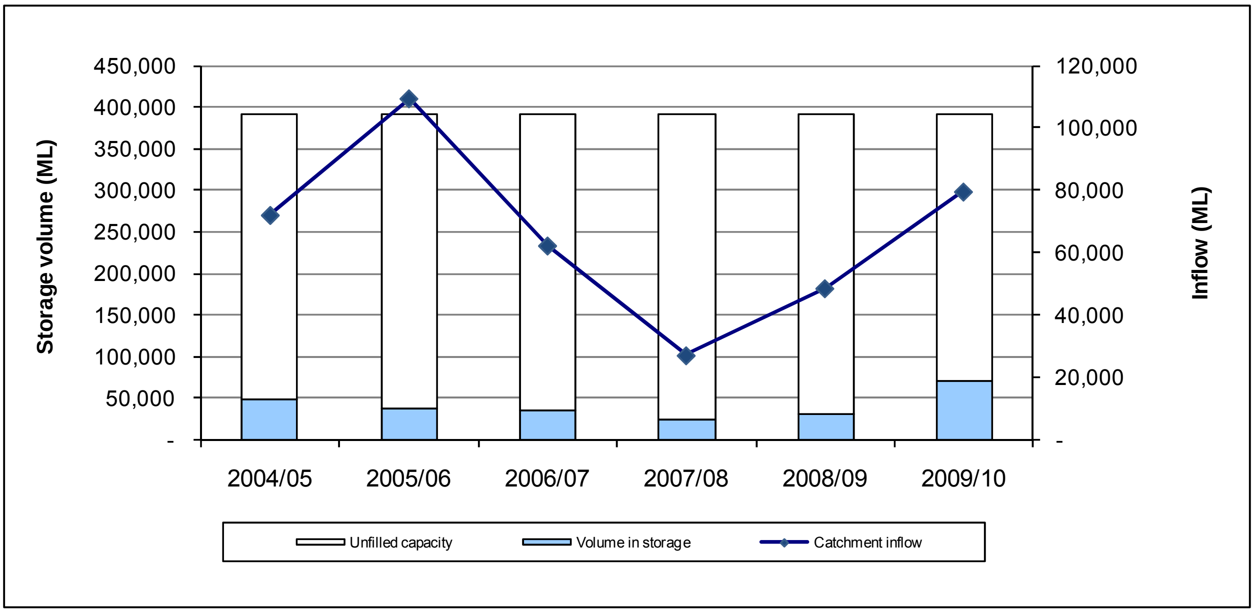
15.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall across the Wimmera basin ranged between 80% and 125% of the long-term average. Catchment inflows in 2009–10 were still low at 24% of the long-term average (of 316,400 ML), but were higher than that experienced in 2008–09.

The volume of water flowing from the Wimmera basin into the terminal lakes in the basin in 2009–10 was again low at 4,100 ML. This represents less than 5% of total inflows into the basin.

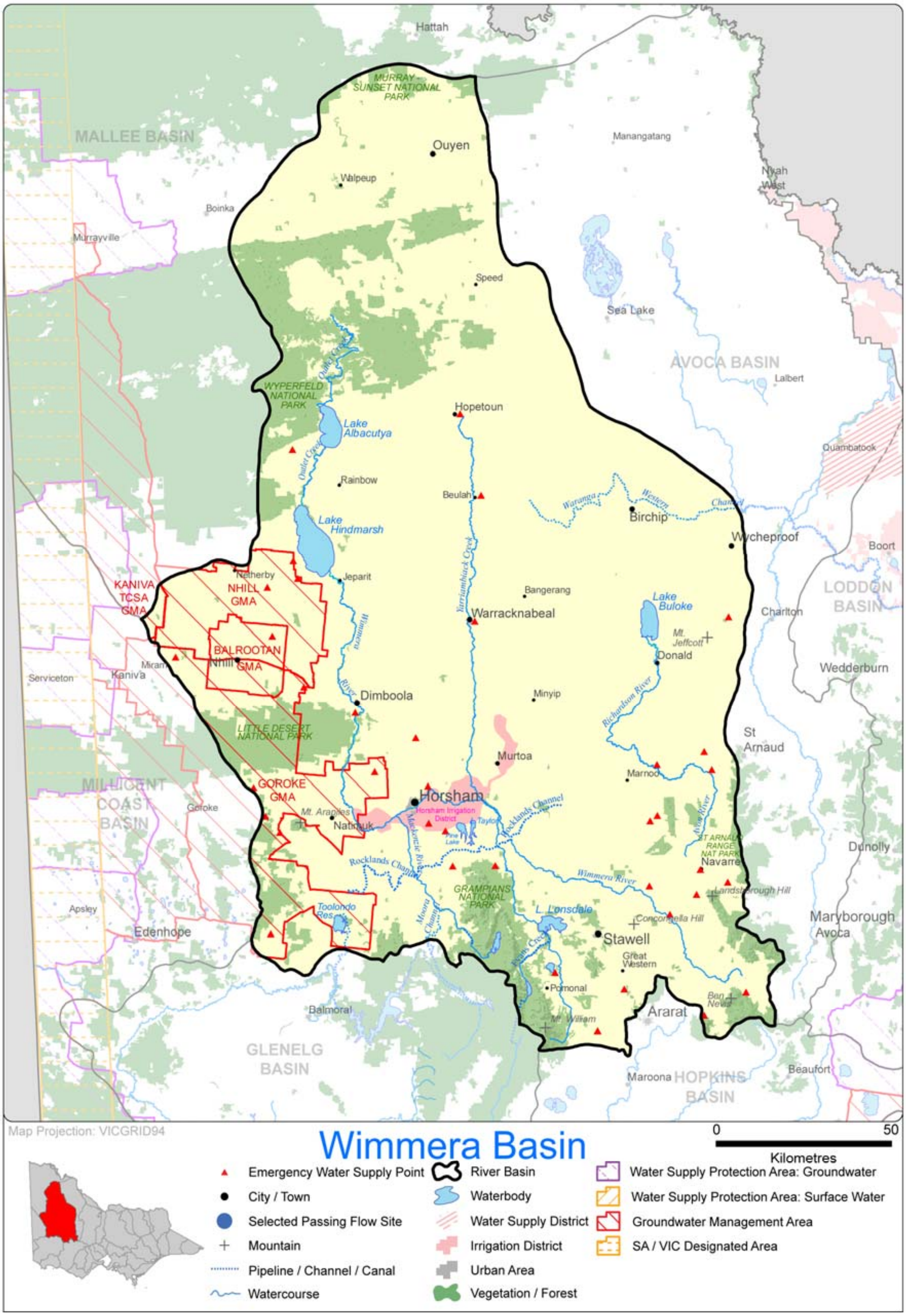
Storage levels for all major storages (greater than 1,000 ML capacity) in the basin increased from 31,200 ML in July 2009 to 70,100 ML (18% of capacity). Only volumes for major on-stream storages have been included in the water balance. In the Wimmera basin, these storages include Dock, Pine, Taylors, Fyans, Green and Batyo Lakes, Lakes Lonsdale and Bellfield, and Wartook and Toolondo Reservoirs.

Figure 15-1 All major storages and catchment inflows in the Wimmera basin



15.4 Location of water resources

Figure 15-2 Map of the Wimmera basin



15.5 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Wimmera basin are shown in Table 15-2.

Table 15-2 Summary of total water resources and water use in the Wimmera basin, 2009–10

Water source	Total water resource (ML)[2]	Total use (ML)
Surface water	93,200	29,200
Groundwater[1]	1,600	800
Recycled water	1,430	1,430

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 15-6 and the estimated domestic and stock use as presented in Table 15-7.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

15.5.1 Infrastructure projects to improve water availability

GWMWater completed construction of the Wimmera Mallee Pipeline in May 2010, which has replaced open earthen channel systems with an 8,800-kilometre pressurised pipeline system. The project commenced in December 2006.

Coliban Water replaced Wimmera System Open Earthen Storages with tanks to reduce losses. This project commenced in July 2009 and was completed in January 2010. Works undertaken included the installation of two 2-ML lined basins plus two 100-KL steel tanks.

Central Highlands Water continued construction on the Groundwater desalination for Landsborough to secure reliable high quality drinking water supply. During 2009–10, water treatment facilities and a new bore were constructed.

15.6 Surface water resources

15.6.1 Water balance

A surface-water balance for the Wimmera basin is shown in Table 15-3.

Table 15-3 Balance of surface water in the Wimmera basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	31,200	23,900
Volume in storage at end of year	70,100	31,200
Change in storage	**38,900**	**7,300**
Inflows		
Catchment inflow(1)	76,400	48,700
Rainfall on major storages	13,500	n/a(4)
Transfer from Glenelg basin	3,300	4,700
Return flow from irrigation	0	0
Treated wastewater discharged back to river	0	0
Sub-total	**93,200**	**53,400**
Usage		
Urban diversions and use	3,900	3,800
Diversions for irrigation and domestic and stock use	9,100	3,100
Licensed diversions from unregulated streams	1,800	1,800
Small catchment dams(2)	14,400	14,400
Sub-total	**29,200**	**23,100**
Losses		
Evaporation losses from major storages	6,700	13,900 (4)
Losses from small catchment dams(2)	8,600	8,600
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	5,700	400
Sub-total	**21,000**	**22,900**
Water passed at outlet of basin		
River outflows to Lake Hindmarsh (measured at Tarranyurk)	4,100	100
River outflows to Lake Buloke	0	0

Notes:
(1) Inflows have been back-calculated from outflows plus diversions.
(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.
(3) Losses estimated using loss functions in the Grampians Wimmera Mallee REALM model.
(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.
n/a: Not applicable.

15.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values provided in Table 15-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 15-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	12,900	6,500	n/a
Registered commercial and irrigation	9,400	7,900	n/a
Total	**22,300**	**14,400**	**23,000**

n/a: Information not available.

15.6.3 Water entitlement transfers

There were no transfers of water entitlements within the basin or across basin boundaries in 2009–10.

15.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 15-5. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. For multi-year entitlements, compliance is assessed based on the total volume of water diverted over the term of the entitlement. Therefore it is possible that the volume diverted in any given year may exceed the average bulk entitlement volume.

Licensed diversions from unregulated streams are estimated based on irrigation demand modelling and climate information.

Table 15-5 Volume of water diverted under surface water entitlements in the Wimmera basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)(3)
Coliban Water					
Wimmera and Glenelg(4)	5	450	-	45	Yes
Central Highlands Water					
Landsborough – Navarre	1	60	-	-	Yes
GWMWater					
Wimmera and Glenelg Rivers – Grampians Water(4)(5)	5	16,110	-	3,863	Yes
Wimmera and Glenelg Rivers – Wimmera Mallee Water(4)(5)(7)	5	109,640	-	9,110	Yes
Wannon Water					
Wimmera and Glenelg Rivers(5)(6)(8)	5	2,120	-	92	Yes
Environment Minister					
Wimmera and Glenelg Rivers Environmental Entitlement(4)(5)	5	40,560	-	5,940	Yes
Total annual volume of bulk entitlements 2009–10 (7)		**168,940**	**-**	**19,050**	
Total annual volume of bulk entitlements 2008–09		**206,473**	**-**	**15,162**	
Licensed diversions from unregulated streams 2009–10 (6)		*2,490*		*1,800*	
Licensed diversions from unregulated streams 2008–09		*2,490*		*1,800*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) Compliance is also assessed against the Murray-Darling Basin annual cap target for the Wimmera and Mallee basins, which is included in the MDBC's *Water audit monitoring report 2009–10*.

(3) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(4) These bulk entitlements are also reported in the Glenelg basin, however are shown only in the water balance for the Wimmera basin.

(5) Diversion is for the 1 November to 31 October period in line with the Glenelg-Wimmera entitlements water year.

(6) This bulk entitlement is also reported in the Glenelg basin, however is only included in the water balance for the Glenelg basin.

(7) This bulk entitlement was amended in 2009 to allocate water savings from the first stage of the Wimmera Mallee Pipeline Project.

(8) This bulk entitlement was amended in 2009 to include 2,000 ML of water savings from the first stage of the Wimmera Mallee Pipeline Project to augment supplies for Hamilton.

15.7 Groundwater resources

A summary of the licensed entitlements and use for groundwater management areas that overlap the Wimmera basin, excluding domestic and stock use, is presented in Table 15-6.

The Wimmera basin contains all of the Balrootan (Nhill) GMA and the majority of the Nhill GMA and Goroke GMA. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A. Groundwater levels are generally stable in all GMUs in this area.

Table 15-6 Licensed groundwater volumes, Wimmera basin 2009–10

WSPA/GMA(1)	GMA/WSPA depth limits[(2)] (m)	Allocation limit (ML/year) [(3)]	Licensed entitlement (ML/year) [(4)]	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Balrootan (Nhill) GMA (100%)	60-125	1,522	1,522	746	0	746	449
Goroke GMA (63%)	Tertiary sand confined aquifer	1,393	0	0	0	0	0
Nhill GMA (100%)	Tertiary sand confined aquifer	1,200	0	0	0	0	0
Total[(5)]		**4,115**	**1,522**	**746**	**0**	**746**	**449**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 15-7.

Table 15-7 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores[(1)(2)]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[(3)]
Balrootan (Nhill) GMA (100%)	20	40
Goroke GMA (63%)	0	0
Nhill GMA (98%)	0	0
Total	**20**	**40**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 15-6.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Groundwater is used as an urban water supply to the townships of Landsborough, Nhill, Boroka, Kiata, and Horsham Mt Zero. The licensed entitlements and metered use for these groundwater supplies is provided in Table 15-8.

Table 15-8 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Kiata	40	4	4
Landsborough	150	17	32
Nhill	1,000	520	437
Horsham Mt Zero[(1)]	800	260	493
Total	**1,990**	**801**	**966**

Note:

(1) New supply in 2008–09.

15.8 Drought contingency measures

Drought contingency measures in the Wimmera basin in 2009–10 included:

- restricting urban and rural water use (discussed in section 15.9)
- carting water to rural customers (see below).

GWMWater continued to implement its rural water-carting program in 2009–10. It provided emergency water supplies to rural customers in the Wimmera Mallee system not yet connected to the Wimmera Mallee Pipeline. Under the program, GWMWater provided 28,000 litres of water for domestic use every month to eligible customers. Water was carted from town storages and from other strategic carting sites. Water was also available for carting by customers for intensive industries, stock watering and crop spraying until a supply via the Wimmera Mallee Pipeline was available to them. In total, 79 deliveries were made to GWMWater customers in 2009–10, totalling approximately 2.2 ML

15.9 Seasonal allocations and restrictions on water use, diversions and extractions

Customers in both the rural and urban areas of the Wimmera basin faced significant restrictions on water use in 2009–10.

All towns supplied by the Wimmera system were on Stage 4 restrictions until October 2009, when restrictions were reduced to Stage 1. Only Landsborough, Navarre and Elmhurst, which are all supplied predominantly by groundwater, were spared the severe restriction levels.

The lack of inflows again prevented GWMWater from providing an allocation in the Wimmera irrigation area. Licensed diverters on unregulated streams across the basin were also banned from taking water the entire year.

Groundwater use was unrestricted in the Wimmera basin during 2009–10.

Table 15-9 Seasonal allocations and restrictions on water use in Wimmera basin, 2008–09

Type of restriction	Area	Nature of restriction
Urban	Landsborough, Navarre, Nandaly	Stage 1 restrictions from July 2009 to June 2010
	Elmhurst	Stage 2 restrictions from July to October 2009
	Korong Vale, Wedderburn, Borung and Wychitella	Stage 4 restrictions from July 2009 to June 2010
	Ouyen, Patchewollock, Speed, Tempy, Underbool, Walpeup, Wycheproof	Stage 3 restrictions from July to November 2009, Stage 1 restrictions from December 2009 to June 2010
	Antwerp, Beulah, Birchip, Brim, Clear Lake, Dimboola, Donald, Dooen, Glenorchy, Great Western, Halls Gap, Hopetoun, Horsham, Jeparit, Jung, Lascelles, Marnoo, Minyip, Moyston, Murtoa, Natimuk, Noradjuha, Pimpinio, Pomonal, Rainbow, Rupanyup, Stawell, Tarranyurk, Warracknabeal, Watchem,. Woomelang, Yaapeet	Stage 4 Ex restrictions from July to September 2009, Stage 1 restrictions from October 2009 to June 2010
Irrigation diversions	Regulated Wimmera Mallee system	0% allocation for the whole of 2009–10
	Avon River	Irrigation ban from July 2009 to June 2010
	Richardson River	Irrigation ban from July 2009 to June 2010
	Burnt Creek, Concongella Creek, Dunmunkle Creek, Fyans Creek, Green Lake, Mackenzie River, Mt Cole Creek, Mt William Creek, Shepherds Creek, Toolondo, Wattle Creek, Wimmera River, Wimmera Tributary, Yarriambiack Creek, Lake Albacutya, Lake Batyo Catyo, Lake Natimuk, Lake Wartook, Colliers Gap Creek, Spring Creek, Sweetwater Creek, Middle Creek and Unnamed Spring	Irrigation ban from July 2009 to June 2010

15.10 Recycled water

GWMWater operates 16 wastewater treatment plants in the Wimmera basin and reuses all wastewater at nine of these plants for purposes including irrigation of pasture, horticulture and vineyards, and urban and industrial uses (Table 15-10). Wastewater produced at seven other plants is evaporated on-site.

Table 15-10 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML) Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)	Volume discharged to the environment (ML)	Release to ocean/ other (ML)(3)
Birchip	34	34	100%	-	34	-	-	-	-
Dimboola	-	-	0%	-	-	-	-	-	-
Donald	54	54	100%	-	54	-	-	-	0
Halls Gap	11	11	100%	-	11	-	-	-	0
Hopetoun(4)	-	-	0%	-	-	-	-	-	-
Horsham(5)	779	779	100%	149	630	-	-	-	-
Jeparit(4)	-	-	0%	-	-	-	-	-	-
Minyip(4)	-	-	0%	-	-	-	-	-	-
Murtoa(5)	31	31	100%	-	31	-	-	-	0
Natimuk(4)	-	-	0%	-	-	-	-	-	-
Nhill	49	49	100%	-	49	-	-	-	-
Ouyen(4)	-	-	0%	-	-	-	-	-	-
Rainbow(4)	-	-	0%	-	-	-	-	-	-
Stawell	390	390	100%	161	229	-	-	-	-
Warracknabeal	42	42	100%	-	42	-	-	-	0
Wycheproof	40	40	100%	-	40	-	-	-	-
Total 2009–10	**1,428**	**1,428**	**100%**	**310**	**1,118**	**-**	**-**	**-**	**0**
Total 2008–09	**1,375**	**1,388**	**101%**	**343**	**1,032**	**12**	**1**	**-**	**-12**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

(4) All wastewater is evaporated on site.

(5) Volume of water recycled exceeded volume produced as water stored on-site carried over from previous year.

15.11 Water for the environment

15.11.1 Environmental Water Reserve (EWR)

The Wimmera River is a heritage river that depends on the EWR. Important environmental assets that are dependent on the Wimmera basin EWR include platypus, freshwater catfish and River Blackfish. Several priority river reaches have been identified and include:

- MacKenzie River Reach 2 which contains regionally threatened native fish (River Blackfish, Southern Pygmy Perch, Mountain Galaxias) and platypus populations (believed to be less than 10 and the only population in the catchment)
- MacKenzie River Reach 3 which contains the only known population of the Wimmera Bottlebrush (*melaleuca wimmerensis* formerly known as *callistemon wimmerensis*) which has recently been classified under the Flora and Fauna Guarantee (FFG) Act. This species is dependent on flows in the MacKenzie River for its survival and recruitment.
- Lower Wimmera River which is listed under the Heritage River Act flows into Lake Hindmarsh (listed as a nationally significant wetland) and Lake Albacutya (a Ramsar Wetland). It also contains Victoria's only self-sustaining population of Freshwater Catfish (FFG Act-listed species). The Wimmera River also contains stocked populations of Murray Cod and Silver Perch which are both FFG Act listed species.

In 2009–10 the Wimmera basin EWR comprised the following components:

- the Bulk Entitlement (Wimmera and Glenelg Rivers – Flora and Fauna) Order 2005 containing 75,299 ML of water, of which 40,560 ML is water held and released from storages and 34,739 ML is associated with passing-flow rules. In 2009–10 there was 13,750 ML available for use under this entitlement for both the Wimmera and Glenelg Basins
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by GWMWater
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions

- all other water in the basin not allocated for consumptive use, that is, water above cap.

15.11.2 Entitlements for the environment

The formal entitlement for the environment for the Wimmera basin in 2009–10 is the Bulk Entitlement (Wimmera and Glenelg Rivers – Flora and Fauna) Order 2005 held by the Environment Minister. The Inter Catchment Advisory Group (ICAG) determines the share of environmental allocations between the two catchments.

A volume of 5,940 ML of water was released for environmental benefits for the Wimmera Basin out of a total of 16,383 ML available in storage under this entitlement in 2009–10.

- 4,420 ML was supplied from Taylors Lake into the Wimmera River in September and October 2009 providing drought refuge to the freshwater catfish population and other aquatic biota.
- 160 ML was supplied from Toolondo Channel into the Wimmera River in October 2009 to fill refuge pools that had not been filled since 2007 and in some cases to provide the first flow along portions of the lower Wimmera River since early 2005. This was critical for securing habitat for native fish species that have been decimated due to the drought and over-extraction as well as reducing the decline of riparian vegetation.
- 365 ML was released from Dad and Dave Weir into the Mackenzie River between December 2009 and June 2010 to keep a high value reach of river (very good fish and macroinvertebrate communities) watered in summer–autumn and only requires a relatively small value
- 1,000 ML was released from Distribution Heads in September and October 2009 for the MacKenzie River to water the highly endangered Wimmera Bottlebrush which depends on flows for its heath and recruitment.

A further 5,298 ML of water flowed over Huddleston's Weir on the Wimmera River as unregulated passing flow (in accordance with the passing-flow rules in the entitlement).

These flows are the first component of water savings from the Wimmera Mallee Pipeline Project to be returned to the environment. They restored connectivity to a 30-kilometre stretch known locally as the 'Dead River' and provided critical additional volumes of regulated releases to maximise river health benefits for the lower Wimmera River.

15.11.3 Passing-flow compliance

GWMWater report that they met all passing-flow requirements in the Wimmera basin for 2009–10.

15.11.4 Streamflow management plans (SFMPs)

The need for a SFMP in the upper Wimmera River will be reviewed in the Western Region Sustainable Water Strategy.

16 East Gippsland basin

This chapter sets out the accounts for the East Gippsland basin. For detailed information about how they have been compiled, refer to Chapter 5.

16.1 East Gippsland basin summary

Despite inflows being just 34% of the long-term average in 2009–10, surface water use in the basin was unrestricted.

Consumptive use in the basin is very low compared to water availability. Almost 99% of inflows passed to Bass Strait in 2008–09.

16.2 Responsibilities for management of water resources

Table 16-1 shows the responsibilities of various authorities within the East Gippsland basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 16-1 Responsibilities for water resources management within the East Gippsland basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages licensed diversions from groundwater and surface water sources		
East Gippsland Water			Supplies urban water to towns including Mallacoota, Cann River and Bemm River	Obliged to meet passing-flow requirements
East Gippsland Catchment Management Authority				Manages waterways in the whole of the East Gippsland basin

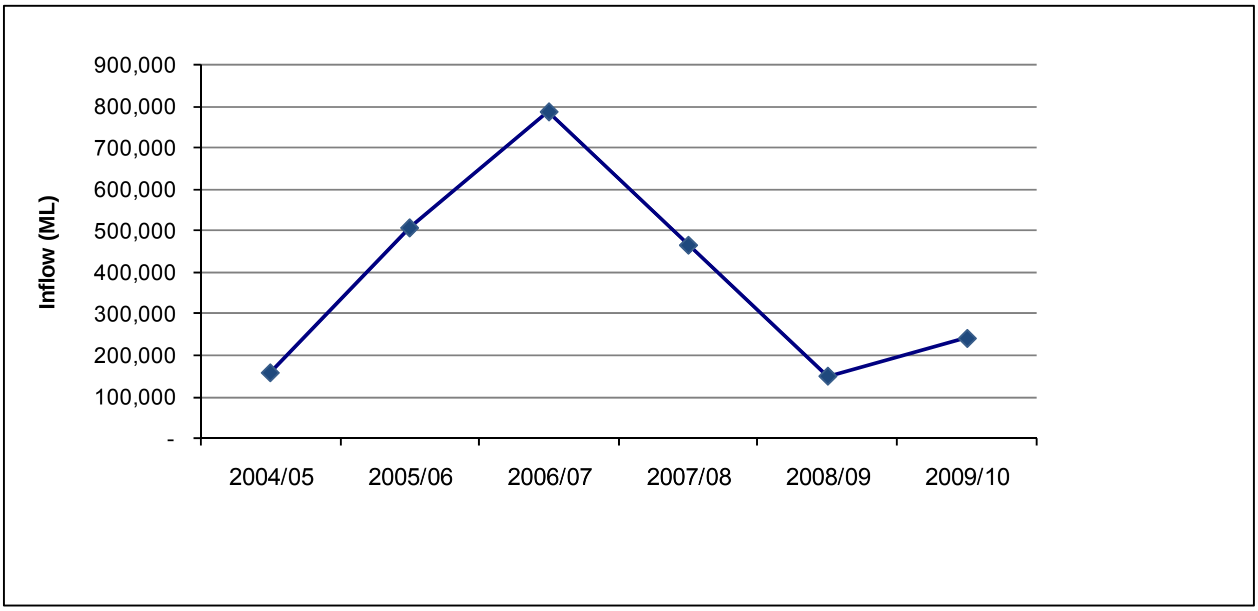
16.3 Rainfall and flows in 2009–10

In 2009–10, rainfall in the East Gippsland basin ranged between 60% and 100% of the long-term average. Inflows were 34% of the long-term average (of 714,000 ML), an increase from the 21% recorded in 2008–09.

The amount of water flowing from the East Gippsland basin into Bass Strait was 240,300 ML in 2009–10, compared with 149,100 ML in 2008–09. Basin outflow represented about 99% of total inflows into the basin.

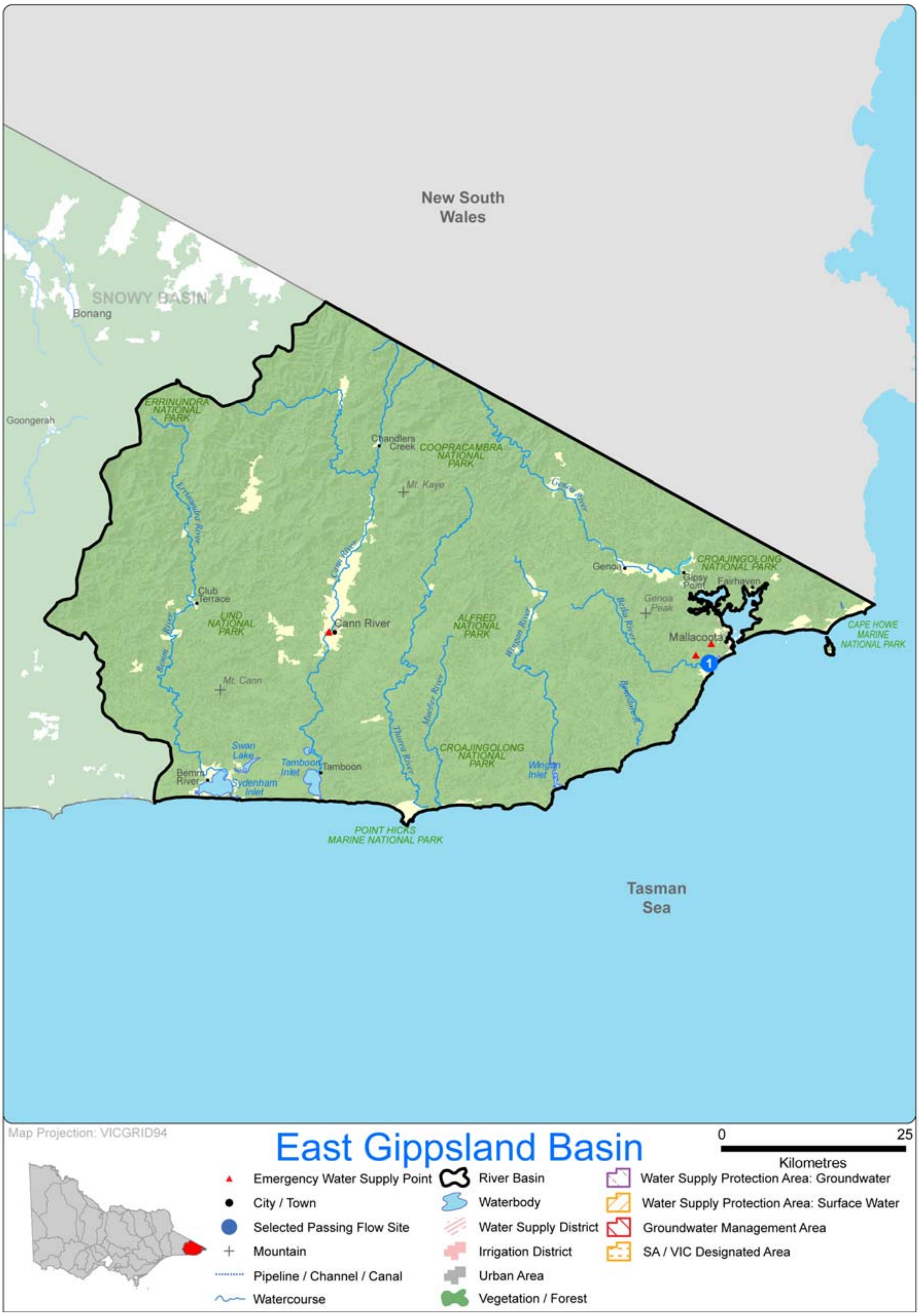
There are no major storages located within the East Gippsland basin.

Figure 16-1 Catchment inflows in the East Gippsland basin



16.4 Location of water resources

Figure 16-2 Map of the East Gippsland basin



16.5 Total water resources in the basin

The total volumes of water available and supplied from water resources in the East Gippsland basin are shown in Table 16-2. There is very low use of surface water relative to the available resource in the basin (0.6% in 2009–10), and only limited groundwater extraction (although using the whole available water resource). All wastewater is recycled for productive purposes.

Table 16-2 Summary of total water resources and water use in the East Gippsland basin, 2009–10

Water source	Total water resource (ML)	Total use (ML)
Surface water	241,800	1,400
Groundwater[(1)]	120	120
Recycled water	30	30

Note:

(1) Although there are no WSPAs or GMAs in the East Gippsland basin, the town of Mallacoota is supplied by groundwater located in an unincorporated area. The groundwater resource and use reflects the licensed volume and use for Mallacoota.

16.6 Surface water resources

16.6.1 Water balance

The surface-water balance for the East Gippsland basin for 2009–10 is presented in Table 16-3.

No reservoir information is recorded in the water balance as there are no storages in the East Gippsland basin with a capacity greater than 1,000 ML.

The inflows to the East Gippsland basin originate from New South Wales and Victoria. On average, New South Wales contributes around 26% of total inflows to the basin. The water balance includes total flow for the basin in both states.

Less than 1% of the catchment inflows were diverted for consumptive use, predominantly in small catchment dams.

Table 16-3 Balance of surface water in the East Gippsland basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow[(1)]	241,800	150,700
Rainfall on major storages	0	n/a[(4)]
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	0	0
Sub-total	**241,800**	**150,700**
Usage		
Urban diversions	130	130
Licensed diversions from unregulated streams	200	300
Small catchment dams	1,100	1,100
Sub-total	**1,400**	**1,500**
Losses		
Evaporation losses from major storages	0	0 [(4)]
Evaporation from small catchment dams[(2)]	100	100
In-stream infiltration to groundwater, flows to floodplain and evaporation[(3)]	0	0
Sub-total	**100**	**100**
Water passed at outlet of basin		
River outflows	240,300	149,100

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(3) Assumed to be zero because data is not readily available.

(4) Evaporation loss from major storage reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

16.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 16-4 below have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 16-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	800	400	n/a
Registered commercial and irrigation	900	700	n/a
Total	**1,700**	**1,100**	**1,200**

n/a: Information not available.

16.6.3 Water entitlement transfers

There were no transfers of water entitlements within the basin or across basin boundaries in 2009–10.

16.6.4 Volume diverted

The volume of water diverted under East Gippsland Water's bulk water entitlements is shown in Table 16-5.

Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10.

Licensed diversions from unregulated streams are estimated based on irrigation demand modelling and climate information.

Table 16-5 Volume of water diverted under surface water entitlements in the East Gippsland basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
East Gippsland Water					
Bemm River	1	100	-	18	Yes
Cann River	1	192	-	41	Yes
Mallacoota	1	330	-	68	Yes
Total annual volume of bulk entitlements 2009–10		**622**	**-**	**126**	
Total annual volume of bulk entitlements 2008–09		**622**	**-**	**127**	
Licensed diversions from unregulated streams 2009–10		*774*		*222*	
Licensed diversions from unregulated streams 2008–09		*908*		*327*	

16.7 Groundwater resources

There are no groundwater management areas or water supply protection areas located within the East Gippsland basin. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

East Gippsland Water operates a groundwater bore in the East Gippsland basin for the town of Mallacoota with a licensed volume of 120 ML a year. 117 ML was extracted from the bore in 2009–10, an increase from the 80 ML extracted during 2008–09.

Table 16-6 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10(ML)	Metered use 2008–09 (ML)
Mallacoota	120	117	80
Total	**120**	**117**	**80**

16.8 Drought contingency measures

East Gippsland was largely unaffected by drought in 2009–10. However East Gippsland Water was required to source groundwater for Mallacoota's supplies after the Betka River stopped flowing over summer.

16.9 Seasonal allocations and restrictions on water use, diversions and extractions

All towns in the East Gippsland region were under permanent water savings rules during 2009–10. Licensed surface water and groundwater users were unrestricted during 2009–10.

16.10 Recycled water

East Gippsland Water operates the wastewater treatment plants at Mallacoota and Cann River. The volume of wastewater produced during 2009–10 was similar to that produced during 2008–09. All the wastewater was recycled for agricultural applications including pasture and tree plantations.

Table 16-7 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation (1)	Within process(2)		
Cann River	8	8	100%	-	8	-	-	-	-
Mallacoota	20	20	100%	-	20	-	-	-	-
Total 2009–10	**28**	**28**	**100%**	**-**	**28**	**-**	**-**	**-**	**-**
Total 2008–09	**35**	**35**	**100%**	**-**	**35**	**-**	**-**	**-**	**0**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example to maintain biological processes. This value is not included in the total percent recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

16.11 Water for the environment

16.11.1 Environmental Water Reserve (EWR)

Several environmental assets rely on the EWR in the East Gippsland Basin, these include: swamp skink, Sydenham, Tamboon and Mallacoota Inlets which are nationally significant wetlands, pristine estuaries, heritage river reaches, Australian Grayling, Australian Bass, Tangle Orchid and Eastern Curlew.

In 2009–10 the East Gippsland basin EWR comprised the following components:

- water set aside for the environment through flow-sharing arrangement conditions within consumptive bulk entitlements held by East Gippsland Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

16.11.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

East Gippsland Water and Southern Rural Water reported that all passing-flow requirements were met under bulk entitlements in 2009–10.

Table 16-8 shows passing-flow compliance in the East Gippsland basin for a selected bulk entitlement compliance point. While there are other compliance points, the point below has been chosen as it was judged to be of community interest. The location of this compliance point is presented in Figure 16-2.

Table 16-8 Selected passing-flow compliance in the East Gippsland basin

River	Passing flow	
Betka River	Instrument where passing flows are specified	Bulk Entitlement (Mallacoota) Conversion Order 1997
	Responsible authority	East Gippsland Water
	Compliance point	Mallacoota Diversion Weir (shown as 1 in Figure 16-2)
	Passing-flow compliance	• Half the flow was passed for flows less than or equal to 3.1 ML per day • A minimum of 1.55 ML per day was passed for flows greater than 3.1 ML per day

17 Snowy basin

This chapter sets out the accounts for the Snowy basin. For detailed information about how they have been compiled, refer to Chapter 5.

17.1 Snowy basin summary

Consumptive entitlements in the Snowy basin are low compared with the total water resource. Although inflows from Victoria were just 37% of the long-term average in 2009–10, more than 99% flowed into Bass Strait.

Urban and rural water users were unrestricted throughout the year. Groundwater users were also unrestricted.

17.2 Responsibilities for management of water resources

Table 17-1 shows the responsibilities of various authorities within the Victorian portion of the Snowy basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 17-1 Responsibilities for water resources management within the Snowy basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions		
East Gippsland Water			Supplies towns including Buchan, Bonang, Orbost and Marlo	Obliged to meet passing-flow requirements
East Gippsland Catchment Management Authority				Manages waterways for the whole of the Snowy basin

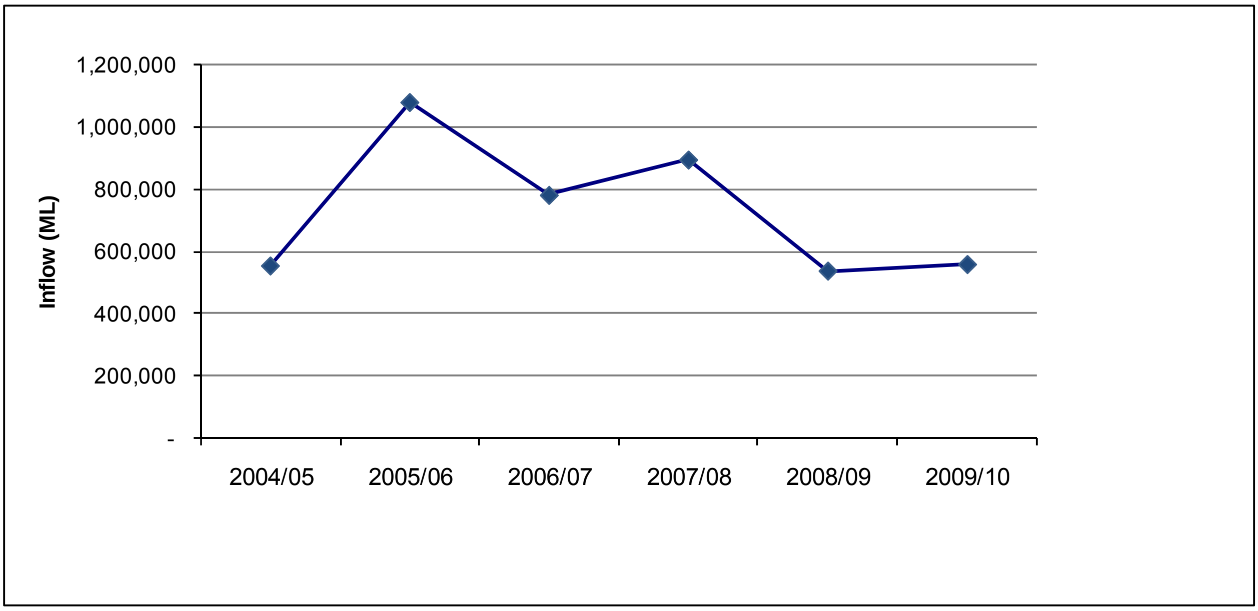
17.3 Rainfall, flows and storage levels in 2009–10

In 2009–10, rainfall in the Snowy basin ranged between 80% and 125% of the long-term average. Total inflows to the Victorian portion of the basin were 380,600 ML or 55% of the long-term average (of 1,022,000 ML). This compared with 431,000 ML or 42% in 2008–09. Inflows from NSW are regulated by the Snowy Mountains Hydro Electricity Scheme. This inflow was 178,400 ML in 2008–09, up from 107,000 ML in 2008–09.

The amount of water flowing from the Snowy basin into Bass Strait was 553,300 ML in 2009–10. This represents 99% of total inflows to the basin.

There are no major storages (greater than 1,000 ML capacity) located within the Victorian portion of the Snowy basin.

Figure 17-1 Catchment inflows to the Snowy basin (including contribution from NSW)



17.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Snowy basin are shown in Table 17-2. There is a very low consumptive use of surface water relative to the available resource in the Victorian portion of the basin. All treated wastewater is reused for productive purposes. Approximately 95% of the Snowy basin is an unincorporated area that contains a significant groundwater resource not represented in these totals.

Table 17-2 Summary of total water resources and water use in the Snowy basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	559,000	5,000
Groundwater(2)	1,200	300
Recycled water	240	240

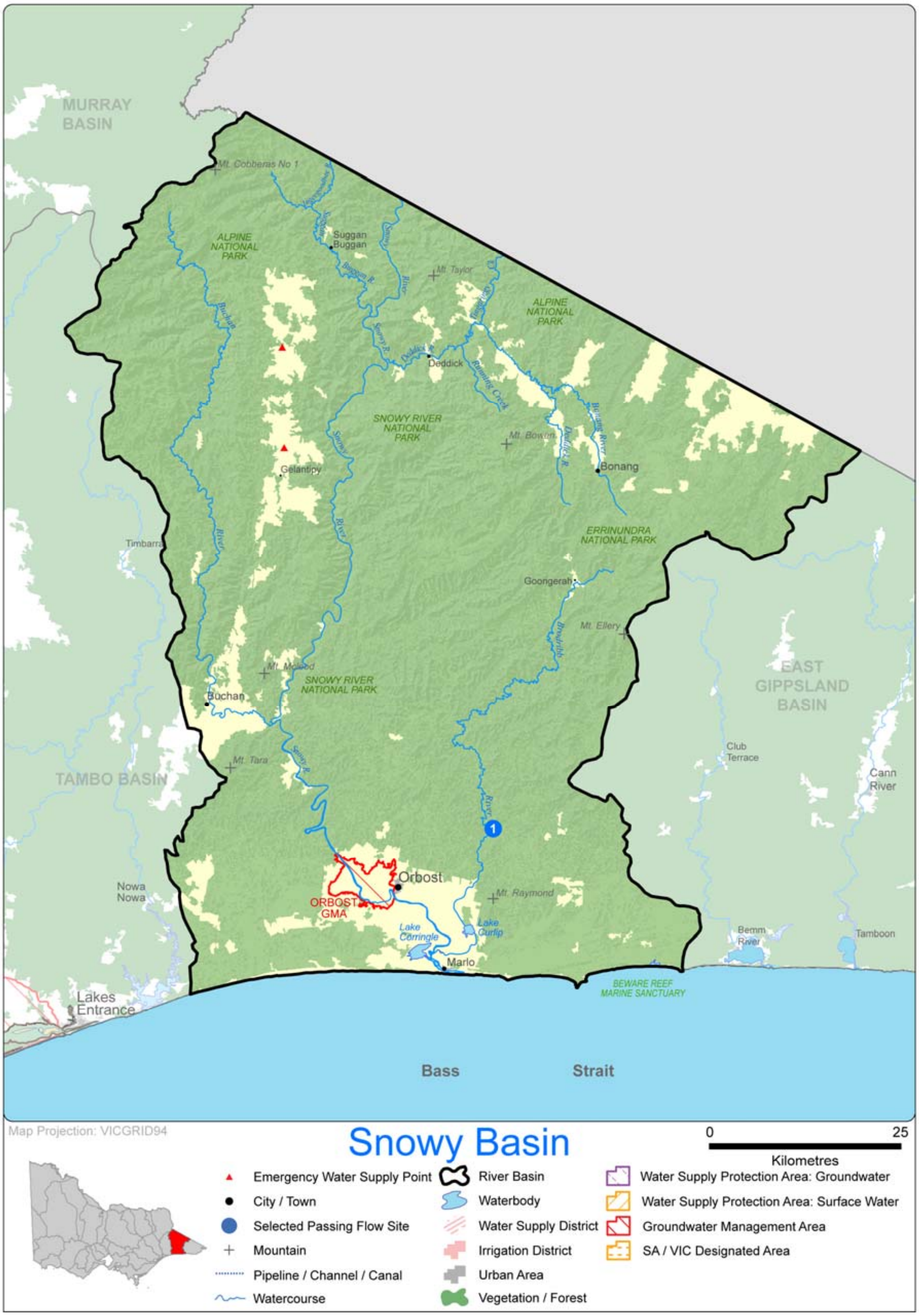
Note:

(1) For groundwater the total water resource is the licensed entitlement volume as presented in Table 17-7 and the estimated domestic and stock use as presented in Table 17-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

17.5 Location of water resources

Figure 17-2 Map of the Snowy basin



17.6 Surface water resources

17.6.1 Water balance

A surface-water balance for the Snowy basin is shown in Table 17-3. As these accounts provide a record of water availability and use across Victoria, this balance considers only the Victorian portion of the Snowy basin.

No reservoir information is recorded in the water balance as there are no storages in the Victorian portion of the Snowy basin with a capacity greater than 1,000 ML.

Victorian inflows accounted for 69% of the total inflows to the basin, compared with 80% in 2008–09. Diversions in Victoria from the Snowy basin represent less than 2% of total inflows. Small catchment dams are estimated to be the largest source of diversions.

Table 17-3 Balance of surface water in the Snowy basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow from Victoria(1)	380,600	431,000
Catchment inflow from NSW(2)	178,400	107,000
Rainfall on major storages	0	n/a(5)
Return flow from irrigation	0	0
Treated wastewater discharged back to river	0	0
Sub-total	**559,000**	**538,000**
Usage		
Urban diversions	790	810
Licensed diversions from unregulated streams	800	1,500
Small catchment dams	3,400	3,400
Sub-total	**5,000**	**5,700**
Losses		
Evaporation losses from major storages	0	0 (5)
Evaporation from small catchment dams(3)	700	700
In-stream infiltration to groundwater, flows to floodplain and evaporation(4)	0	0
Sub-total	**700**	**700**
Water passed at outlet of basin		
River outflows to the ocean	553,300	531,600

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.
(2) Inflows from NSW recorded on the Snowy River at Burnt Hut Crossing (gauge 222013).
(3) Evaporation losses are calculated by subtracting estimated usage from the total water harvested.
(4) Assumed to be zero because data is not available.
(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.
n/a: Not applicable.

17.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 17-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 17-4 Catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	3,100	1,600	n/a
Registered commercial and irrigation	2,100	1,800	n/a
Total	**5,200**	**3,400**	**4,100**

n/a: Information not available.

17.6.3 Water entitlement transfers

In 2009–10, no net movement of surface water resources occurred into, or out of, the Snowy basin. Trades of temporary bundled water entitlements did occur within the basin.

Table 17-5 summarises the trade in bundled surface water entitlements in 2009–10. 64 ML of temporary entitlements were traded within the Snowy Unregulated system in this year.

Table 17-5 Transfers of surface water bundled entitlements in the Snowy basin 2009–10

Trading zone	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Snowy Unregulated	0	0	0	64	64	0
Total 2009–10	**0**	**0**	**0**	**64**	**64**	**0**
Total 2008–09	**0**	**0**	**0**	**53**	**53**	**0**

17.6.4 Volume diverted

The volume of water diverted under East Gippsland Water's bulk entitlements is shown in Table 17-6. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2008–09.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 17-6 Volume of water diverted under surface water entitlements in the Snowy basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
East Gippsland Water					
Buchan	1	170	-	25	Yes
Orbost System	1	2,031	-	763	Yes
Total annual volume of bulk entitlements 2009–10		**2,201**	**-**	**787**	
Total annual volume of bulk entitlements *2008–09*		**2,201**	**-**	**805**	
Licensed diversions from unregulated streams 2009–10		*4,034*		*807*	
Licensed diversions from unregulated streams 2008–09		*3,940*		*1,466*	

17.7 Groundwater resources

The Snowy basin contains the entire Orbost GMA. Licensed groundwater entitlements and use for the Orbost GMA in the Snowy basin, excluding domestic and stock use, are shown in Table 17-7. Groundwater levels in Orbost GMA are generally stable.

Table 17-7 Licensed groundwater volumes, Snowy basin 2009–10

WSPA/GMA(1)	GMA/WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement (4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Orbost GMA (100%)	20-45	1,201	1,201	333	0	333	578
Total		**1,201**	**1,201**	**333**	**0**	**333**	**578**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV).

(4) Licensed entitlement includes domestic and stock usage in those cases where this forms part of a licensed volume.

An estimate of domestic and stock groundwater use in the Snowy basin is provided in Table 17-8. Groundwater is not used as an urban supply in the Snowy basin.

Table 17-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Orbost GMA (100%)	5	10
Total	**5**	**10**

Note:
(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 17-7.
(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

17.8 Drought contingency measures

No drought contingency measures were implemented in 2009–10.

17.9 Seasonal allocations and restrictions on water use, diversions and extractions

There were no urban or rural restrictions on surface water or groundwater use in the Snowy basin in 2009–10.

17.10 Recycled water

The Orbost wastewater treatment plant is the only treatment plant in the Snowy basin. In 2009–10 all of the wastewater passing through this treatment plant was recycled and used for a number of agricultural applications including pasture and tree plantations (Table 17-9).

Table 17-9 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation (1)	Within process(2)		
Orbost	243	243	100%	-	243	-	-	-	-
Total 2009–10	**243**	**243**	**100%**	**-**	**243**	**-**	**-**	**-**	**-**
Total 2008–09	**217**	**217**	**100%**	**-**	**217**	**-**	**-**	**-**	**-**

Notes:
(1) Volume used to deliver specific environmental flow benefits.
(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.
(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

17.11 Water for the environment

17.11.1 Environmental Water Reserve (EWR)

The health of the Snowy River is dependent on the Snowy basin's EWR. Particularly, this includes: Australian Grayling populations, Australian Bass, Lower Snowy wetlands and estuary which are nationally important wetlands, heritage river reaches, Ewing's Marsh wetlands complex and the Snowy River Daisy.

In 2009–10 the Snowy basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of the water licence issued to Snowy Hydro
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by East Gippsland Water
- environmental allocations from outcomes of the Snowy Water Inquiry
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

17.11.2 Entitlements for the environment

The Victorian volume of environmental entitlements and water shares purchased for the Snowy basin as at June 2010 was 80,634 ML. During 2009–10 the Bulk Entitlement (River Murray – Snowy Environmental Reserve) Order 2004 was amended to add 22,100 ML of high-reliability water for the Snowy River. This water reflected water savings achieved through the decommissioning of Lake Mokoan and new operational arrangements for the Victorian mid-Murray storages.

The Snowy environmental entitlements were created through the inter-governmental agreements between the Commonwealth, Victorian and New South Wales Governments, known as the Snowy Water Inquiry Outcomes Implementation Deed (SWIOID). The agreement is to provide for the return of 212,000 ML (21%) of the original flow to the Snowy River below Jindabyne by 2012, and 28% in the longer term. The environmental water for the Snowy River will be achieved through investment in water recovery projects in the Goulburn, Murray and Murrumbidgee basins.

The second interim target under the SWIOID was met in June 2009 with the recovery of 142,000 ML of water entitlements for the Snowy River. The Snowy water-recovery project is on track to meet the 2012 target of recovering 212,000 ML of water entitlements for the Snowy River.

17.11.3 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

East Gippsland Water and Southern Rural Water reported that all passing-flow requirements were met under bulk entitlements in 2009–10.

Table 17-10 shows passing-flow compliance in the Snowy basin for a selected bulk entitlement compliance point. While there are other compliance points, the point below has been chosen as it was judged to be of community interest. The location of this compliance point is presented in Figure 17-2.

Table 17-10 Selected passing-flow compliance in the Snowy basin

River	Passing flow	
Rocky River, Brodribb River	Instrument where passing flows are specified	Bulk Entitlement (Orbost) Conversion Order 1997
	Responsible authority	East Gippsland Water
	Compliance point	Rocky River, downstream of the offtake weir (shown as 1 in Figure 17-2)
	Passing-flow compliance	The lesser of 1 ML per day or natural inflow was passed

18 Tambo basin

This chapter sets out the accounts for the Tambo basin. For detailed information about how they have been compiled, refer to Chapter 5.

18.1 Tambo basin summary

Inflows in the Tambo basin were very low in 2009–10 at just 27% of the long-term average. This is almost 50% lower than the annual inflows experienced in 2008–09,

There are no large authorised diversions in the Tambo basin as its bigger towns, such as Lakes Entrance, are now supplied by the Bairnsdale water system. As such, about 90% of basin inflows flow to the Gippsland Lakes.

Licensed surface-water users were unrestricted during the year.

18.2 Responsibilities for management of water resources

Table 18-1 shows the responsibilities of various authorities within the Tambo basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 18-1 Responsibilities for water resources management within the Tambo basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions		
East Gippsland Water			Supplies towns including Lakes Entrance, Bruthen, and Swifts Creek	Obliged to meet passing-flow requirements
East Gippsland Catchment Management Authority				Manages waterways in the whole of the Tambo basin

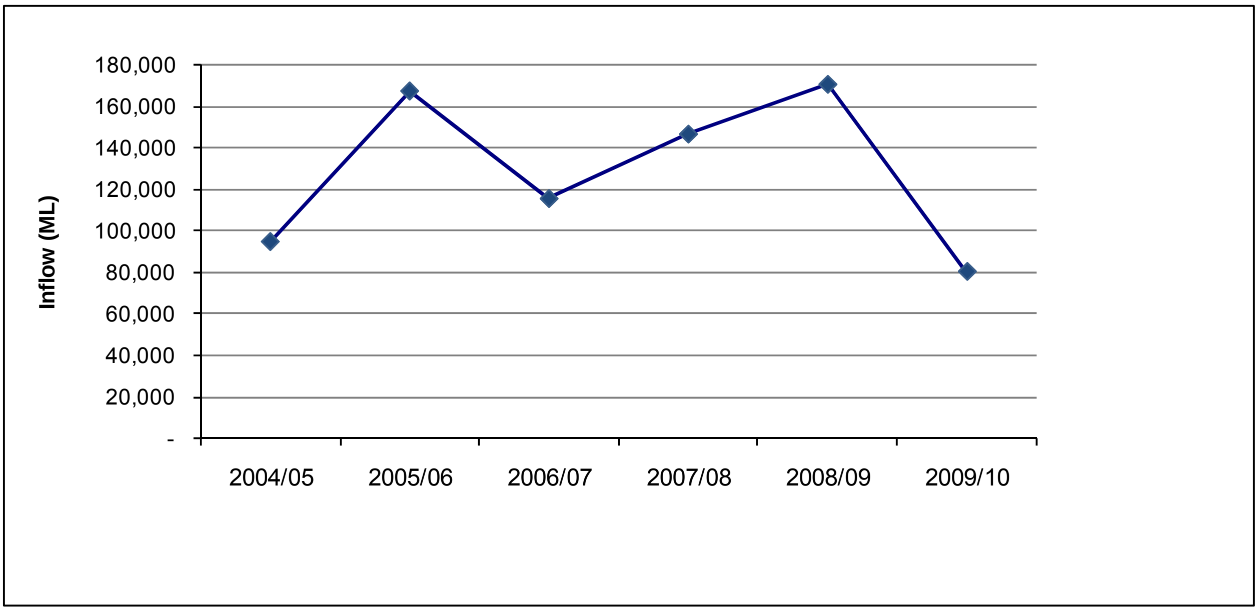
18.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Tambo basin ranged between 80% and 125% of the long-term average. While rainfall was close to average, inflows in 2009–10 were about 27% of the long-term average (of 297,800 ML).

The amount of water flowing from the Tambo basin into the Gippsland Lakes was 73,400 ML in 2009–10, which was approximately 91% of total inflows to the basin.

There are no major storages located within the Tambo basin.

Figure 18-1 Catchment inflows in the Tambo basin



18.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Tambo basin are shown in Table 18-2.

The total diversions do not include the surface water transferred from the Mitchell River to the towns of Bruthen, Nicholson, Johnsonville, Swan Reach, Metung and Lakes Entrance. Consumptive use in the Tambo basin is low compared to the available resource in the basin.

Table 18-2 Summary of total water resources and water use in the Tambo basin, 2009–10

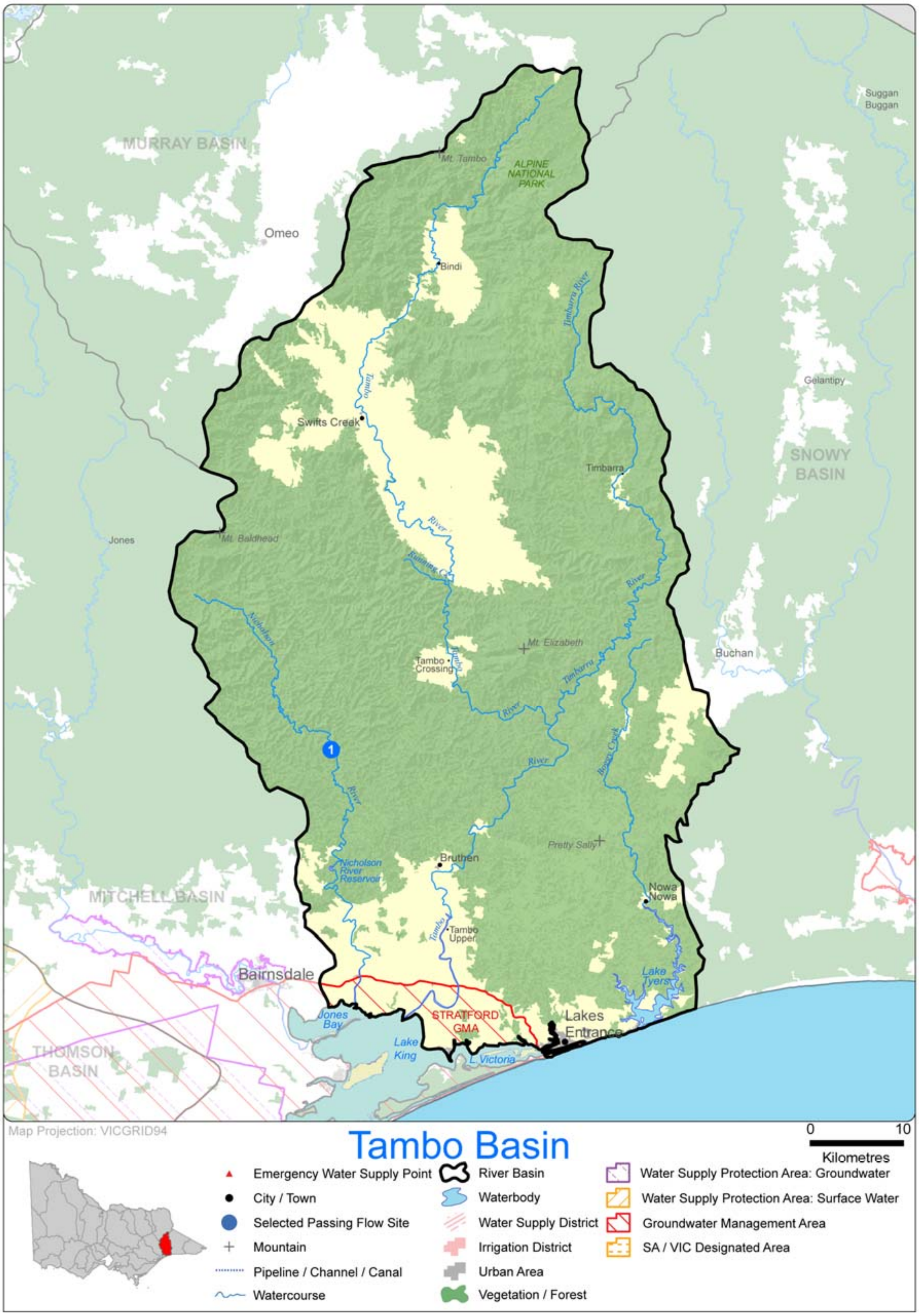
Water source	Total water resource (ML)	Total use (ML)
Surface water	80,500	5,000
Groundwater	-	-
Recycled water	480	480

18.4.1 Infrastructure projects to improve water availability

East Gippsland Water undertook a project to reduce losses and improve water quality for Sarsfield. This involved constructing a 6-ML tank to replace the 160-ML open basin.

18.5 Location of water resources

Figure 18-2 Map of the Tambo basin



18.6 Surface water resources

18.6.1 Water balance

A surface-water balance for the Tambo basin is shown in Table 18-3.

No reservoir information is recorded in the water balance as there is no reservoir in the Tambo basin with a capacity greater than 1,000 ML.

Table 18-3 Balance of surface water in the Tambo basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow(1)	80,500	170,700
Rainfall on major storages	0	n/a(4)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	0	0
Sub-total	**80,500**	**170,700**
Usage		
Urban diversions	30	40
Licensed diversions from unregulated streams	1,100	1,300
Small catchment dams	3,900	3,900
Sub-total	**5,000**	**5,200**
Losses		
Evaporation losses from major storages	0	0(4)
Evaporation from small catchment dams(2)	2,100	2,100
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	0	0
Sub-total	**2,100**	**2,100**
Water passed at outlet of basin		
River outflows to the ocean	73,400	163,400

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(3) Assumed to be zero because data is not readily available.

(4) Evaporation loss on major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

18.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 18-4 below are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 18-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	4,500	2,200	n/a
Registered commercial and irrigation	2,100	1,700	n/a
Total	**6,600**	**3,900**	**6,000**

n/a: Information not available.

18.6.3 Water entitlement transfers

There were no surface-water entitlement transfers in the Tambo basin during 2009–10.

Table 18-5 is included to present a comparison with data from 2008–09.

Table 18-5 Transfers of surface water bundled entitlements in the Tambo basin 2009–10

Trading zone	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Tambo Unregulated	0	0	0	0	0	0
Total 2009–10	0	0	0	0	0	0
Total *2008–09*	4	4	0	10	10	0

18.6.4 Volume diverted

Table 18-6 shows the volume of water diverted under East Gippsland Water's bulk entitlements. Compliance with individual bulk entitlement volumes is deemed to occur if water-use is not more than the average annual bulk entitlement volume.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

No water was extracted under the Bruthen, Nowa Nowa and Lakes Entrance bulk entitlements. These towns were supplied with water taken from the Mitchell basin under East Gippsland Water's Bairnsdale bulk entitlement.

Table 18-6 Volume of water diverted under surface water entitlements in the Tambo basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
East Gippsland Water					
Bruthen(1)	1	313	-	-	Yes
Lakes Entrance(1)	1	2,993	-	-	Yes
Nowa Nowa(1)	1	118	-	-	Yes
Swifts Creek	1	224	-	31	Yes
Total annual volume of bulk entitlements 2009–10		**3,648**	**-**	**31**	
Total annual volume of bulk entitlements *2008–09*		**3,648**	**-**	**37**	
Licensed diversions from unregulated streams 2009–10		*4,188*		*1,144*	
Licensed diversions from unregulated streams 2008–09		*4,177*		*1,337*	

Note:

(1) No water was extracted under the Bruthen, Lakes Entrance and Nowa Nowa bulk entitlements. Water is supplied to these towns under the Bairnsdale bulk entitlement, reported in Table 19-6 in the Mitchell Basin.

18.7 Groundwater resources

There are no GMAs or WSPAs located within the Tambo basin.

There is no urban groundwater supply in the Tambo basin.

Groundwater entitlements and use for unincorporated areas are detailed in Appendix A.

18.8 Drought contingency measures

No drought contingency measures were in place in the Tambo Basin in 2009–10.

18.9 Seasonal allocations and restrictions on water use, diversions and extractions

No restrictions on water use, diversions or extractions occurred in the Tambo Basin in 2009–10.

18.10 Recycled water

East Gippsland Water operates the wastewater treatment plants at Lakes Entrance and Metung. All of the wastewater passing through these treatment plants was recycled and used for a number of agricultural applications including pasture and tree plantations, racecourses and golf courses (Table 18-7).

Table 18-7 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Lakes Entrance	416	416	100%	-	416	-	-	-	-
Metung	65	65	100%	-	65	-	-	-	-
Total 2009–10	**481**	**481**	**100%**	**-**	**481**	**-**	**-**	**-**	**-**
Total 2008–09	**731**	**731**	**100%**	**-**	**731**	**-**	**-**	**-**	**-**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

18.11 Water for the environment

18.11.1 Environmental Water Reserve (EWR)

The Gippsland Lakes are important environmental assets partially dependent on water from the EWR in the Tambo basin. They are listed as internationally significant wetlands under the Ramsar convention and rely on the freshwater inputs from the Tambo basin to ecologically function. Other environmental assets that rely on the EWR include: fish populations (Australian Grayling, Black Bream), and the Bosses, Nebbor, Russell's and Tambo River East swamps, which are nationally important wetlands.

In 2009–10 the Tambo basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by East Gippsland Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

18.11.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

East Gippsland Water and Southern Rural Water reported that all passing-flow requirements were met in the Tambo basin under their bulk entitlements in 2009–10.

Table 18-8 shows passing-flow compliance in the Tambo basin for a selected bulk-entitlement compliance point. While there are other compliance points, the point below has been chosen as it was judged to be of community interest. The location of this compliance point is presented in Figure 18-2.

Table 18-8 Selected passing-flow compliance in the Tambo basin

River	Passing flow	
Nicholson River	Instrument where passing flows are specified	Bulk Entitlement (Lakes Entrance) Conversion Order 1997
	Responsible authority	East Gippsland Water
	Compliance point	Nicholson River Reservoir Weir (shown as 1 in Figure 18-2)

	Passing-flow compliance	• from June to November inclusive:
		  • half the flow was passed when flow was less than 60 ML per day
		  • 30 ML per day was passed when flow was greater than 60 ML per day
		• from December to May inclusive:
		  • half the flow was passed when flow was less than 14 ML per day
		  • 7 ML per day was passed when flow was greater than 14 ML per day
		• instantaneous minimum passing flow:
		  • half the flow was passed when flow was less than 6 ML per day
		  • 3 ML per day was passed when flow was greater than 6 ML per day

19 Mitchell basin

This chapter sets out the accounts for the Mitchell basin. For detailed information about how they have been compiled, refer to Chapter 5.

19.1 Mitchell basin summary

Inflows in the Mitchell basin increased by 57% this year compared to 2008–09, and were 65% of the long-term average. About 96% of these inflows were not diverted and entered the Gippsland Lakes.

Surface-water users, including those supplied from the Bairnsdale water system, were unrestricted during the year. This is because consumptive use is low compared to the total surface water resource.

Licensed groundwater use in the basin was similar to 2008–09.

19.2 Responsibilities for management of water resources

Table 19-1 shows the responsibilities of various authorities within the Mitchell basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 19-1 Responsibilities for water resources management within the Mitchell basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions		
East Gippsland Water			Supplies towns, including Bairnsdale and Paynesville	Obliged to meet passing-flow requirements
East Gippsland Catchment Management Authority				Manages waterways in the entire Mitchell basin

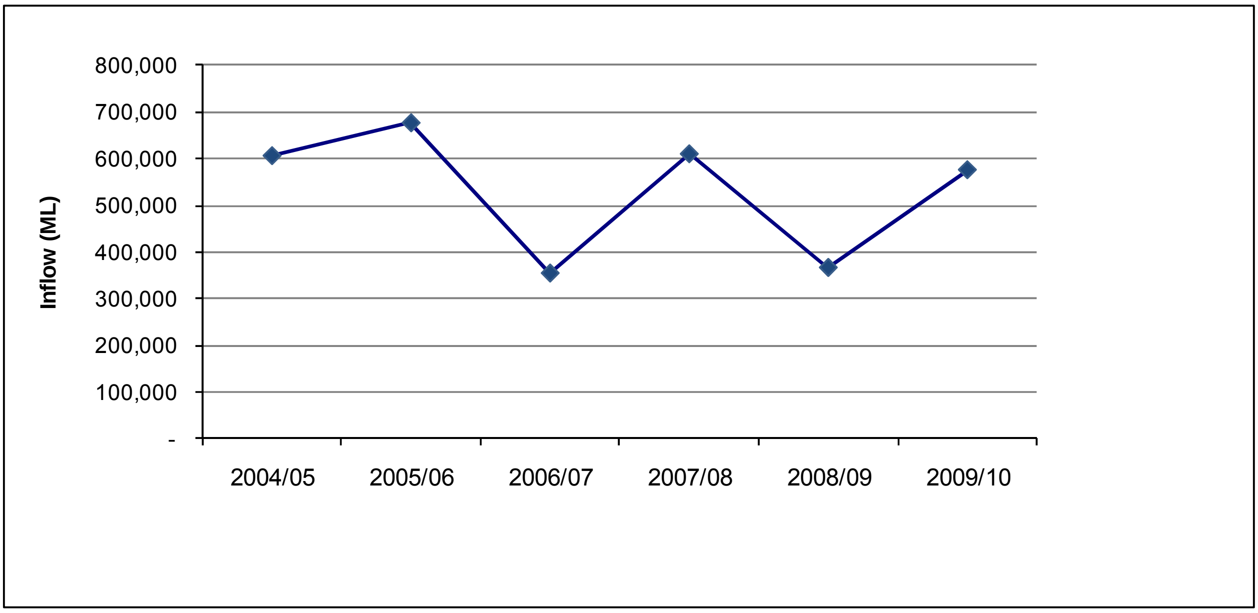
19.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Mitchell basin ranged between 80% and 125% of the long-term average. Inflows to the basin were 65% of the long-term average (of 884,500 ML) compared to 41% in 2008–09.

The amount of water flowing from the Mitchell basin into the Gippsland Lakes was 550,800 ML in 2009–10, a significant increase from 340,700 ML recorded in 2008–09. The 2009–10 outflows were 96% of the total inflows into the basin.

There are no major storages located within the Mitchell basin.

Figure 19-1 Catchment inflows in the Mitchell basin



19.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Mitchell basin are shown in Table 19-2. As well as supplying Bairnsdale, the Mitchell River is the source of supply for the towns of Bruthen, Nicholson, Johnsonville, Swan Reach, Metung and Lakes Entrance in adjacent river basins, and supports irrigation on the Lindenow Flats. Annual water use in the Mitchell basin is low compared to the available resource.

Table 19-2 Summary of total water resources and water use in the Mitchell basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	575,200	23,000
Groundwater(2)	11,400	4,000
Recycled water	1,340	1,340

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 19-7 and the estimated domestic and stock use as presented in Table 19-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

19.4.1 Infrastructure projects to improve water availability

East Gippsland Water progressed with its $45 million program of works to secure high quality, long term water supplies for its customers reliant on the Mitchell River. Work in 2009–10 included construction of a new water treatment plant and construction of new 700 ML raw water storage.

19.5 Location of water resources

Figure 19-2 Map of the Mitchell basin

19.6 Surface water resources

19.6.1 Water balance

A surface-water balance for the Mitchell basin is shown in Table 19-3. Diversions make up a relatively small proportion of total inflows, with approximately 4% of the total basin inflows diverted for consumptive use.

No storage information is recorded in the water balance as there are no on-stream storages in the Mitchell basin with a capacity greater than 1,000 ML.

Table 19-3 Balance of surface water in the Mitchell basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow(1)	575,100	365,800
Rainfall on major storages	0	n/a(5)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river(2)	90	90
Sub-total	**575,200**	**365,900**
Usage		
Urban diversions	4,800	4,490
Licensed diversions from unregulated streams	13,700	14,800
Small catchment dams	4,500	4,500
Sub-total	**23,000**	**23,800**
Losses		
Evaporation losses from major storages	0	0(5)
Evaporation from small catchment dams(3)	1,100	1,100
In-stream infiltration to groundwater, flows to floodplain and evaporation(4)	300	300
Sub-total	**1,400**	**1,400**
Water passed at outlet of basin		
River outflows to the ocean	550,800	340,700

Notes:
(1) Inflows have been back-calculated from outflows plus diversions.
(2) Comprises water returned to rivers within the basin from alpine resorts.
(3) Evaporation losses are calculated by subtracting estimated usage from water harvested.
(4) Losses are calculated from the Wonnangatta River between Waterford and Angusvale and part upstream of Waterford. This length of river covers approximately 50% of the basin.
(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.
n/a: Not applicable.

19.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 19-4 have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 19-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	4,200	2,100	n/a
Registered commercial and irrigation	2,900	2,400	n/a
Total	**7,100**	**4,500**	**5,600**

n/a: Information not available.

19.6.3 Water entitlement transfers

Movement of surface water entitlements in the Mitchell basin was limited to transfers of bundled entitlement within the basin. In 2009–10, 40 ML of entitlements were transferred on a permanent basis in the Mitchell Basin and 90 ML was traded on a temporary basis. There was no net movement of water into the Mitchell basin in this year.

Table 19-5 summarises the movement of bundled entitlements in the Mitchell basin during 2009–10.

Table 19-5 Transfers of surface water bundled entitlements in the Mitchell basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
Mitchell Unregulated	40	40	0	90	90	0
Total 2009–10	40	40	0	90	90	0
Total *2008–09*	**0**	**0**	**0**	**192**	**192**	**0**

19.6.4 Volume diverted

The volume of water diverted under the bulk entitlement established for the Mitchell basin is shown in Table 19-6. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 19-6 Volume of water diverted under surface water entitlements in the Mitchell basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
East Gippsland Water					
Bairnsdale	1	5,902	-	4,802	Yes
Total annual volume of bulk entitlements 2009–10		**5,902**	**-**	**4,802**	
Total annual volume of bulk entitlements *2008–09*		**5,902**	**-**	**4,491**	
Licensed diversions from unregulated streams 2009–10		*16,895*		*13,674*	
Licensed diversions from unregulated streams 2008–09		*16,285*		*14,817*	

19.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Mitchell basin, excluding domestic and stock use, is presented in Table 19-7.

The Mitchell basin contains the entire Wy Yung WSPA as well as part of the Sale WSPA and Stratford GMA. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A. Groundwater levels in the Wy Yung WSPA are stable, while levels in the Sale WSPA and Stratford GMA are declining.

Groundwater use in 2009–10 decreased slightly compared to 2008–09.

Table 19-7 Licensed groundwater volumes, Mitchell basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)(6)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Stratford GMA (7%)	Zone 1 >150 Zone 2 >350	2,050	2,050	7	2,061	2,069	1,995
Sale WSPA (8%)	25-200	1,697	1,688	888	-	888	895
Wy Yung WSPA (100%)	≤25	7,463	7,462	798	-	798	1,024
Total(5)		**11,210**	**11,200**	**1,693**	**2,061**	**3,754**	**3,914**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Includes domestic and stock usage in those cases where this forms part of a licensed volume.

(5) Total volumes are based on the sum of management unit data prior to rounding.

(6) Non-metered use includes estimated extraction from Latrobe Valley Mines.

An estimate of domestic and stock groundwater use is provided in Table 19-8. Groundwater is not used for urban supply within the Mitchell basin.

Table 19-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Stratford GMA (7%)	0	0
Sale WSPA (8%)	66	132
Wy Yung WSPA (100%)	39	78
Total	**105**	**210**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 19-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

19.8 Drought contingency measures

There were no drought contingency measures in place in the Mitchell basin during 2009–10.

19.9 Seasonal allocations and restrictions on water use, diversions and extractions

No restrictions on water use, diversions or extractions occurred in the Mitchell Basin in 2009–10.

19.10 Recycled water

The wastewater treatment plants at Bairnsdale, Lindenow and Paynesville are operated by East Gippsland Water. All the wastewater passing through the Paynesville and Lindenow treatment plants was recycled and used for a number of applications including pasture and tree plantations, racecourses and golf courses (Table 19-9).

The Bairnsdale wastewater treatment plant has, as part of its treatment process, a series of constructed wetlands located within the Macleod Morass. The constructed wetlands provide additional filtration for water discharged from the treatment plant before it is released into the morass as environmentally beneficial water for the deep freshwater marsh. This discharge is considered a beneficial allocation.

Table 19-9 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Bairnsdale	1,119	1,119	100%	-	46	1,073	-	-	-
Lindenow	7	7	100%	-	-	7	-	-	-
Paynesville	217	217	100%	-	217	-	-	-	-
Total 2009–10	**1,343**	**1,343**	**100%**	**-**	**263**	**1,080**	**-**	**-**	**-**
Total 2008–09	**1,348**	**1,348**	**100%**	**-**	**252**	**1,096**	**-**	**-**	**-**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percent recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

19.11 Water for the environment

19.11.1 Environmental Water Reserve (EWR)

The Gippsland Lakes are important environmental assets partially dependent on water from the EWR in the Mitchell basin. The lakes are listed as internationally significant wetlands under the Ramsar convention and rely on the freshwater inputs from the Mitchell basin to function ecologically. Other environmental assets that rely on the EWR include: heritage river reaches, fish populations (Australian Grayling , Black Bream), water birds (Great Egret), and botanical values (Yellow-wood)..

In 2009–10 the Mitchell basin EWR comprised the following components:

- water set aside for the environment through the release of passing flows, as a condition of the consumptive bulk entitlement held by East Gippsland Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

19.11.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

East Gippsland Water and Southern Rural Water reported that all passing-flow requirements were met under bulk entitlements in 2009–10.

Table 19-10 shows passing-flow compliance in the Mitchell basin for a selected bulk entitlement compliance point. While there are other compliance points, the point below has been chosen as it was judged to be of community interest. The location of this compliance point is presented in Figure 19-2.

Table 19-10 Selected passing-flow compliance in the Mitchell basin

River	Passing flow	
Mitchell River	Instrument where passing flows are specified	Bulk Entitlement (Bairnsdale) Conversion Order 2000
	Responsible authority	East Gippsland Water
	Compliance point	Mitchell River, downstream of Glenaladale pump station (shown as 1 in Figure 19-2)
	Passing-flow compliance	Flows were passed according to the following rules: • no diversion when flow was less than 30 ML per day • 30 ML per day passed when flow was between 30 and 46 ML per day • when flow was between 46 and 246 ML per day, the entire flow, less 16 ML per day, was passed • when flow was between 246 and 265 ML per day the entire flow, less 16 ML per day, was passed • when flow was greater than 265 ML per day the authority passed the entire flow, less 35 ML per day.

20 Thomson basin

This chapter sets out the accounts for the Thomson basin. For detailed information regarding the manner in which they have been compiled, refer to Chapter 5.

20.1 Thomson basin summary

While inflows in the Thomson basin were only 58% of the long-term average this year, they were 57% greater than 2008–09.

The volume of water in major storages in the Thomson basin increased by 120,000 ML over the year. Around half of the improvement was attributable to Thomson Reservoir, which recorded a small but significant increase from 16% to 22% by the end 2009–10.

Towns in the Thomson basin were not subject to restrictions in 2009–10. However, the Melbourne supply system, which partially relies on Thomson Reservoir, remained on Stage 3a restrictions for most of the year.

Rights to water in the Thomson River were further qualified in September 2009 to increase the volume of environmental flows retained in storage in Thomson Reservoir to secure water supplies for Melbourne.

By April 2010, the improvement in storage levels and the completion of the north-south pipeline and re-connection of Tarago reservoir provided the opportunity to reinstate 3,000 ML of the environment's water.

Although irrigation allocations for the Macalister irrigation district were higher this year (100% high-reliability water shares, 45% low-reliability water shares) than 2008–09, water use was slightly less because of the higher rainfall during the irrigation season.

Groundwater use across the basin was similar to 2008–09.

Southern Rural Water transferred 737 ML of water from its drought reserve stored in Thomson Reservoir to the Bacchus Marsh irrigation district to augment the extreme supply shortage in the Werribee basin.

Licensed surface-water diverters on Valencia Creek and the Avon River were subject to restrictions and irrigation bans for periods during the year.

20.2 Responsibilities for management of water resources

Table 20-1 shows the responsibilities of various authorities within the Thomson basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 20-1 Responsibilities for water resources management within the Thomson basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Melbourne Water				Operates Thomson Reservoir, which supplies water to Melbourne and irrigators in the Macalister irrigation district Releases water to the Thomson River for environmental flows Obliged to meet passing-flow requirements
Southern Rural Water	Provides irrigation supplies to the Macalister irrigation district	Manages groundwater and surface water licensed diversions	Provides bulk water supply to Gippsland Water	Operation of Lake Glenmaggie Obliged to meet passing-flow requirements
Gippsland Water			Supply towns including Sale, Maffra, Heyfield, Stratford and Boisdale	
Environment Minister				Manages environment entitlement in the regulated Thomson River
West Gippsland Catchment Management Authority				Manages waterways and environmental flows

20.3 Rainfall, flows and storages in 2009–10

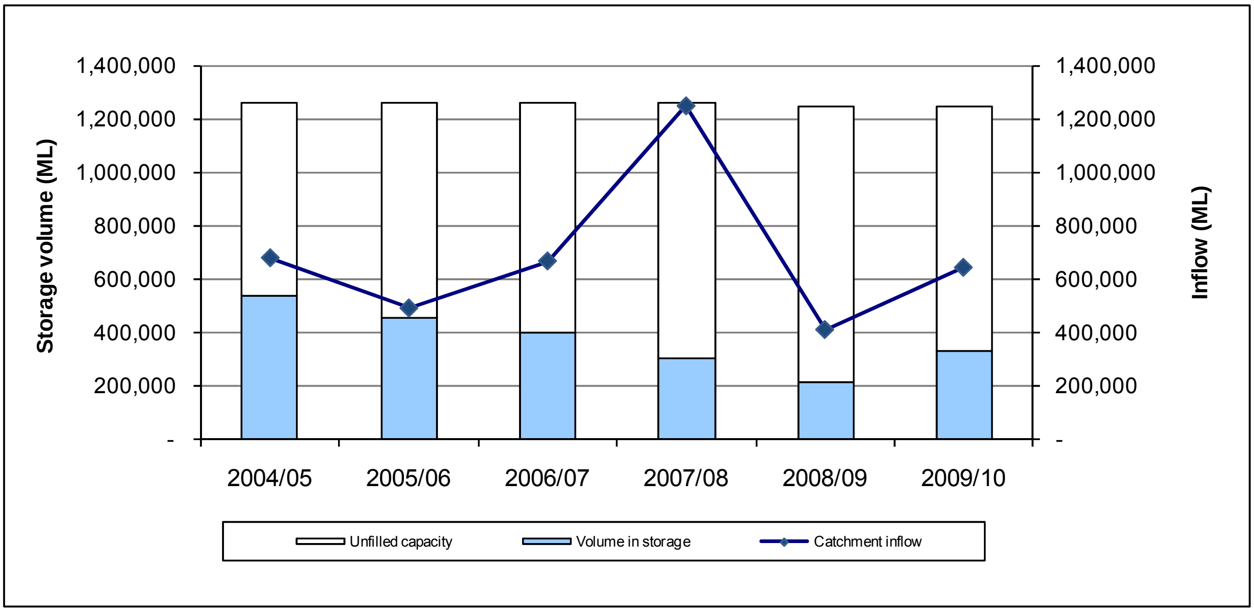
In 2009–10, rainfall in the Thomson basin ranged between 80% and 125% of the long-term average. Inflows to the Thomson basin amounted to 641,800 ML in 2009–10, which is 58% of the long-term average (of 1,101,760 ML). This is an increase from the very low inflows of 37% of the long-term average in 2008–09.

The amount of water flowing from the Thomson basin into the Gippsland Lakes in 2009–10 was 230,700 ML. This represents 36% of catchment inflows. Outflows in 2009–10 were higher than the 164,100 ML of outflows in 2008–09, although proportionally less was discharged to the lakes in 2009–10.

The volume of water held in major storages (greater than 1,000 ML capacity) increased from 211,500 ML in July 2009 to 332,200 ML (27% of capacity) by June 2010.

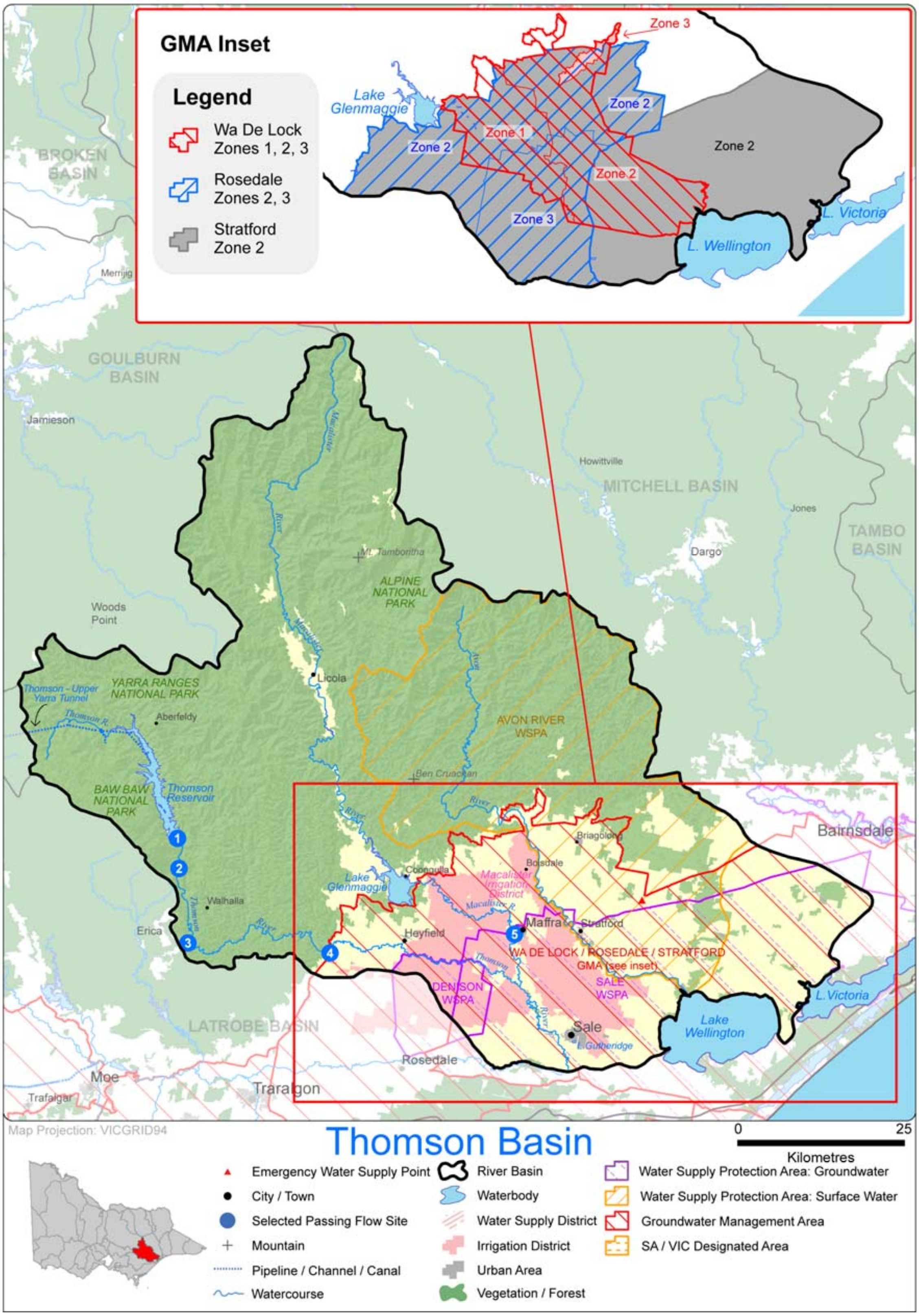
In the Thomson basin, storages greater than 1,000 ML capacity include Thomson Reservoir and Lake Glenmaggie, both of which are on-stream storages. Lake Glenmaggie finished the year with a volume of 95,100 ML, which is 54% of the total capacity. Melbourne's biggest water storage, the Thomson Reservoir, began the year at 16% of capacity and increased by 22% by June 2010.

Figure 20-1 All major storages and catchment inflows in the Thomson basin



20.4 Location of water resources

Figure 20-2 Map of the Thomson basin



20.5 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Thomson basin are shown in Table 20-2. An overview of the methodology used to derive the information presented in this chapter is set out in Chapter 5.

Table 20-2 Summary of total water resources and water use in the Thomson basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	691,500	298,500
Groundwater(2)	73,500	41,200
Recycled water	310	280

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 20-9 and the estimated domestic and stock use presented in Table 20-10.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

20.5.1 Infrastructure projects to improve water availability

Southern Rural Water undertook works to improve system operational efficiency through automation of the Nambrok Denison Channels. This involved retrofitting flume gates to 50 regulators.

20.6 Surface water resources

20.6.1 Water balance

A surface-water balance for the Thomson basin is shown in Table 20-3. Irrigation water use in the Macalister irrigation district and transfers to the Yarra basin for urban use comprise the majority of diversions within the basin.

A total volume of 216,800 ML was diverted for irrigation purposes in 2009–10, which is slightly lower than the volume used in 2008–09. Melbourne Water's diversion from the Thomson Reservoir decreased to 62,400 ML in 2009–10 compared to 93,780 ML in 2008–09.

Table 20-3 Balance of surface water in the Thomson basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	211,500	299,400
Volume in storage at end of year	332,200	211,500
Change in storage	**120,700**	**-87,900**
Inflows		
Catchment inflow(1)	641,800	408,300
Rainfall on major storages	23,100	n/a(3)
Transfers from other basins	0	0
Return flow from irrigation	26,600	26,400
Treated wastewater discharged back to river	40	40
Sub-total	**691,500**	**434,700**
Usage		
Diversions to towns in Thomson River basin	1,560	1,580
Transfers to Yarra River basin for urban use	62,400	93,780
Irrigation district diversions	216,800	227,100
Licensed diversions from unregulated streams	10,000	5,100
Transfers to other basins(5)	737	0
Small catchment dams(2)	7,000	7,000
Sub-total	**298,500**	**334,600**
Losses		
Evaporation losses from major storages	16,800	10,200 (3)
Evaporation from small catchment dams	2,500	2,500
In-stream infiltration to groundwater, flows to floodplain and evaporation(4)	22,300	11,200
Sub-total	**41,600**	**23,900**
Water passed at outlet of basin		
River outflows to the Latrobe River	208,800	130,200
River outflows direct to Lake Wellington	21,900	33,900

Notes:
(1) Inflows have been back-calculated from outflows plus diversions.
(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.
(3) Evaporation loss from major storages for 2008–09 is actually net evaporation which accounts for rainfall.
(4) Losses estimated based on loss functions within the Thomson–Macalister REALM.
(5) This transfer was from Thomson Reservoir to the Werribee basin for emergency supplies in BMID and WID.
n/a: Not applicable.

20.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 20-4 have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 20-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	5,600	2,800	n/a
Registered commercial and irrigation	5,000	4,200	n/a
Total	**10,600**	**7,000**	**9,500**

n/a: Information not available.

20.6.3 Water entitlement transfers

Surface water entitlements were moved into, out of and within the Thomson basin during 2009–10 through water share transfers and variations, allocation trade and temporary transfer of bundled entitlement. Water share and allocation transactions make up the bulk of this movement, with only 279 ML of Thomson basin bundled entitlement being temporarily transferred during the year.

Table 20-5 summarises the movement of water shares into and out of the Thomson basin delivery systems during 2009–10. There was a small net export of both high and low-reliability water shares with 340 ML of high reliability, and 50 ML of low-reliability water shares leaving the basin in 2009–10.

Table 20-5 Transfers and variations of water shares in the Thomson basin 2009–10 [(1), (2)]

Delivery System	High-reliability water Shares			Low and Spill Reliability Water Shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Macalister irrigation district	13456	13,989	-532	6,511	6,650	-139
Macalister River	439	273	166	212	132	80
Thomson River	2,325	2,298	27	1,146	1,137	9
Total 2009–10	**16,220**	**16,559**	**-340**	**7,869**	**7,919**	**-50**
Total 2008–09	31,899	32,342	-443	15,103	15,323	-221

Notes:

(1) This table summarises all recorded water share transfers and variations in the Thomson basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water and land sale are also included in this table.

Table 20-6 summarises the trade in water allocations into and out of the Thomson basin in 2009–10. All trade in water allocations occurred within the Thomson basin.

Table 20-6 Allocation Trade in the Thomson basin [(1), (2)]

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Thomson basin	12,145	20,032
Trade from other Victorian basins	0	0
Trade to other Victorian basins	0	0
Interstate trade - inbound	0	0
Interstate trade - outbound	0	0
Total trade into the Thomson basin	12,145	20,032
Net trade into the Thomson basin	0	0

Notes:

(1) This table summarises allocation trades approved into, out of and within the Thomson basin trading zones (Zone 41 A Northern Macalister and Zone 42 B Mid Thomson) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

Table 20-7 summarises the movement of bundled entitlements in the Thomson basin during 2009–10. All transfers occurred between users within the basin, and were mostly temporary in nature.

Table 20-7 Transfers of surface water bundled entitlements in the Thomson basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
Thomson Unregulated	2	2	0	279	279	0
Total 2009–10	**2**	**2**	**0**	**279**	**279**	**0**
Total 2008–09	0	0	0	203	203	0

20.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement in the basin is shown in Table 20-8.

Bulk entitlements held by the Melbourne retailers and Southern Rural Water in the basin are applied over a multi-year period, where the average usage over a defined rolling period (15 years for the Melbourne retailers and five years for Southern Rural Water) must be less than the average bulk entitlement volume.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 20-8 Volume of water diverted under surface water entitlements in the Thomson basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance? (2)(3)
Gippsland Water					
Thomson Macalister towns – Gippsland Water	1	2,335	-	1,558	Yes
Melbourne metropolitan retailers					
Thomson River	15	171,800	-	62,400	Yes
Southern Rural Water					
Thomson/Macalister	5	274,800	-	216,778	Yes
Environment Minister					
Thomson River – Environment	1	10,000	-	3,984	Yes
Total annual volume of bulk entitlements 2009–10		**458,935**	**-**	**284,720**	
Total annual volume of bulk entitlements 2008–09		**458,935**	**-**	**326,642**	
Licensed diversions from unregulated streams 2009–10		*17,201*		*9,997*	
Licensed diversions from unregulated streams 2008–09		*12,006*		*5,134*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(3) Compliance for the entire Melbourne supply system is assessed against a long term (15 year) average volume limit of 555,000 ML. The corresponding long-term average annual diversions for 2009–10 was 428,900 ML.

20.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management areas within the Thomson basin, excluding domestic and stock use, is presented in Table 20-9. The Thomson basin contains all of the Wa De Lock GMA as well as part of the Denison WSPA, Sale WSPA, Stratford GMA and Rosedale GMA.

The majority of the Stratford and Rosedale GMA water use is for mine dewatering. While the groundwater levels in the Denison WSPA are stable, levels in the Sale WSPA and Wa De Lock GMA are declining. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Groundwater use in the Thomson basin increased by around 2% in 2009–10 compared with 2008–09.

Table 20-9 Licensed groundwater volumes, Thomson basin 2009–10

WSPA/GMA(1)	GMA/WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)(7)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Rosedale GMA (36%)	Zone 1 50-150, Zone 2 25-350, Zone 3 200-300	7,972	7,952	2,340	1,594(8)	3,934	4,123
Stratford GMA (45%)	Zone 1 >150, Zone 2 >350	12,319	12,319	45	12,386(8)	12,431	11,986
Wa De Lock GMA (100%)(5)	≤25	30,172	26,805	10,386	-	10,386	9,517
Denison WSPA (53%)(6)	≤25	9,396	9,236	4,230	-	4,230	4,440
Sale WSPA (70%)	25-200	14,829	14,755	7,756	-	7,756	7,819
Total(7)		**74,688**	**71,067**	**24,757**	**13,980**	**38,737**	**37,885**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Includes domestic and stock usage in those cases where this forms part of a licensed volume.

(5) Total volumes are based on the sum of management unit data prior to rounding.

(6) This includes a salinity control extraction of 1,702 ML for 2009–10

(7) This includes a salinity control extraction of 542 ML for 2009–10

(8) Non-metered use includes estimated extraction from Latrobe Valley Mines.

An estimate of domestic and stock groundwater use is provided in Table 20-10.

Table 20-10 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Rosedale GMA (36%)	79	158
Stratford GMA (45%)	2	4
Wa De Lock GMA (100%)	434	868
Denison WSPA (53%)	144	288
Sale WSPA (70%)	575	1,150
Total	**1,234**	**2,468**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 20-9.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

In the Thomson basin groundwater is used as an urban water supply for the townships of Sale, Briagolong and Boisdale. The licensed entitlements and metered use for these groundwater supplies are provided in Table 20-11.

Table 20-11 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Boisdale	37	0	0
Briagolong	160	81	119
Sale	3,500	1,920	1,981
Total	**3,697**	**2,001**	**2,100**

20.8 Drought contingency measures

A number of drought contingency measures were implemented in the Thomson basin in 2009–10. These included:

- restricting rural water use (discussed below in section 20.9)
- temporary qualification of rights as detailed in Table 20-12 below.

20.9 Qualification of rights

Four qualifications continued into 2009–10 in response to continuing water shortages the Melbourne and Werribee–Bacchus Marsh systems. Two continued to retain up to 14,000 ML per year of water in Thomson Reservoir to supplement Melbourne's water supplies. The other two continued to provide water share holders in the Bacchus Marsh irrigation districts access to Southern Rural Water's drought reserve in the Thomson Reservoir.

In September 2009, the Victorian Government agreed to further reduce environmental flows in Thomson River to mitigate the risk of Melbourne entering Stage 4 restrictions before the desalination plant is completed. The Minister for Water subsequently revoked the December 2007 qualification and requalified rights to provide Melbourne 8,000 ML per year of the environment's share of inflows to Thomson Reservoir, and reduce passing flows in the Thomson River by up to 10,000 ML per year.

While the qualification further reduced environmental passing flows, it did provide the environment with a 2,000 ML per year share of Thomson Reservoir. The government increased this volume to 5,000 ML per year in April 2010 after Melbourne's water resource position had improved.

The environmental risks were monitored and managed by West Gippsland Catchment Management Authority under an emergency management plan funded by the three Melbourne retail water businesses. According to WGCMA's impact assessment of the Thomson qualification, no additional environmental impacts were found to have occurred in the Thomson River as a result of the qualifications.

According to the Melbourne retail water businesses' annual report on the effectiveness of the Melbourne qualifications, about 13,000 ML of water was retained in Thomson Reservoir in 2009–10. This is equivalent to two week's water supply.

On 3 July 2009, Southern Rural Water qualified rights to provide irrigators in the Bacchus Marsh irrigation district access to an extra 500 ML of its drought reserve in Thomson Reservoir. Since 2007–08, Southern Rural Water has made 4,800 ML of Thomson drought reserve available to Werribee and Bacchus Marsh farmers via three qualifications.

In 2009–10, Southern Rural Water transferred 737 ML into the Werribee system and delivered 534 ML to farmers in Bacchus Marsh. This enabled farming to continue in the district while allocations remained extremely low.

Table 20-12 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Declaration of Temporary Qualification of Rights in the Melbourne Water Supply System – March 2007	1 July 2009 to 30 June 2010 (continuing from 29 March 2007)	Differential access by priority entitlements	Provided up to 4,000 ML/year more water for Melbourne by removing the environmental flow operating tolerances under the Thomson Environment bulk entitlement	When Melbourne is no longer subject to Stage 2 restrictions or a stage of restrictions more severe than Stage 2	
Temporary Qualification of Rights in the Melbourne Water Supply System – Thomson December 2007	1 July 2009 to 11 September 2009 (continuing from 20 December 2007)	Differential access by priority entitlements Reduced passing-flow requirements	Allowed Melbourne to use eight of the environment's 10,000 ML of inflows to Thomson Reservoir. The remaining 2,000 ML was also set aside each year for use by Melbourne, if needed, or else was available for use by the environment, if needed	When Melbourne is no longer subject to restrictions greater than Stage 2 or the desalination plant is constructed	11 September 2009 (revoked)
Temporary Qualification of Rights in the Melbourne Water Supply System – Thomson River September 2009	11 September 2009 to 30 June 2010	Differential access by priority entitlements / Reduced passing-flow requirements	Allowed Melbourne to use eight of the environment's 10,000 ML of inflows to Thomson Reservoir. The remaining 2,000 ML was available for use by the environment, if needed. Reduced environmental flows in Thomson River to save up to 10,000 ML/year in Thomson Reservoir for Melbourne. Returned the 2,000 ML/year of water set aside in Thomson Reservoir under the 2007 qualification to the environment's account in Thomson Reservoir	When Melbourne is no longer subject to restrictions greater than Stage 2	
Declaration of Temporary Qualification of Rights in the Thomson Water System 2008	1 July 2009 to 30 June 2010 (from 21 December 2007)	*Differential access by priority entitlements*	Allowed Werribee and Bacchus Marsh irrigators access to up to 2,000 ML from the Thomson Drought Reserve	When the allocation for Werribee and Bacchus Marsh is 50% or greater	
Declaration of Temporary Qualification of Rights in the Thomson Water System 2008	1 July 2009 to 30 June 2010 (from 24 October 2008)	*Differential access by priority entitlements*	Allowed Werribee and Bacchus Marsh irrigators access to an additional 2,300 ML from the Thomson Drought Reserve	When the allocation for Werribee and Bacchus Marsh is 50% or greater	
Declaration of Temporary Qualification of Rights in the Thomson Water System 2009	3 July 2009 to 30 June 2010	*Differential access by priority entitlements*	Allowed Werribee and Bacchus Marsh irrigators access to an additional 500 ML from the Thomson Drought Reserve	When the allocation for Werribee and Bacchus Marsh is 50% or greater	

20.10 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 20-13.

Urban water users and licensed groundwater diverters across the basin were unrestricted in 2009–10. However, licensed surface water diverters on Valencia Creek and the Avon River were affected by the dry conditions at various times throughout the year, and were subsequently placed on restrictions.

Irrigation allocations in the Macalister irrigation district reached 100% of high-reliability water shares and 45% of low-reliability water shares.

Table 20-13 Seasonal allocations and restrictions on water use in Thomson basin, 2008–09

Type of restriction	Area	Nature of restriction
Licensed diversions on unregulated streams	Valencia Creek	Stage 1 restrictions from July to August 2009, irrigation ban from September to October 2009. Irrigation ban in January 2010, Stage 1 restrictions in March 2010, Irrigation ban in April 2010, Stage 1 restrictions from May to June 2010.
	Avon River	Section 1: Stage 4 restrictions from July to August 2010, in January 2010, and from April to June 2010. Section 2 and 3: Stage 3 restrictions from July to August 2010, Stage 4 restrictions in January 2010, and Stage 3 restrictions from April to June 2010.
Irrigation	Macalister irrigation district	Opening allocation of 40% of high-reliability water shares from July 2009. Increased to 100% of high-reliability water share by January 2010. 45% low-reliability water share by May 2010.

20.11 Recycled water

Gippsland Water operates four wastewater treatment plants in the Thomson basin. Recycled water is mainly used to irrigate pasture and for watering facilities such as the Maffra Recreational Reserve. The volume of wastewater produced during 2009–10 is slightly less than that produced in 2008–09. A total of 88% of wastewater was recycled in the basin in 2009–10 (Table 20-14).

Table 20-14 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Heyfield	53	53	100%	-	53	-	-	-	0
Maffra	168	169	101%	4	165	-	-	-	(1)
Rawson	38	-	0%	-	-	-	-	38	0
Stratford	55	55	100%	-	55	-	-	-	0
Total 2009–10	**314**	**277**	**88%**	**4**	**273**	**-**	**-**	**38**	**(1)**
Total 2008–09	**358**	**318**	**89%**	**3**	**315**	**-**	**-**	**40**	**-**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

20.12 Water for the environment

20.12.1 Environmental Water Reserve (EWR)

The Gippsland Lakes are important environmental assets partially dependent on water from the EWR in the Thomson basin. The lakes are listed as internationally significant wetlands under the Ramsar convention and rely on the freshwater inputs from basins including the Thomson to ecologically function. The Upper Thomson River is identified as a heritage river reach and the Australian Grayling populations also rely on Thomson EWR.

In 2009–10 the Thomson basin EWR comprised the following components:

- the Bulk Entitlement (Thomson River – Environment) Order 2005
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Melbourne Water and Southern Rural Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated under entitlements.

20.12.2 Entitlements for the environment

A 10,000 ML bulk entitlement for the environment on the Thomson River was provided from water saving initiatives in the basin. This bulk entitlement order was gazetted in August 2005, with the Environment Minister receiving:

- an entitlement for a 10,000 ML share of storage capacity in Thomson Reservoir
- carryover in storage space in the reservoir not being used by other entitlement holders
- passing flows between Thomson Reservoir and Cowwarr Weir on the Thomson River, which were previously specified as an obligation in Melbourne Water's bulk entitlement.

Due to the ongoing drought this entitlement was qualified in December 2007, holding 10 GL per year in storage to secure Melbourne's drinking water supplies. Part of the qualification involved holding 2,000 ML in reserve for each year of the qualification to mitigate the risks to the environment. This qualification continued for part of the 2009–10 year.

As part of the qualification of this entitlement, the Macalister River Irrigation Offset Account was created to hold water that was generated through savings from the Macalister Channel Automation Project. This water provided security for irrigators on the Macalister who were affected by the Thomson River temporary qualification of rights. This water was allowed to be used for environmental purposes after May each year if it had not been required by irrigators. In 2009–10, 5,510 ML was released from this account to trigger spawning events for the Australian grayling, water river bank and in-stream vegetation, flush accumulated sediments from the rivers' channels and to maintain the form of the channels.

In April 2010, the government committed to returning 3,000 ML of water per year to the Thomson River for environmental flows, following good spring rainfall and water saving efforts.

Of the water available under the qualification of rights, 3,980 ML was released down the Thomson River in May and June 2010.

20.12.3 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

Table 20-15 shows passing-flow compliance in the Thomson basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The location of these compliance points is presented in Figure 20-2.

During 2009–10 passing flows under the Thomson River environmental bulk entitlement were temporarily qualified, enabling savings to be provided to the Melbourne system.

Melbourne Water (as storage operator) reported that all passing-flow requirements were met in 2009–10.

Table 20-15 Selected passing-flow compliance in the Thomson basin

River	Passing flow	
Thomson River	Instrument where passing flows are specified	Bulk Entitlement (Thomson River – Environment) Order 2005
	Responsible authority	Environment Minister(1)
	Compliance point	Thomson Reservoir (shown as 1 in Figure 20-2)
	Passing-flow compliance	Flows were passed according to the following rules: • from November to February, 75 ML per day • from March to October, 25 ML per day
	Compliance point	The Narrows Gauging Station (shown as 2 in Figure 20-2)
	Passing-flow compliance	From November to February 120 ML per day were passed, while 80 ML per day were passed from March to October
	Compliance point	Coopers Creek Gauging Station (shown as 3 in Figure 20-2)
	Passing-flow compliance	The following rules applied: • in July, 216 ML per day • in August, 238 ML per day • in September, 245 ML per day • in October, 225 ML per day • in November, 205 ML per day • from December to January, 200 ML per day • in February, 180 ML per day • from March to April, 155 ML per day • from May to June, 150 ML per day
	Instrument where passing flows are specified	Bulk Entitlement (Thomson Macalister – Southern Rural Water) Conversion Order 2001
	Responsible authority	Southern Rural Water
	Compliance point	Thomson River between Cowwarr Weir and Wandocka (shown as 4 in Figure 20-2)
	Passing-flow compliance	• Lesser of 125 ML per day or natural flow was passed • Where natural flow was less than 50 ML per day, 50 ML per day was passed
Macalister River	Instrument where passing flows are specified	Bulk Entitlement (Thomson Macalister – Southern Rural Water) Conversion Order 2001
	Responsible authority	Southern Rural Water
	Compliance point	Macalister River below Maffra Weir (shown as 5 in Figure 20-2)
	Passing-flow compliance	Passing flows were qualified between July and August 2007, with Southern Rural Water meeting the qualified requirements 60 ML per day, was passed, but this was reduced to 30 ML per day when the following conditions occurred: • between June and October, if inflow to Lake Glenmaggie was less than the 80th percentile • in November, if storage volume was less than 13,000 ML • once dropped to 30 ML per day, passing flows had to stay as this until the end of May • passing flows could be increased back up to 60 ML per day: • if between June to October, inflow for the previous month is greater than the 80th percentile • if between August to January, storage volume is greater than 185,000 ML • if inflow to Lake Glenmaggie is less than the calculated passing flows, then passing flow may be reduced to this value

Notes:

(1) While the Environment Minister holds the environmental bulk entitlement, Melbourne Water manages the releases of the passing flows immediately downstream of the Thomson Reservoir and reports on compliance with these requirements.

20.12.4 Streamflow management plans (SFMPs)

The Avon River was declared a WSPA in 2006–07. The Gippsland Region Sustainable Water Strategy will review the need for a management plan in the Avon River.

21 Latrobe basin

This chapter sets out the accounts for the Latrobe basin. For detailed information about how they have been compiled, refer to Chapter 5.

21.1 Latrobe basin summary

Despite average rainfall, inflows were only 61% of the long-term average in 2009–10. However, inflows were significantly greater than in 2008–09.

There was a modest increase to the volume of water in major storages over the year. By the end of June, Latrobe basin storages were in a healthy position for 2010–11 at around 80% of capacity.

Surface-water use across the basin decreased in 2009–10 compared to 2008–09. These users account for the majority of surface water diversions in the basin.

The total volume of water taken by licensed diverters and licensed groundwater use also reduced compared to the previous year.

21.2 Responsibilities for management of water resources

Table 21-1 shows the responsibilities of various authorities within the Latrobe basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 21-1 Responsibilities for water resources management within the Latrobe basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages the Macalister irrigation district (which is supplied from the Thomson basin)	Manages groundwater and surface water licensed diversions		Operates part of the Latrobe water supply system including Blue Rock Lake and Lake Narracan for supply to Gippsland Water, power stations and licensed diverters Obliged to meet passing-flow requirements
Gippsland Water			Supplies towns including Moe, Morwell and Traralgon. Provides industrial supply to Hazelwood and Energy Brix power stations(1), and other major industries	Operates Moondarra Reservoir Obliged to meet passing-flow requirements
West Gippsland Catchment Management Authority				Manages waterways in the whole of the Latrobe basin

Note:

(1) Three power stations – Loy Yang A, Loy Yang B and Yallourn – are responsible for their own water supply from the Latrobe system (Blue Rock Lake and Lake Narracan).

21.3 Rainfall, flows and storages in 2009–10

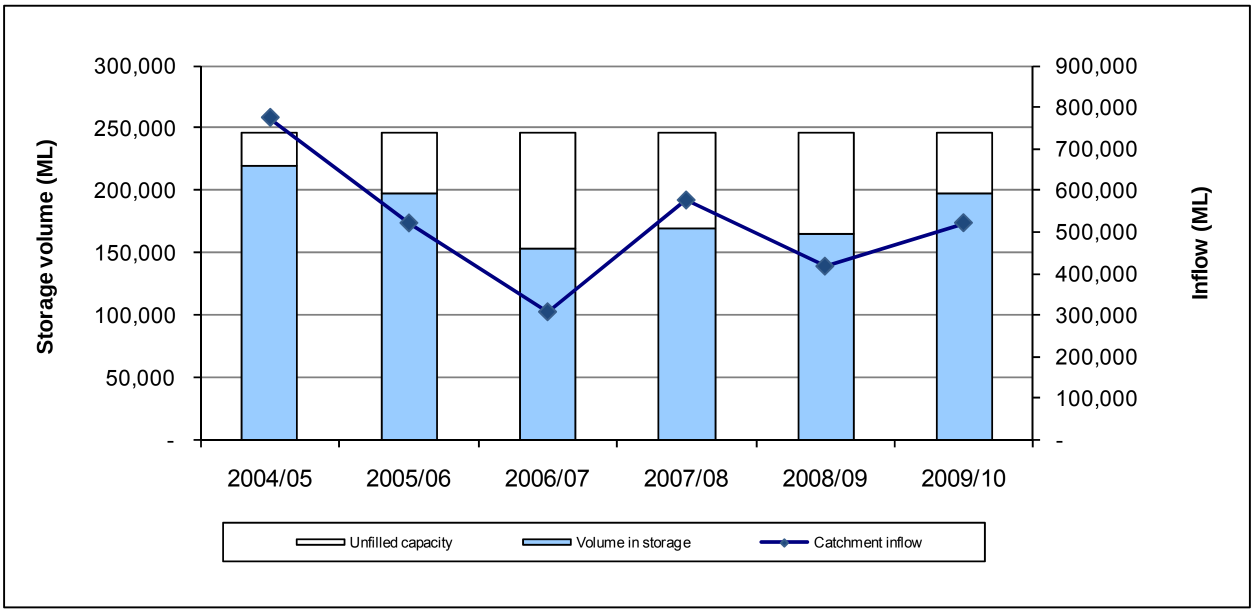
In 2009–10, rainfall in the Latrobe basin ranged between 80% and 125% of the long-term average. Inflows were 61% of the long-term average (of 847,400 ML), which is higher than the 49% in 2008–09.

The amount of water flowing from the Latrobe basin into the Gippsland Lakes (excluding the Thomson River) increased to 369,900 ML in 2009–10 from 284,200 ML recorded in 2008–09.

Storage levels for all major storages (greater than 1,000 ML capacity) in the basin increased from 164,400 ML in July 2009 to 198,100 ML (80% of capacity) in June 2010.

Only volumes for major on-stream storages have been included in the water balance. In the Latrobe basin this includes Blue Rock Lake, Lake Narracan, and Moondarra Reservoir. The largest storage in the basin is Blue Rock Lake, which has a capacity of approximately 208,000 ML. The volume of water held in Blue Rock Lake at the end of the year was 166,500 ML (80% of capacity).

Figure 21-1 All major storages and catchment inflows in the Latrobe basin



21.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Latrobe basin are shown in Table 21-2.

Table 21-2 Summary of total water resources and water use in the Latrobe basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	580,000	157,100
Groundwater(2)	42,300	26,300
Recycled water	21,710	720

Notes:

(1) For groundwater, the total water resource is the total entitlement limit as presented in Table 21-7 and the estimated domestic and stock use as presented in Table 21-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

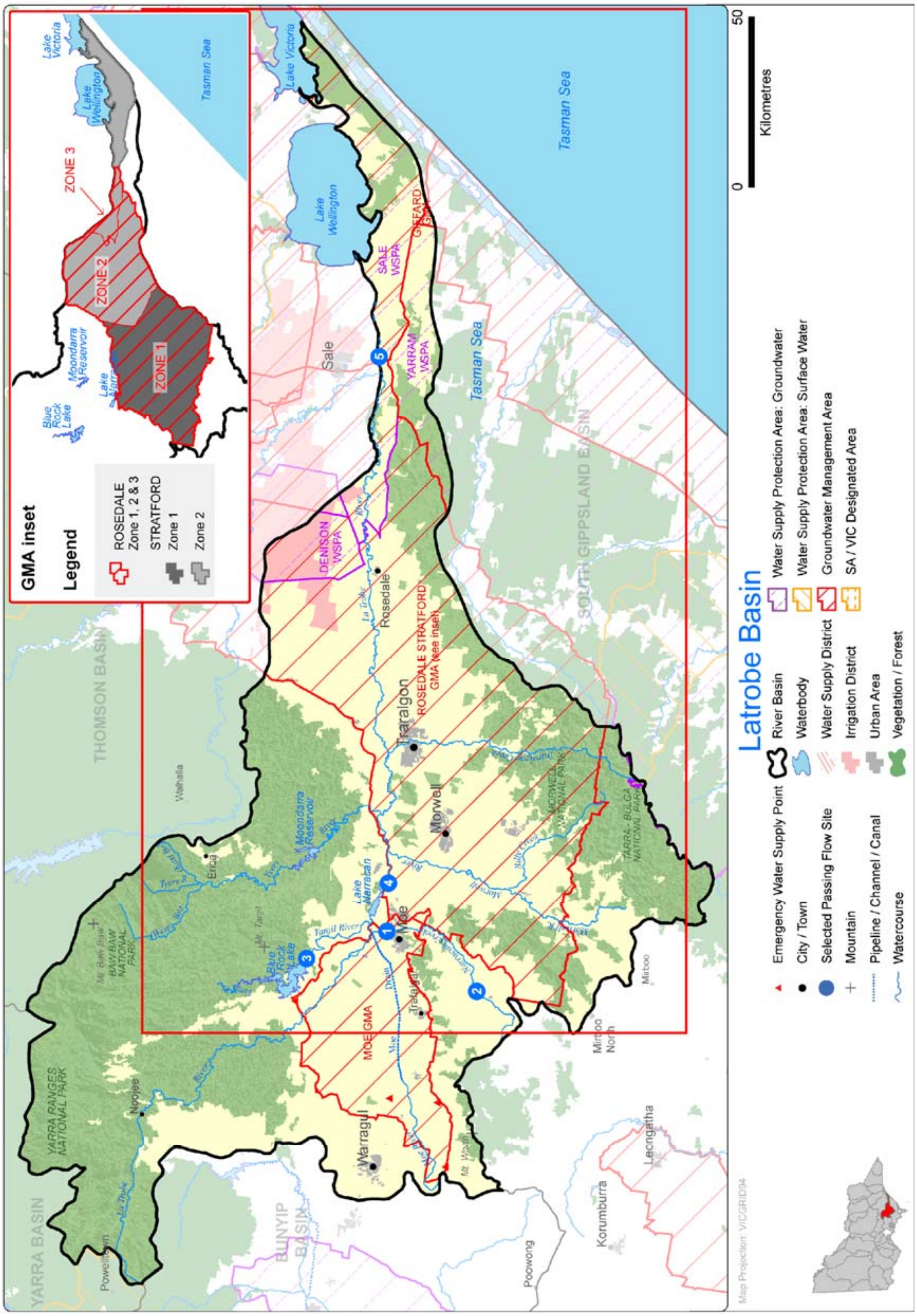
21.4.1 Infrastructure projects to improve water availability

Gippsland Water undertook detailed design work on a pipeline to connect Boolarra to the main Latrobe Valley water supply grid. This pipeline will improve the water security of Boolara. Construction is yet to be undertaken and is likely to be completed by the end of the 2010–11 water year.

The Yarragon–Darnum interconnection pipeline underwent detailed design. The pipeline will be 7-kilometres long and designed to reduce demand from the Tarago system through provision of water from the Latrobe system. Construction is yet to be undertaken and is likely to be completed by the end of 2010–11 water year.

21.5 Location of water resources

Figure 21-2 Map of the Latrobe basin



21.6 Surface water resources

21.6.1 Water balance

A surface-water balance for the Latrobe basin is shown in Table 21-3.

The major industrial water users in the basin include a number of electricity generators and Australian Paper. In 2009–10, these entities accounted for more than half of the surface water diversions in the Latrobe basin. These industries also returned approximately 42,400 ML to the Latrobe River system.

Table 21-3 Balance of surface water in the Latrobe basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	164,400	169,300
Volume in storage at end of year	198,100	164,400
Change in storage	**33,700**	**(4,900)**
Inflows		
Catchment inflow(1)	520,700	416,200
Rainfall on major storages	13,600	n/a (3)
Transfers from other basins	0	0
Return flow from power stations and major industry	42,400	43,300
Return flow from irrigation	0	0
Treated wastewater discharged back to river	3,260	2,960
Sub-total	**580,000**	**462,500**
Usage		
Urban and industrial diversions	122,070	130,740
Licensed diversions from regulated streams	6,670	7,030
Licensed diversions from unregulated streams	7,900	8,500
Small catchment dams	20,500	20,500
Sub-total	**157,100**	**166,800**
Losses		
Evaporation losses from major storages	13,600	10,700(3)
Evaporation from small catchment dams(2)	5,700	5,700
In-stream infiltration to groundwater, flows to floodplain and evaporation	0	0
Sub-total	**19,300**	**16,400**
Water passed at outlet of basin		
River outflows to the Gippsland Lakes (excluding Thomson River)	369,900	284,200
River outflows to the Gippsland Lakes (including Thomson River)	578,700	414,400

Notes:

(1) Inflows have been back-calculated from outflows plus diversions. Excludes Thomson River outflows.

(2) Evaporation losses are calculated by subtracting estimated usage from water harvested.

(3) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

21.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 21-4 below have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 21-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	13,000	6,500	n/a
Registered commercial and irrigation	16,700	14,000	n/a
Total	**29,700**	**20,500**	**26,200**

n/a: Information not available.

21.6.3 Water entitlement transfers

The movement of surface water entitlements in the Latrobe basin was limited to transfers of bundled entitlement within the basin. In 2009–10, 70 ML of bundled entitlement in the Latrobe basin was transferred on a permanent basis, and 1,440 ML on a temporary basis.

Table 21-5 summarises the movement of bundled entitlements in the Latrobe basin during 2009–10.

Table 21-5 Transfers of surface water bundled entitlements in the Latrobe basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
La Trobe Unregulated	70	70	0	1,440	1,440	0
Total 2009–10	70	70	0	1,440	1,440	0
Total 2008–09	3	3	0	537	537	0

21.6.4 Volume diverted

The volume of water diverted under each bulk entitlement is shown in Table 21-6. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. For multi-year entitlements, compliance is assessed based on the total volume of water diverted over the term of the entitlement. Therefore it is possible that the volume diverted in any given year may exceed the average bulk entitlement volume.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 21-6 Volume of water diverted under surface water entitlements in the Latrobe basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)(3)
Gippsland Water					
Boolarra	1	145	11	71	Yes
CGRWA – Blue Rock	3	15,150	-	4,783	Yes
Erica	1	340	-	84	Yes
Mirboo North	1	270	-	200	Yes
Moe – Narracan Creek	1	3,884	-	2,148	Yes
Moondarra Reservoir	2	62,000	-	48,195	Yes
Noojee(4)	1	73	-	0	Yes
Thorpdale	1	80	8	16	Yes
Southern Rural Water					
Yallourn Energy Ltd for Gippsland and Southern Rural Water (5)	1	20,000	-	15,763	Yes
Latrobe licensed diverters	2	13,400	-	6,672	Yes
Great Energy Alliance Corporation Pty Ltd					
Yallourn Energy Ltd for Loy Yang Power Ltd	1	40,000	-	20,045	Yes
TRUenergy					
Yallourn Energy Ltd	1	36,500	-	30,764	Yes
Environment Minister (on behalf of the Treasurer)					
Yallourn Energy Ltd for SECV	1	25,000	-	-	Yes
Total annual volume of bulk entitlements 2009–10		**216,842**	**19**	**128,741**	
Total annual volume of bulk entitlements *2008–09*		**216,842**	**16**	**137,763**	
Licensed diversions from unregulated streams 2009–10		*18,562*		*7,901*	
Licensed diversions from unregulated streams 2008–09		*16,738*		*8,488*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) Bulk entitlement compliance for the purpose of the Victorian Water Accounts is assessed based on the information provided by the water businesses and has not been independently audited.

(3) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(4) Gippsland Water is not utilising the Noojee bulk entitlement because Noojee is supplied via the Neerim South system (that is Tarago).

(5) Water for Loy Yang B power station.

21.7 Groundwater resources

The Latrobe basin contains the entire Moe GMA as well as part of the Sale WSPA, Yarram WSPA, Denison WSPA, Stratford GMA and Rosedale GMA. A summary of the licensed entitlements and use from groundwater management units within the Latrobe basin, excluding domestic and stock use, is presented in Table 21-7. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A. While groundwater levels in the Denison WSPA are stable, levels in the other WSPA and GMAs are declining, with off-shore oil and gas extractions impacting on the Yarram WSPA water levels. Licensed water used from the Stratford and Rosedale GMAs are generally mine dewatering related.

The reported groundwater use in the Latrobe basin in 2009–10 was similar to that reported in 2008–09.

Table 21-7 Licensed groundwater volumes, Latrobe basin 2009–10

WSPA/GMA[1]	GMA/WSPA depth limits[2] (m)	Entitlement limit[3] (ML/year)	Licensed entitlement[4] (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)[7]	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Moe GMA (100%)	>25	8,200	3,803	1,095	-	1,095	1,081
Rosedale GMA (58%)	Zone 1 50-150 Zone 2 25-350 Zone 3 200-300	13,003	12,970	3,816	2,599	6,416	6,725
Stratford GMA (41%)	Zone 1 >150 Zone 2 >350	11,275	11,275	41	11,336	11,377	10,970
Denison WSPA (47%)[5]	≤25	8,347	8,204	3,757	-	3,757	3,944
Sale WSPA (17%)	25-200	3,515	3,497	1,838	-	1,838	1,853
Yarram WSPA (5%)	Zone 1 >200 Zone 2 all depths	1,360	1,360	633	-	633	747
Total [6]		**45,700**	**41,109**	**11,180**	**13,936**	**25,116**	**25,320**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Includes domestic and stock usage in those cases where this forms part of a licensed volume.

(5) This includes a salinity control extraction of 481 ML for 2009–10

(6) Total volumes are based on the sum of management unit data prior to rounding.

(7) Non-metered use includes estimated extraction from Latrobe Valley Mines.

An estimate of domestic and stock groundwater use is provided in Table 21-8. Groundwater is currently not used to supplement town supplies in the Latrobe basin.

Table 21-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores[1][2]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[3]
Moe GMA (100%)	179	358
Rosedale GMA (58%)	129	258
Stratford GMA (41%)	2	4
Denison WSPA (47%)	127	255
Sale WSPA (17%)	136	272
Yarram WSPA (5%)	17	35
Total	**590**	**1,182**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 21-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

In the Latrobe basin groundwater is used as an urban water supply for the township of Trafalgar. The licensed entitlements and metered use for these groundwater supplies are provided in Table 21-9.

Table 21-9 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Trafalgar	100	0	0
Total	**100**	**0**	**0**

21.8 Drought contingency measures

Drought contingency measures in the Latrobe basin in 2009–10 included:

- restricting urban and rural water use (discussed below)
- transfers of entitlement to supplement urban supplies.

Gippsland Water purchased entitlement to supplement supplies for Boolarra (11 ML) and Thorpdale (8 ML) in response to water quality issues. Only 5 ML of the purchased entitlement for Thorpdale was used.

21.9 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to licensed diversions on unregulated streams are shown in Table 21-10. Supplies were adequate to meet the needs of major industry and Gippsland Water's towns without severe restriction. Low-level restrictions were in place over the summer months for licensed diversions from several streams

Table 21-10 Seasonal allocations and restrictions on water use in Latrobe basin, 2009–10

Type of restriction	Area	Nature of restriction
Licensed diversions from unregulated streams	Morwell River	Stage 1 restriction in February 2010, Stage 2 restriction in March 2010
	Ten Mile Creek	Irrigation ban in January 2010, Stage 2 restrictions in March 2010
	Narracan Creek and tributaries	Irrigation ban in January 2010, Stage 1 restrictions in February 2010, Stage 2 restrictions in March 2010
Irrigation	Macalister irrigation district	Opening allocation of 40% of high-reliability water shares from July 2009. Increased to 100% of high-reliability water share by January 2010. 45% low-reliability water share by May 2010.

Note:

(1) The Macalister irrigation district is supplied from the Thomson basin.

21.10 Recycled water

Gippsland Water treated over 21,000 ML of wastewater in the Latrobe basin, the majority of which is highly saline and unsuitable for recycling, and is discharged to Bass Strait. The volume of water recycled in 2009–10 was similar to that for 2008–09 and represents around 3% of the wastewater produced.

Table 21-11 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Mirboo North	34	33	98%	8	25	-	-	-	1
Moe	1,876	-	0%	-	-	-	-	1,876	0
Morwell	677	677	100%	-	-	677	-	-	0
Dutson Downs (regional outfall sewer)	9,608	-	0%	-	-	-	-		9,608
Saline wastewater outfall pipeline	8,124	-	0%	-	-	-	-		8,124
Warragul	1,386	-	0%	-	-	-	-	1,386	0
Willow Grove	7	7	107%	-	7	-	-	-	0
Total 2009–10	**21,711**	**717**	**3%**	**8**	**32**	**677**	**-**	**3,262**	**17,732**
Total 2008–09	**18,342**	**592**	**3%**	**31**	**39**	**522**	**-**	**2,961**	**14,789**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

21.11 Water for the environment

21.11.1 Environmental Water Reserve (EWR)

The Gippsland Lakes are important environmental assets partially dependent on water from the EWR in the Latrobe basin. The lakes are listed as internationally significant wetlands under the Ramsar convention and rely on the freshwater inputs from rivers including the Latrobe River to ecologically function. Australian Grayling, which are listed as part of the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) and the *Flora and Fauna Guarantee Act 1988* (Vic).

In 2009–10 the Latrobe basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Southern Rural Water and Gippsland Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

21.11.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

Gippsland Water reported it met all passing-flow requirements under its bulk entitlements in the Latrobe Basin in 2009–10.

Table 21-12 shows passing-flow compliance in the Latrobe basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The location of these compliance points is presented in Figure 21-2.

Table 21-12 Selected passing-flow compliance in the Latrobe basin

River	Passing flow	
Narracan Creek	Instrument where passing flows are specified	Bulk Entitlement (Moe – Narracan Creek) Conversion Order 1998
	Responsible authority	Gippsland Water
	Compliance point	Narracan Creek, Moe diversion weir (shown as 1 in Figure 21-2)
	Passing-flow compliance	• The lesser of 11 ML per day or natural flow was passed • The authority passed 11 ML per day when flow was between 11 and 27 ML per day • The authority passed the entire flow, minus 16 ML per day, when flow was greater than 27 ML per day
Easterbrook Creek	Instrument where passing flows are specified	Bulk Entitlement (Thorpdale) Conversion Order 1997
	Responsible authority	Gippsland Water
	Compliance point	Thorpdale pumping station (shown as 2 in Figure 21-2)
	Passing-flow compliance	• The lesser of 1 ML per day or natural flow was passed • The authority passed 1 ML per day when flow was between 1 and 2.73 ML per day • The authority passed the entire flow, minus 1.73 ML per day, when flow was greater than 2.73 ML per day
Latrobe River and Tanjil River	Instrument where passing flows are specified	Bulk Entitlement (Latrobe – Southern Rural) Conversion Order 1996
	Responsible authority	Southern Rural Water
	Compliance point	Blue Rock Lake (to maintain flow at Tanjil South) (shown as 3 in Figure 21-2)
	Passing-flow compliance	• 90 ML per day was passed from January to April • 100 ML per day was passed from May to July • 150 ML per day was passed from August to November • 100 ML per day was passed during December
	Compliance point	Yallourn Weir (shown as 4 in Figure 21-2)
	Passing-flow compliance	• The lesser of a minimum average weekly of 350 ML per day, with a daily minimum of 300 ML per day, or modified natural flow, was passed
	Compliance point	Swing Bridge gauging station (Sale) (shown as 5 in Figure 21-2)
	Passing-flow compliance	• The lesser of a minimum average weekly of 750 ML per day, with a daily minimum of 700 ML per day, or modified natural flow, was passed

21.11.3 Streamflow management plans (SFMPs)

The need for a SFMP in the upper Latrobe River is being reviewed as part of the Gippsland Region Sustainable Water Strategy.

22 South Gippsland basin

This chapter sets out the accounts for the South Gippsland basin. For detailed information about how they have been compiled, refer to Chapter 5.

22.1 South Gippsland basin summary

Inflows in the South Gippsland basin in 2009–10 were about three quarters of the long-term average. Levels in the basin's major storages continued to recover from the extremely low levels experienced in 2006–07. By the end of the year, the total volume held in store had increased from 4,500 ML to 6,600 ML, or 80% of capacity.

Increased water availability enabled urban water corporations to provide unrestricted supplies to most of their customers. Only Seaspray was subject to restrictions during 2009–10. Urban surface water use increased slightly in 2009–10 compared to 2008–09.

In contrast, in 2009–10 the total volume of licensed surface water diversions decreased by 35% and licensed groundwater diversions decreased by 20%, compared with 2008–09. Groundwater use in 2009–10 decreased by some 20% compared with 2008–09.

The extreme low-flow conditions in 2006–07 demonstrated that South Gippsland's towns are vulnerable to severe water shortages. Although water availability continued to improve in 2008–09 and 2009–10, a number of systems continued to rely on qualifications for at least part of the year. The qualifications allowed water corporations to pump additional water to assist storage recovery in the winter–spring period, reducing the risk of water shortages over summer.

22.2 Responsibilities for management of water resources

Table 22-1 shows the responsibilities of various authorities within the South Gippsland basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 22-1 Responsibilities for water resources management within the South Gippsland basin, 2009–10

Authority	**Irrigation and rural water supply**	**Licensing**	**Urban water supply**	**Storage management; waterway management; environmental obligations**
Southern Rural Water		Manages groundwater and surface water licensed diversions		
South Gippsland Water			Supplies towns including Leongatha, Inverloch, Wonthaggi Korumburra and Foster	Obliged to meet passing-flow requirements
Westernport Water			Supplies towns including San Remo and Phillip Island	
Gippsland Water			Supplies towns in the far east of the basin including Seaspray	Obliged to meet passing-flow requirements
West Gippsland Catchment Management Authority				Manages waterways in most of the South Gippsland basin
Melbourne Water				Manages waterways in the far west of the South Gippsland basin

22.3 Rainfall, flow and storages in 2009–10

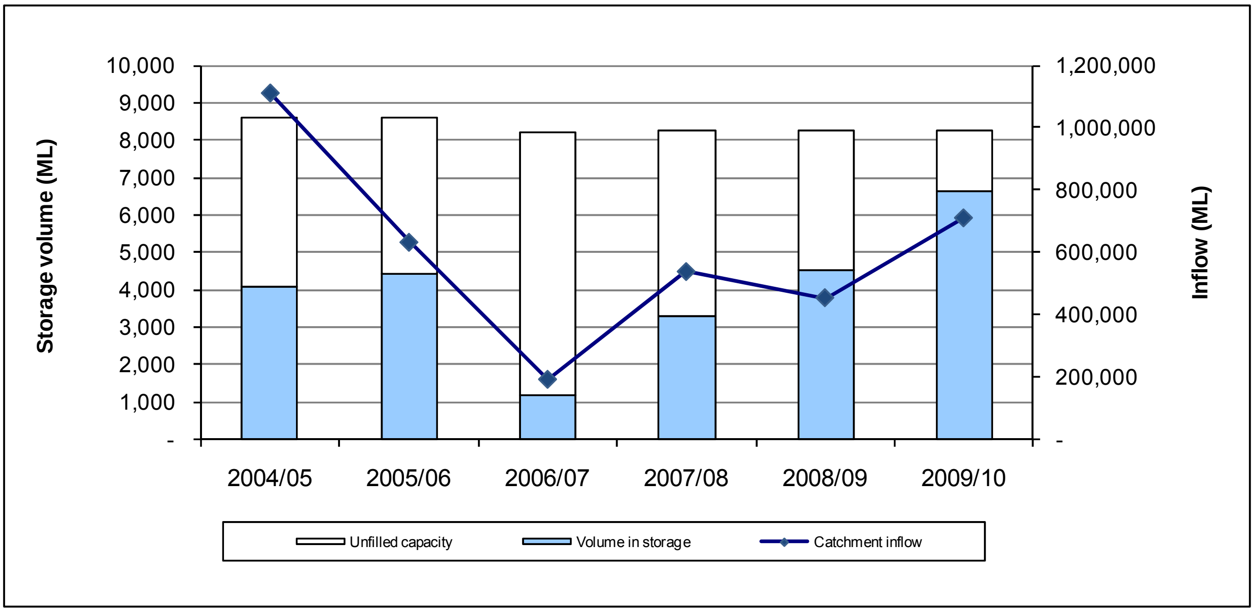
In 2009–10, rainfall across the South Gippsland basin ranged between 80% and 125% of the long-term average. Inflows were 711,400 ML, or 78% of the long-term average (of 911,500 ML). This is higher than the 2008–09 inflows of 454,000 ML.

The amount of water flowing from the South Gippsland basin into Westernport Bay and Bass Strait was 671,400 ML in 2009–10. This represents 94% of the total inflows into the basin.

Storage levels for all major storages (greater than 1,000 ML capacity) in the basin increased from 4,500 ML in July 2009 to 6,600 ML (80% of capacity) by June 2010.

Only volumes for major on-stream storages have been included in the water balance. In the South Gippsland basin this includes Lance Creek, Western, Candowie and Hyland Reservoirs.

Figure 22-1 All major storages and catchment inflows in the South Gippsland basin



22.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the South Gippsland basin are shown in Table 22-2. Consumptive use in the South Gippsland basin is low compared to the available resource in the basin.

Table 22-2 Summary of total water resources and water use in the South Gippsland basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	717,200	37,500
Groundwater(2)	38,900	19,400
Recycled water	4,750	310

Note:

(1) For groundwater, the total water resource is the total entitlement limit as presented in Table 22-7 and the estimated domestic and stock use as presented in Table 22-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

22.4.1 Infrastructure projects to improve water availability

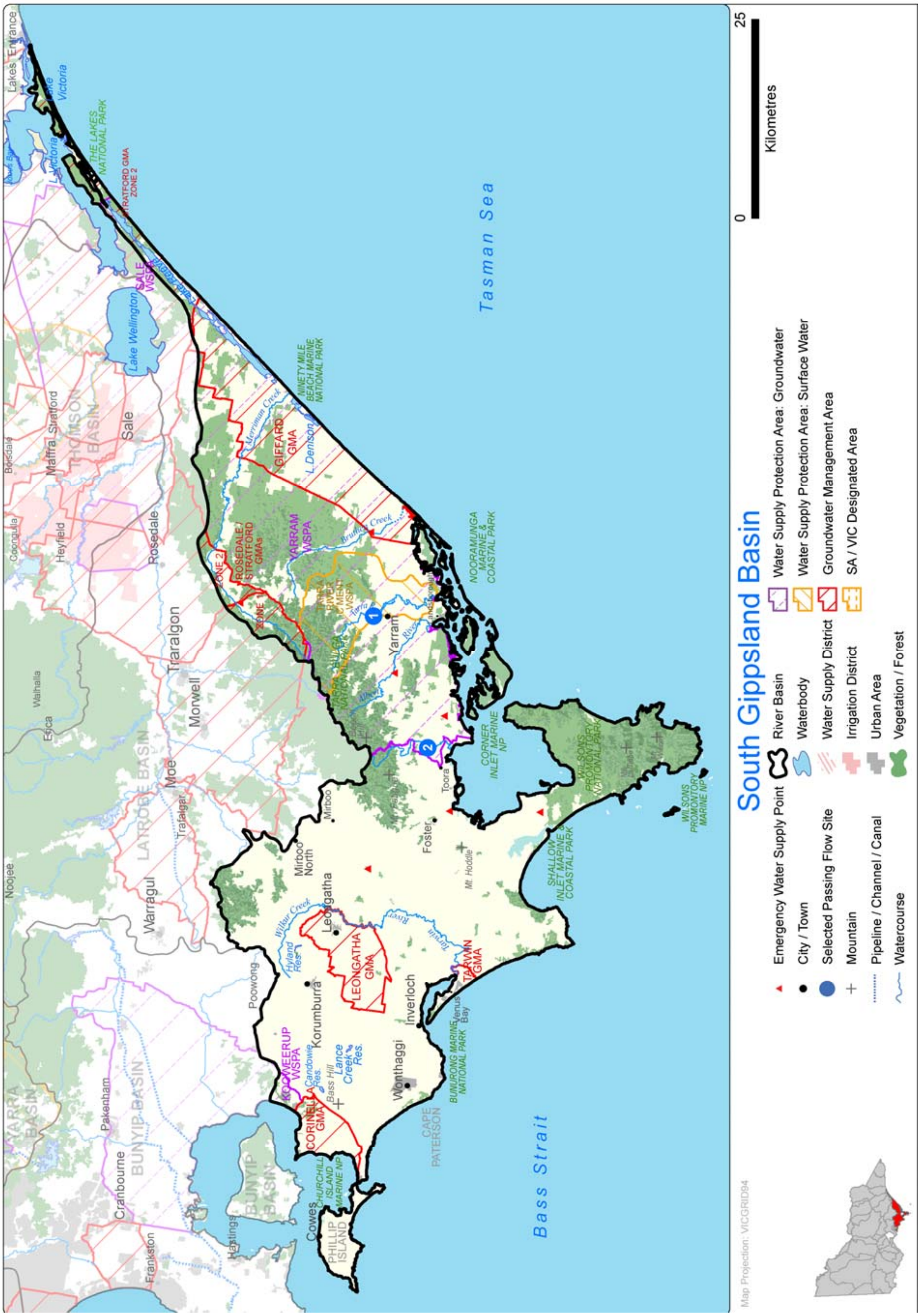
A number of infrastructure projects were undertaken in the South Gippsland basin during 2009–10 to improve water availability.

Westernport Water finished constructing three bores in the Corinella aquifer in June 2010 to supplement supplies from Candowie Reservoir.

South Gippsland Water constructed a bore and 3.4-kilometre pipeline from Wron Wron Road to Devon North Water Treatment Plant. The project was started and completed in 2009–10. A pipeline was also constructed to connect the Lance Creek system with the desalination plant at Wonthaggi. This will enable water to be supplied for the construction of the desalination plant, but later will connect the South Gippsland Water system into the Melbourne System. A total of 10.5 kilometres of pipeline was constructed over two stages, both completed in the 2009–10 water year.

22.5 Location of water resources

Figure 22-2 Map of the South Gippsland basin



22.6 Surface water resources

22.6.1 Water balance

A surface-water balance for the South Gippsland basin is shown Table 22-3.

Diversions make up a relatively small proportion of total inflows, with around 9% of basin inflows diverted for consumptive use in 2008–09. Most inflows leave the basin and flow into Bass Strait or Westernport.

Table 22-3 Balance of surface water in the South Gippsland basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	4,500	3,300
Volume in storage at end of year	6,600	4,500
Change in storage	**2,100**	**1,200**
Inflows		
Catchment inflow(1)	711,400	454,000
Rainfall on major storages	3,400	n/a(4)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	2,400	2,200
Sub-total	**717,200**	**456,200**
Usage		
Urban diversions	8,000	7,180
Licensed diversions from unregulated streams	5,200	8,100
Small catchment dams	24,300	24,300
Sub-total	**37,500**	**39,600**
Losses		
Net evaporation losses from major storages	1,100	1,200 (4)
Evaporation from small catchment dams(2)	5,100	5,100
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	0	0
Sub-total	**6,200**	**6,300**
Water passed at outlet of basin		
River outflows to Bass Strait and Westernport	671,400	409,100

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Evaporation losses are calculated by subtracting estimated usage from water harvested.

(3) Assumed to be zero because data is not readily available.

(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

22.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 22-4 below have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 22-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	23,000	11,500	n/a
Registered commercial and irrigation	15,200	12,800	n/a
Total	**38,200**	**24,300**	**29,400**

n/a: Information not available.

22.6.3 Water entitlement transfers

The movement of surface water entitlements in the South Gippsland basin was limited to transfers of bundled entitlement within the basin. In 2009–10, 124 ML of permanent entitlement transfers and 119 ML of temporary entitlements transfers were traded within the basin. This is a significant increase from 2008–09. There was no net movement of water into or out of the basin in 2009–10.

Table 22-5 summarises the movement of bundled entitlements in the South Gippsland basin during 2009–10.

Table 22-5 Transfers of surface water bundled entitlements in the South Gippsland basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
South Gippsland Unregulated	124	124	0	119	119	0
Total 2009–10	**124**	**124**	**0**	**119**	**119**	**0**
Total 2008–09	0	0	0	2	2	0

22.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 22-6. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10.

Table 22-6 Volume of water diverted under surface water entitlements in the South Gippsland basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
Gippsland Water					
Seaspray	1	133	-	33	Yes
South Gippsland Water					
Devon North Alberton – Yarram and Port Albert	1	853	-	482	Yes
Dumbalk	1	100	-	21	Yes
Fish Creek	1	251	-	107	Yes
Foster	1	326	-	175	Yes
Korumburra	1	1,000	-	488	Yes
Leongatha	1	2,476	-	1,606	Yes
Loch, Poowong and Nyora	1	420	-	206	Yes
Meeniyan(1)	1	1,800	-	476	Yes
Toora Port Franklin – Welshpool and Port Welshpool	1	1,617	-	545	Yes
Wonthaggi – Inverloch(2)	1	5,600	-	1,526	Yes
Westernport Water					
Westernport	1	2,911	-	1,394	Yes
Westernport – Bass River(3)	1	3,000		941	Yes
Total annual volume of bulk entitlements 2009–10		**20,487**	**-**	**8,000**	
Total annual volume of bulk entitlements *2008–09*		**15,615**	**-**	**7,182**	
Licensed diversions from unregulated streams 2009–10		*12,306*		*5,223*	
Licensed diversions from unregulated streams 2008–09		*13,290*		*8,099*	

Notes:
(1) The bulk entitlement was temporarily increased to 1,800 ML in 2008–09 and 2009–10 under a qualification of rights.
(2) The bulk entitlement was amended in November 2009 to increase the entitlement volume by 1,800 ML.
(3) The Bass River bulk entitlement came into effect in August 2009.

22.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the South Gippsland basin, excluding domestic and stock use, is presented in Table 22-7.

The South Gippsland basin contains all of the Corinella GMA and Leongatha GMA, most of the Yarram WSPA, Tarwin GMA and Giffard GMA, as well as part of the Sale WSPA, Rosedale GMA and Stratford GMA. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Groundwater use in 2009–10 decreased by some 20% compared with 2008–09. Westernport Water undertook a pump test of two bores in the Corinella borefield in 2008–09 for potential additional urban water supply.

Table 22-7 Licensed groundwater volumes, South Gippsland basin 2009–10

WSPA/GMA[1]	GMA/ WSPA depth limits[2] (m)	Entitlement limit[3] (ML/year)	Licensed entitlement[4] (ML/year)	Metered use (ML)	Estimated use in unmetered bores(ML)[6]	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Corinella GMA (100%)	All depths	2,550	146	129	-	129	45
Giffard GMA (100%)	50-200	5,670	5,670	1,717	-	1,717	3,662
Leongatha GMA (100%)	All depths	6,500	1,693	158	-	158	344
Rosedale GMA (6%)	Zone 1 50–150 Zone 2 25–350 Zone 3 200–300	1,337	1,334	393	267	660	692
Stratford GMA (7%)	Zone 1 >150 Zone 2 >350	2,001	2,001	7	2,012	2,019	1,947
Tarwin GMA (100%)	≤25	1,300	38	6	-	6	6
Sale WSPA (6%)	25–200	1,171	1,165	613	-	613	618
Yarram WSPA (95%)	Zone 1 >200 Zone 2 All depths	23,957	23,957	11,146	-	11,146	13,164
Total[5]		**44,486**	**36,004**	**14,169**	**2,279**	**16,448**	**20,478**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

(6) Non-metered use includes estimated extraction from Latrobe Valley Mines.

An estimate of domestic and stock groundwater use is provided in Table 22-8.

Table 22-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores[1][2]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Corinella GMA (100%)	131	262
Giffard GMA (100%)	109	218
Leongatha GMA (100%)[3]	106	212
Rosedale GMA (6%)	13	26
Stratford GMA (7%)	-	1
Tarwin GMA (100%)	761	1,522
Sale WSPA (6%)	45	91
Yarram WSPA (95%)	306	611
Total[4]	**1,471**	**2,943**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the previous table.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Licence increase approved 20 May 2010

(4) Estimated use for domestic and stock is based on the proportion of bores for each management unit data located in the basin prior to rounding.

The licensed entitlements and metered use for urban groundwater supplies is provided in Table 22-9.

Table 22-9 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Leongatha[(1)]	715	16	381
Yarram	60	7	11
Total	**775**	**23**	**392**

Note:
(1) Increase to license from 400 ML to 715 ML was approved April, 2010

22.8 Drought contingency measures

Drought contingency measures in the South Gippsland basin in 2009–10 included:

- restricting rural water use (discussed below)
- amending water allocation arrangements in bulk entitlements
- use of groundwater to supplement surface water supplies
- temporary qualification of rights as detailed in Table 22-10.

The Minister for Water amended the Bulk Entitlement for Wonthaggi-Inverloch in November 2009 to enable South Gippsland Water to supplement supplies from the Powlett River. South Gippsland Water utilised a license for groundwater supply to the Ruby Creek storages to supplement water supplies for Leongatha and Koonwarra.

Gippsland Water sought a Bulk Entitlement amendment as a result of low flows in Merrimans Creek at Seaspray. Note that this amendment was approved by the Minister for Water in 2009–10, but was not gazetted until August 2010 (the 2010–11 water year).

Construction on the desalination plant continued which will provide water from the ocean at Wonthaggi (South Gippsland basin) to supply Melbourne, Geelong, and towns in the Westernport and South Gippsland region.

22.9 Qualification of rights

There were two temporary qualifications in place during 2009–10 while water security remained at risk for towns such as Leongatha, Korumburra, Wonthaggi and Inverloch.

The qualifications allowed South Gippsland Water to harvest and store extra water from the Tarwin and Powlett rivers during winter and spring (when flows are typically higher) to maintain essential supplies over summer and autumn.

The qualification on the Powlett River provided an additional 403 ML of water for Wonthaggi and Inverloch. This water was particularly important for meeting critical residential demands over summer when the population in these towns doubled. The qualification expired on 19 November 2009, when South Gippsland Water's temporary diversion licence expired.

At the beginning of the year, storage levels for Leongatha and Korumburra were low, at 53% and 34% of capacity respectively. The qualification on the Tarwin River provided an additional 420 ML of water, which assisted storage level recovery and enabled South Gippsland Water to meet critical residential and industrial demands for these towns. Meeting these demands ensured that production by the region's important dairy and food production companies was not significantly impacted from the ongoing water shortage. The qualification expired on 30 June 2010.

The environmental impacts of the qualifications were managed by South Gippsland Water in consultation with West Gippsland Catchment Management Authority. Since 2007, South Gippsland Water has undertaken a number of environmental and risk assessments on the Tarwin, Coalition and Powlett rivers, and commissioned macroinvertebrate and fish surveys to help identify, monitor and manage any impacts of the qualifications.

The qualifications also included rules to reduce the impacts of diverting extra water from these rivers by setting diversion rules dependant on the time of year, volume in storage, streamflows and river water quality.

To help the environment recover from the qualifications, South Gippsland Water is developing and implementing a river health programme for the Tarwin and Powlett rivers. A significant component of this work is the construction of a fish ladder on the Tarwin River near Meeniyan.

Table 22-10 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights to water in the Tarwin River 2008	1 July 2009 to 30 June 2010 (continuing from 13 June 2008)	Extended pumping and diversion times Reduced passing-flow requirements	Allows South Gippsland Water to access additional water from the Tarwin River, increase extraction rates, and reduces passing-flow requirements to enable emergency supply to Korumburra and Leongatha–Koonwarra.	Expiry date: 30 June 2010.	30 June 2010
Temporary Qualification of Rights to water from the Powlett River 2008	1 July 2009 to 19 November 2009 (continuing from 20 December 2007)	Extended pumping and diversion times New diversion point provided	Allows South Gippsland Water to access additional water from the Powlett River, extend the period in which pumping is permitted, and introduce passing-flow requirements to enable emergency supply to Wonthaggi.	Connection to the desalination plant, or expiry of SGW's temporary diversion licence, whichever comes first.	19 November 2009

22.10 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 22-11. Seaspray was the only urban centre that experienced restrictions throughout 2009–10.

In contrast, licensed diverters on a number of tributaries across the basin were severely restricted or banned throughout the year.

Table 22-11 Seasonal allocations and restrictions on water use in South Gippsland basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Seaspray	Stage 2 restrictions from February to April 2010
Licensed diversions from unregulated streams	Bruthen Creek	Irrigation ban from July to August 2009 and from January to June 2010
	Tarra River	Irrigation ban in January 2010, Stage 1 restrictions in March 2010, and Irrigation ban in April 2010
	Jack River	Irrigation ban from January to May 2010
	Greigs Creek	Stage 1 restriction from July to August 2009, Irrigation ban January to June 2010

22.11 Recycled water

South Gippsland Water is responsible for eight wastewater treatment plants within the basin, with the Yarram (Tarraville) treatment plant the only site where all wastewater is recycled. Recycling opportunities are limited due to a small industrial base and crop types that are not suited to recycled water.

Westernport Water reuses water from its treatment plants at Coronet Bay and Cowes for sporting fields and gardens of significance.

Across the basin 6% of wastewater was reused, compared to 7% in 2008–09 (Table 22-12).

Table 22-12 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Coronet Bay	142	89	63%	-	89	-	-	-	53
Cowes	991	91	9%	77	11	-	4		900
Foster	125	-	0%	-	-	-	-	125	-
Korumburra	638	4	1%	4	-	-	-	634	-
Leongatha domestic	547	0	0%	0	-	-	-	547	-
Leongatha trade waste	1,088	-	0%	-	-	-	-		1,088
Toora	52	3	6%	3	-	-	-	49	-
Welshpool	41	-	0%	-	-	-	-	41	-
Wonthaggi/Cape Paterson/Inverloch	1,021	18	2%	-	18	-	-	1,004	-
Yarram (Tarraville)	101	101	100%	-	101	-	-	-	-
Total 2009–10	**4,748**	**307**	**6%**	**84**	**219**	**-**	**4**	**2,400**	**2,041**
Total 2008–09	**4,467**	**325**	**7%**	**92**	**227**	**-**	**5**	**2,204**	**1,938**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percent recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

22.12 Water for the environment

22.12.1 Environmental Water Reserve (EWR)

There are important environmental assets dependent on water from the EWR in the South Gippsland basin. Corner Inlet and Westernport Bay are listed as internationally significant wetlands under the Ramsar convention and rely on the freshwater inputs from the South Gippsland basin to ecologically function. The local Australian Grayling population, which is EPBC and FFG listed, also relies on water from the South Gippsland EWR.

In 2009–10 the South Gippsland basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Gippsland Water and South Gippsland Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

22.12.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

Gippsland Water and South Gippsland Water reported that they met all passing-flow requirements under their bulk entitlements in the South Gippsland Basin in 2009–10. For the Tarwin River, passing-flow requirements were reduced during 2009–10 under the qualification of rights discussed in Section 22.9.

Westernport Water's bulk entitlement does not contain any passing-flow requirements.

Table 22-13 shows passing-flow compliance in the South Gippsland basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The location of these compliance points is presented in Figure 22-2.

Table 22-13 Selected passing-flow compliance in the South Gippsland basin

River	Passing flow	
Tarra River	Instrument where passing flows are specified	Bulk Entitlement (Devon North, Alberton, Yarram and Port Albert) Conversion Order 1997
	Responsible authority	South Gippsland Water
	Compliance point	Tarra River diversion weir (shown as 1 in Figure 22-2)
	Passing-flow compliance	• The authority passed the entire flow when flows were between 0 and 3 ML per day • The authority passed 3 ML per day when flow was between 3 and 6 ML per day • The authority passed half the flow when flow was between 6 and 12 ML per day • The authority passed 6 ML per day when flow was greater than 12 ML per day
Agnes River	Instrument where passing flows are specified	Bulk Entitlement (Toora, Port Franklin, Welshpool and Port Welshpool) Conversion Order 1997
	Responsible authority	South Gippsland Water
	Compliance point	Agnes River storage diversion point (shown as 2 in Figure 22-2)
	Passing-flow compliance	The lesser of 1 ML per day or natural flow was passed

22.12.3 Streamflow management plans (SFMPs)

The Draft Gippsland Region Sustainable Water Strategy proposed to develop local management rules for the Tarra River, instead of a SFMP. This will be reviewed in the final Gippsland Region Sustainable Water Strategy.

23 Bunyip basin

This chapter sets out the accounts for the Bunyip basin. For detailed information about how they have been compiled, refer to Chapter 5.

23.1 Bunyip basin summary

Inflows to the Bunyip basin in 2009–10, at 596,600 ML, were 10% above the long-term average and were double the annual inflows received in 2008–09.

Water from Tarago reservoir was used to supplement metropolitan Melbourne's water supply for the first time since the early 1990s following the completion of the Tarago water treatment plant in June 2009.

Towns in the basin supplied by Gippsland Water were not subject to restrictions in 2009–10, however Melbourne remained on Stage 3a restrictions for most of the year as dry conditions continued in Yarra and Thomson basins.

Licensed groundwater use reduced by over 20% in 2009–10 compared to 2008–09, largely due to above-average rainfall reducing the need for irrigation.

23.2 Responsibilities for management of water resources

Table 23-1 shows the responsibilities of various authorities within the Bunyip basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 23-1 Responsibilities for water resources management within the Bunyip basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages surface water and groundwater private diversions		
Melbourne Water			Operates Eastern Treatment Plant Provides bulk water supply to South East Water	Operates Tarago Reservoir Obliged to meet passing flows Manages waterways
South East Water			Supplies part of the metropolitan Melbourne area including Dandenong, Frankston, Pakenham and the Mornington Peninsula[(1)]	
Gippsland Water			Supplies towns in the east of the basin including Drouin and Neerim South	Obliged to meet passing flows

Note:

(1) Metropolitan Melbourne is mostly supplied from the Yarra and Thomson basins.

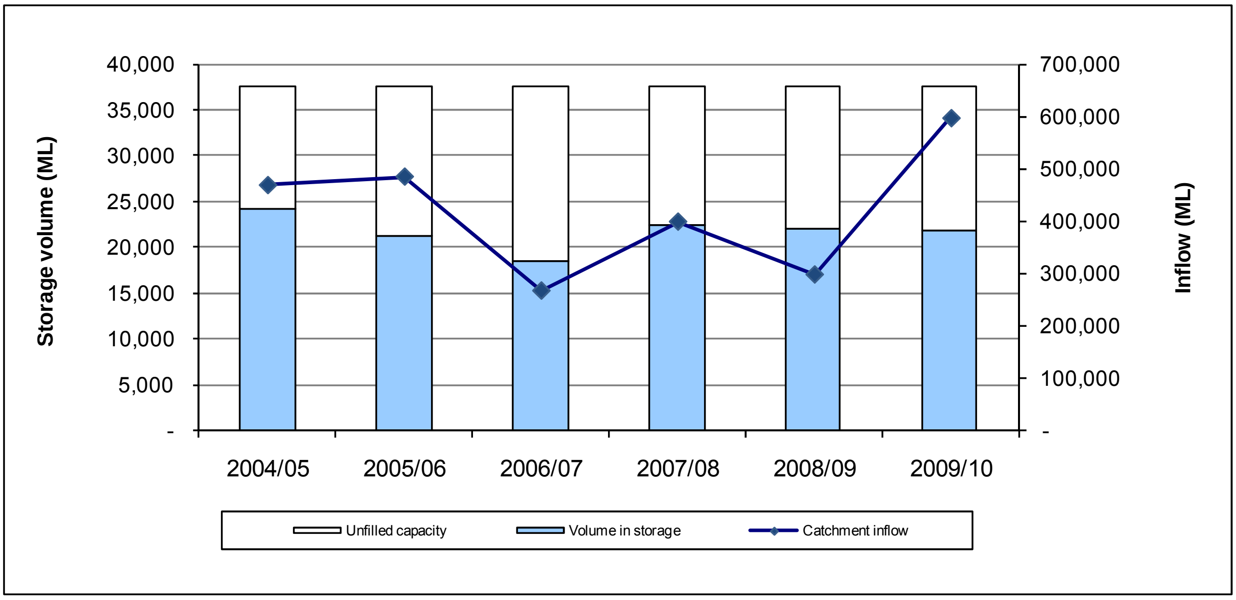
23.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Bunyip basin ranged between 80% and 125% of the long-term average. Catchment inflows were 597,100 ML, which equates to 110% of the long-term average of 541,000 ML. This was significantly higher than 2008–09 inflows of 296,800 ML and is the highest inflow for the past five years.

The amount of water flowing from the Bunyip basin into Port Phillip Bay, Westernport and Bass Strait was 567,700 ML in 2009–10. This represents 95% of the catchment inflows into the basin, which is similar to that of 2008–09.

The Tarago Reservoir is the only major storage (greater than 1,000 ML) in the Bunyip basin. The Tarago Reservoir ended the year at 21,800 ML, or 87% of the effective capacity of 25,000 ML. Tarago Reservoir has a capacity of 37,500 ML, however in 2009–10, as in previous years, it is operating at a temporary capacity of 25,000 ML for dam safety reasons.

Figure 23-1 All major storages and catchment inflows in the Bunyip basin(1)



Note:

(1) The reservoir has a capacity of 37,500 ML, however it is operated at 25,000 ML capacity for dam safety reasons.

23.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Bunyip basin are shown in Table 23-2. These figures exclude water delivered directly to customers from Melbourne Water's supply system in the Yarra and Thomson basins.

Table 23-2 Summary of total water resources and water use in the Bunyip basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	608,500	37,500
Groundwater(2)	26,700	12,900
Recycled water	135,800	23,540

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 23-7 and the estimated domestic and stock use as presented in Table 23-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

23.4.1 Infrastructure projects to improve water availability

Melbourne Water successfully supplied water to Melbourne from Tarago Reservoir and Bunyip Weir during 2009–10, which was the first full year the Tarago water treatment plant was operational

The Wonthaggi Desalination Plant is due to supply 150 GL of water into Melbourne's south east region by December 2011. Works completed in 2009–10 included site works and start of pipeline construction. When completed, desalinated water will be supplied into Melbourne's Cardinia Reservoir, located in the Bunyip basin, and to towns located off the transfer pipeline.

23.5 Location of water resources

Figure 23-2 Map of the Bunyip basin

23.6 Surface water resources

23.6.1 Water balance

A surface-water balance for the Bunyip basin is shown in Table 23-3.

Water was diverted from the Bunyip basin to Melbourne over the entire year after completion of the Tarago water treatment plant and granting of bulk entitlements to the Melbourne metropolitan retailers in late 2008–09. This explains why the volume of urban diversions was significantly higher in 2009–10 compared to 2008–09.

Cardinia Reservoir is an off-channel storage located within the Bunyip basin and stores water harvested and transferred from the Yarra basin. It is therefore not included in the Bunyip basin figures.

Table 23-3 Balance of surface water in the Bunyip basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	22,000	22,300
Volume in storage at end of year	21,800	22,000
Change in storage	**-200**	**-300**
Inflows		
Catchment inflow[(1)]	597,100	296,800
Rainfall on major storages	2,300	n/a[(2)]
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	9,200	8,680
Sub-total	**608,600**	**305,500**
Usage		
Urban diversions	16,670	3,130
Licensed diversions from regulated streams	150	0
Licensed diversions from unregulated streams	5,300	6,000
Small catchment dams	15,500	15,500
Sub-total	**37,600**	**24,600**
Losses		
Evaporation losses from major storages	1,600	-200[(2)]
Losses from small catchment dams[(3)]	600	600
In-stream infiltration to groundwater, flows to floodplain and evaporation[(4)]	1,300	1,200
Sub-total	**3,500**	**1,600**
Water passed at outlet of basin		
River outflows to the ocean and Port Phillip Bay and Westernport	567,700	279,600

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

(3) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from total water harvested.

(4) Losses estimated using loss functions in the Tarago River REALM.

n/a: Not applicable.

23.6.2 Small catchment dams

Small catchment dams are responsible for diverting a large volume of surface water in the basin. Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values provided in Table 23-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 23-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	8,000	4,000	n/a
Registered commercial and irrigation	13,700	11,500	n/a
Total	**21,700**	**15,500**	**16,100**

n/a: Information not available.

23.6.3 Water entitlement transfers

There are no declared water systems in the Bunyip basin. As such surface water movement in the Bunyip basin was limited to transfers of bundled entitlements. In 2009–10, 58 ML of licences was transferred within the basin on a permanent basis, and 159 ML on a temporary basis. No bulk entitlements were transferred.

Table 23-5 summarises the movement of bundled entitlements in the Bunyip basin during 2009–10.

Table 23-5 Transfer of surface water bundled entitlements in the Bunyip basin 2009–10

Trading Zone	Permanent transfers			Temporary transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Bunyip Unregulated	58	58	0	159	159	0
Total 2009–10	58	58	0	159	159	0
Total 2008–09	12	12	0	281	281	0

23.6.4 Volume diverted

The volume of water diverted in 2009–10 is shown in Table 23-6.

Licensed diversions from unregulated streams are a large component of surface water use in the basin. Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

In May 2009, the Melbourne metropolitan retailers were granted bulk entitlements to take and use water from the Tarago and Bunyip rivers, which explains why the volume of urban diversions were significantly different between 2008–09 and 2009–10.

Table 23-6 Volume of water diverted under surface water entitlements in the Bunyip basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
Gippsland Water					
Tarago River	5	4,825	-	3,085	Yes
Melbourne metropolitan retailers					
Tarago and Bunyip Rivers(1)	5	30,510	-	13,580	Yes
Southern Rural Water					
Tarago River – Southern Rural Water	5	1,260		150	Yes
Minister for the Environment					
Tarago and Bunyip Rivers (2)	1	3,000	-	0	Yes
Total annual volume of bulk entitlements 2009–10		**34,035**	**-**	**16,815**	
Total annual volume of bulk entitlements 2008–09		**-**	**75**	**3,133**	
Licensed diversions from unregulated streams 2009–10		*19,319*		*5,295*	
Licensed diversions from unregulated streams 2008–09		*17,672*		*6,031*	

Note:

(1) The Tarago and Bunyip Rivers bulk entitlements for the Melbourne metropolitan retailers commenced at the end of 2009–10 and therefore was not previously reported.

(2) The entire entitlement for 2009–10 was carried over to 2010–11. This environmental entitlement specifies that the full allocation is not provided until Stage 3a water restrictions are lifted in Melbourne. This occurred on 2 April 2010.

23.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Bunyip basin, excluding domestic and stock use, is presented Table 23-7.

The Bunyip basin contains the whole Frankston GMA, Nepean GMA, most of the Koo Wee Rup WSPA as well as part of the Moorabbin GMA. While groundwater levels in the Koo Wee Rup WSPA and Nepean GMA are declining, insufficient observation bores are available to determine trends for the Frankston and Moorabbin GMAs. A draft groundwater management plan was released in September 2009 for the Koo Wee Rup WSPA in light of declining water levels. Groundwater entitlements and use for unincorporated areas are detailed in Appendix A. Reported groundwater use in the Bunyip decreased in 2009–10 compared with 2008–09, largely as a result of reduced extractions from the Koo Wee Rup WSPA.

Table 23-7 Licensed groundwater volumes, Bunyip basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Frankston GMA (100%)	All depths	3,200	1,080	126	-	126	211
Moorabbin GMA (61%)	All depths	1,660	1,606	739	-	739	726
Nepean GMA (100%)	All depths	6,013	6,012	3,521	-	3,521	3,918
Koo-Wee-Rup WSPA (100%)	All depths	12,915	12,915	3,378	-	3,378	5,086
Total (5)		**23,788**	**21,612**	**7,764**	**-**	**7,764**	**9,941**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV).

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 23-8. The number of domestic and stock bores in the Bunyip basin reduced slightly in 2009–10 compared to 2008–09.

Table 23-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(4)(5)
Frankston GMA (100%)	233	466
Moorabbin GMA (61%)	257	514
Nepean GMA (100%)(3)	2,297	1,149
Koo Wee Rup WSPA (100%)	1,492	2,984
Total	**4,279**	**5,113**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the previous table.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) The estimated domestic and stock use for Nepean GMA is estimated at 0.5 ML per bore not 2 ML per bore because most Nepean properties have access to potable water and bores are mainly used for domestic purposes such as watering gardens.

(4) Estimated domestic and stock use is based on the proportion of bores for each management unit data located in the basin prior to rounding.

In the Bunyip basin, groundwater is used as an urban water supply for the township of Lang Lang. The licensed entitlements and metered use for this groundwater supplies are provided in Table 11-10.

Table 23-9 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Lang Lang	114	22	-

23.8 Drought contingency measures

The restriction of urban and rural water use (discussed below in section 23.9) were the only drought contingency measures implemented in the Bunyip basin in 2009–10.

Dam-safety risk assessments were conducted for Cardinia and Tarago reservoirs by Melbourne Water throughout the year; this resulted in a temporary reduction in the full supply level of these reservoirs.

23.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 23-10.

All towns in the basin supplied by Gippsland Water were unrestricted during the year. Melbourne was subject to Stage 3a restrictions for most of the year until they were eased to Stage 3 in March 2010.Licensed diverters on Monbulk Creek were restricted for part of the year, but only to Stage 1 restrictions.

Groundwater use was unrestricted in the Bunyip basin during 2009–10.

Table 23-10 Seasonal allocations and restrictions on water use in Bunyip basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	South East Water customers	Stage 3a restrictions from July 2009 to March 2010, Stage 3 restrictions from April to June 2010. These restrictions were also supported by the Target 155 campaign.
Licensed diversions from unregulated streams	Monbulk Creek	Stage 1 restrictions from January to May 2010

23.10 Recycled water

Gippsland Water, South East Water and Melbourne Water operate wastewater treatment plants within the Bunyip basin. Overall, 6% of wastewater was recycled for off-site purposes.

The largest treatment plant is the Eastern Treatment Plant operated by Melbourne Water, which recycled 5% of its total wastewater volume of 123,123 ML. The plant's recycled wastewater was predominantly used on-site and this volume has not been included in the percentage of water recycled. However, an increasing amount is being used by the Eastern Irrigation Scheme for horticultural, recreational and residential customers.

Table 23-11 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)					Volume discharged to the environment (ML)	Release to ocean/ other (ML)(3)
				To retailers	Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Blind Bight	210	209	76%	-	159	-	-	50	-	-
Boneo	3,083	448	14%	-	15	404	-	29	2,633	-
Drouin	481	177	37%	-	-	177	-	-	305	(1)
Eastern Treatment Plant	123,123	20,496	5%	6,317	-	-	-	14,179	-	102,627
Koo Wee Rup	118	60	51%	-	60	-	-	-	-	58
Lang Lang	67	46	69%	-	46	-	-	-	-	21
Longwarry	158	101	64%	-	-	101	-	-	-	57
Mt Martha	5,134	861	1%	-	53	-	-	808	4,273	-
Neerim South	40	-	0%	-	-	-	-	-	40	0
Pakenham	1,913	930	47%	-	402	496	-	32	792	-
Somers	1,472	210	14%	-	202	-	-	8	1,154	-
Total 2009–10	**135,800**	**23,538**	**6%**	**6,317**	**937**	**1,178**	**-**	**15,106**	**9,197**	**102,763**
Total 2008–09	**133,986**	**25,775**	**8%**	**8,243**	**1,032**	**1,677**	**-**	**14,823**	**8,679**	**99,534**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

23.11 Water for the environment

23.11.1 Environmental Water Reserve (EWR)

Westernport Bay is an important environmental asset dependent on water from the EWR in the Bunyip basin. The bay is listed as an internationally significant wetland under the Ramsar convention and relies on the freshwater inputs from the Bunyip basin to ecologically function. Additionally, there is a nationally threatened population of Dwarf Galaxias and Australian Grayling in the Tarago and Bunyip systems.

In 2009–10 the Bunyip basin EWR comprised:

- the Tarago and Bunyip Rivers Environmental Entitlement 2009
- all other water in the basin not allocated for consumptive use, that is water above the cap
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions.

23.11.2 Environmental entitlements

The Tarago and Bunyip Rivers Environmental Entitlement 2009 was granted by the Minister for Water to the Minister for Environment in March 2009 and came into effect in May 2009. However the water held in this entitlement, a combination of passing-flow requirements and a share of inflows, was not available for use by the environment until April 2010, when restrictions for Melbourne customers were eased from Stage 3a to Stage 2.

23.11.3 Passing-flow compliance

Melbourne Water operates Tarago Reservoir to provide a passing flow below the reservoir. As discussed above, the passing-flow requirements under the Tarago and Bunyip Rivers Environmental Entitlement did not come into effect until April 2010, when restrictions for Melbourne customers were eased from Stage 3a to Stage 2. The passing-flow requirements under this entitlement were complied with after this date.

Gippsland Water reported one non-compliant passing flow at Pederson Weir under its Tarago River bulk entitlement. The non-compliance lasted for four days between 26 and 29 November as a result of manual gauge board readings which risk low passing flow going undetected between readings. To ensure this does not happen in the future, a project is underway to monitor the site at a greater frequency by telemetry system.

24 Yarra basin

This chapter sets out the accounts for the Yarra basin. For detailed information about how they have been compiled, refer to Chapter 5.

24.1 Yarra basin summary

While inflows to the Yarra basin were only 54% of the long-term average, they were significantly higher than in 2008–09.

Storages levels in the Yarra basin remained low in 2008–09, however it was the first time since 2004–05 that levels didn't decline over the year. By the end of June 2010 the volume of water in storage had increased modestly to 50% of capacity.

Water from Tarago Reservoir (in the Bunyip basin) was used to supplement metropolitan Melbourne's water supply for the first time since the early 1990s following the completion of the Tarago water treatment plant in June 2009.

The construction of the north-south pipeline, connecting Melbourne water supplies to the Goulburn River, was completed in February 2010, and 16,744 ML of water was pumped to Sugarloaf Reservoir by the end of the irrigation season in May.

With the completion of these projects, there was less reliance on Thomson Reservoir in the Thomson basin for supply to Melbourne in 2009–10.

Melbourne's restrictions were reduced from Stage 3a to Stage 3 at the end of March 2010. At this time the Government also returned 7,000 ML to the environment that had been reserved in storage under a qualification of rights in the Yarra system to secure supplies for Melbourne.

Groundwater use was unrestricted in 2009–10, however licensed diverters on many of the Yarra basin's unregulated rivers were banned or restricted in some form, particularly over summer.

24.2 Responsibilities for management of water resources

Table 24-1 shows the responsibilities of various authorities within the Yarra basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 24-1 Responsibilities for water resources management within the Yarra basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Melbourne Water		Manages surface water licensed diversions in the Yarra basin	Provides bulk water to the Melbourne retail water authorities	Manages waterways in the Yarra basin Operates storages for the Melbourne supply system(1) and is obliged to meet passing-flow requirements
Yarra Valley Water			Supplies part of the metropolitan Melbourne area, including Healesville, Yarra Glen and Warburton	
South East Water			Supplies part of the metropolitan Melbourne area	
City West Water			Supplies part of the metropolitan Melbourne area	
Southern Rural Water		Manages groundwater licensed diversions		

Notes:
(1) Melbourne is also supplied from the Thomson and Bunyip basins.

24.3 Rainfall, flows and storages in 2009–10

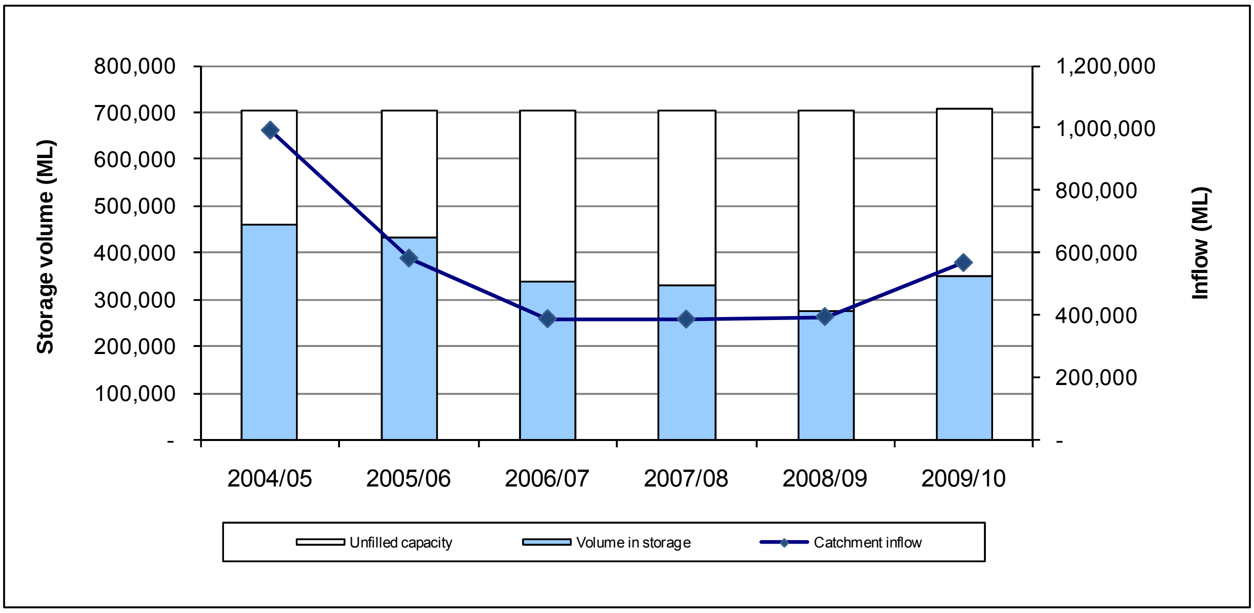
In 2009–10 rainfall in the Yarra basin ranged between 80% and 125% of the long-term average. Total inflows were 54% of the long-term average of 1,054,000 ML. This was higher than inflows experienced in 2008–09, and is the first time in three years that inflows to the Yarra basin were more than 40% of the long-term average.

The amount of water flowing from the Yarra basin into Port Phillip Bay was 217,900 ML in 2009–10. This represents 38% of the catchment inflows to the basin, compared with 34% in 2008–09.

Melbourne Water operates seven major storages within the Yarra basin. Water is harvested by Upper Yarra Reservoir, O'Shannassy Reservoir and Maroondah Reservoir. Sugarloaf Reservoir is an off-stream storage but has a dual role to harvest water and to act as a seasonal balancing reservoir. Silvan Reservoir, Yan Yean Reservoir, and Greenvale Reservoir are off-stream storages and act as seasonal balancing reservoirs. Another major Melbourne Water storage (Cardinia Reservoir) is an off-stream storage located within the Bunyip basin, although it stores water harvested from the Yarra basin.

Storage levels for all major storages (greater than 1,000 ML) in the basin increased from 275,900 ML in July 2009 to 351,500 ML (50% of capacity) by the end of June 2010.

Figure 24-1 All major storages and catchment inflows in the Yarra basin



Only volumes for major on-stream storages have been included in the water balance, and as such, major off-stream storages such as Cardinia, Sugarloaf, Greenvale and Silvan Reservoir have not been included. The volume of water in the major on-stream storages increased from 96,000 ML in July 2009 to 138,800 ML in June 2010.

24.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Yarra basin are shown in Table 24-2.

Table 24-2 Summary of total water resources and water use in the Yarra basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	671,000	398,300
Groundwater(2)	5,000	1,500
Recycled water	9,560	2,640

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 24-7 and the estimated domestic and stock use presented in Table 24-9.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

24.4.1 Infrastructure projects to improve water availability

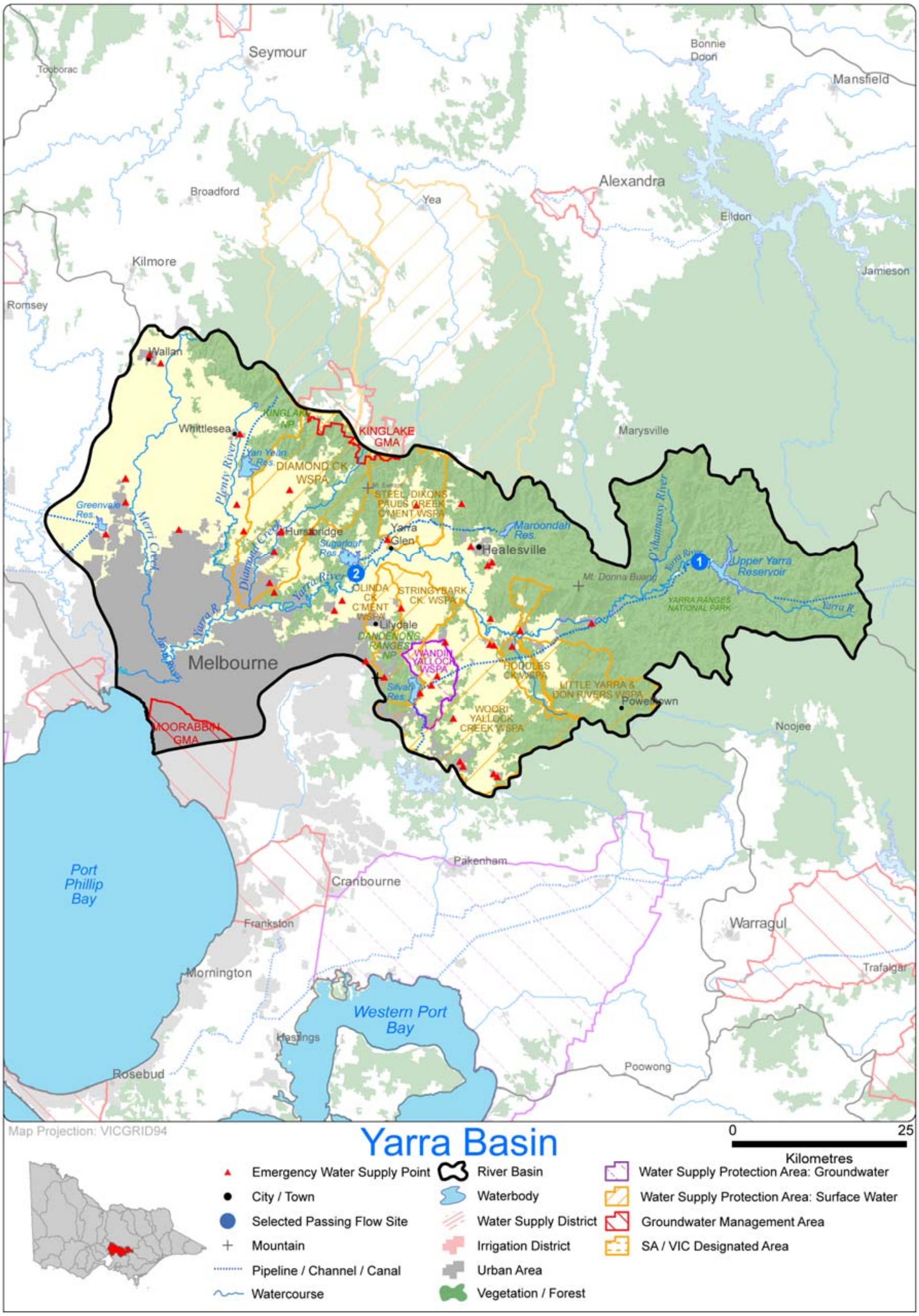
The North-South pipeline was officially opened on 10 February 2010 and supplied 16,744 ML of water from the Goulburn River to Sugarloaf Reservoir in 2009–10. The pipeline enables water savings from the Northern Victorian Irrigation Renewal Project to be piped to Melbourne.

Melbourne Water completed construction of the Preston Pump Station which is used to transfer new Winneke Water to Silvan Reservoir. It also completed (with the exception of centrifuges) the upgrade of the Winneke Treatment Plant which will increase the capacity of treatment plant to allow for North-South Pipeline flows.

Melbourne Water successfully supplied water to Melbourne from Tarago Reservoir and Bunyip Weir during 2009–10, following completion of the Tarago water treatment plant in June 2009.

24.5 Location of water resources

Figure 24-2 Map of the Yarra basin



24.6 Surface water resources

24.6.1 Water balance

A surface-water balance for the Yarra basin is presented in Table 24-3.

Melbourne Water transferred 84,200 ML from the Thomson and Goulburn basins to the Yarra basin for Melbourne's supplies in 2009–10.

Table 24-3 Balance of surface water in the Yarra basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	96,000	108,500
Volume in storage at end of year	138,800	96,000
Change in storage	**42,800**	**-12,500**
Inflows		
Catchment inflow(1)	568,000	395,000
Rainfall on major storages	11,600	n/a(6)
Transfers from Thomson(5)	62,400	94,900
Transfers from Goulburn (Silver and Wallaby Creeks)	5,300	n/a
Transfers from Goulburn via North-South Pipeline	16,740	n/a
Return flow from irrigation	0	0
Treated wastewater discharged back to river	6,920	6,760
Sub-total	**671,000**	**496,700**
Usage		
Urban diversions(2)	368,070	339,190
Licensed diversions from unregulated streams	14,300	15,200
Small catchment dams(3)	15,900	15,900
Transfers to the Werribee system	0	0
Sub-total	**398,300**	**370,300**
Losses		
Net evaporation losses from major storages	10,800	2,300 (6)
Evaporation from small catchment dams(3)	1,200	1,200
In-stream infiltration to groundwater, flows to floodplain and evaporation(4)	0	0
Sub-total	**12,000**	**3,500**
Water passed at outlet of basin		
River outflows to Port Phillip Bay	217,900	135,400

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Diversions from the Melbourne supply system represent the total amount diverted for consumptive purposes and do not equate to the sum of the three individual Melbourne bulk entitlements, due to a different calculation method.

(3) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(4) Losses estimated to be zero since no loss function is available for the Yarra basin.

(5) For 2008–09, this value represents 'Transfers from other basins', which combined the volumes transferred from the Thomson and Goulburn basins. For comparison, the combined transfer volume from other basins in 2009–10 was 84,200 ML.

(6) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

24.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 24-4 have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 24-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,500	5,300	n/a
Registered commercial and irrigation	12,600	10,600	n/a
Total	**23,100**	**15,900**	**17,100**

n/a: Information not available.

24.6.3 Water entitlement transfers

No surface water movement occurred in the Yarra basin during 2009–10. Table 24-5 compares transfers of bundled entitlements with 2008–09, in which transfers actually occurred.

Table 24-5 Transfer of surface water bundled entitlements in the Yarra Basins 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net transfer to basin	Bought (ML)	Sold (ML)	Net transfer to basin
Yarra Unregulated	0	0	0	0	0	0
Total 2009–10	0	0	0	0	0	0
Total 2008–09	130	130	0	585	585	0

24.6.4 Volume diverted

The Melbourne metropolitan retailers, City West Water, South East Water and Yarra Valley Water, and Western Water hold bulk entitlements on the Yarra River. The volume of water diverted by these corporations is shown in Table 24-6.

The Yarra River bulk entitlement held by the Melbourne retailers is applied over a multi-year period, where the average usage over a defined rolling period (15 years for the Melbourne retailers) must be less than the average bulk entitlement volume. Compliance with the bulk entitlement held by Western Water is deemed to occur if water use is less than the specified maximum annual volume.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Melbourne Water.

Table 24-6 Volume of water diverted under surface water entitlements in the Yarra basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)
Melbourne metropolitan retailers					
Yarra River	15	400,000	-	290,500	Yes
Western Water					
Yarra River	1	11,250	-	9,874	Yes
Environment Minister					
Yarra Environmental Entitlement(3)	1	17,000	-	0	Yes
Total annual volume taken in 2009–10		**428,250**		**300,374**	
Total annual volume taken in 2008–09		**411,250**	**(164)**	**244,385**	
Licensed diversions from unregulated streams 2009–10		*45,753*		*14,285*	
Licensed diversions from unregulated streams 2008–09		*45,291*		*15,200*	

Notes:

(1) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(2) Compliance for the entire Melbourne supply system is assessed against a long-term (15-year) average volume limit of 555,000 ML. The corresponding long-term average annual diversions for 2009–10 was 428,900 ML.

(3) The Yarra Environmental Entitlement was subject to a qualification of rights in 2009–10, refer Section 24.9.

24.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Yarra basin, excluding domestic and stock use, is presented in Table 24-7.

The Yarra basin contains the whole Wandin Yallock WSPA as well as part of the Kinglake GMA and Moorabbin GMA. Groundwater levels in the Wandin Yallock WSPA had a declining trend in 2009–10. Insufficient observation bores are available to determine trends in the Kinglake and Moorabbin GMAs. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Reported groundwater use in the Yarra basin decreased in 2009–10 compared with 2008–09, due to reduced extractions in the Kinglake GMA and Wandin Yallock WSPA.

Table 24-7 Licensed groundwater volumes, Yarra basin 2009–10

WSPA/GMA[(1)]	GMA/WSPA depth limits[(2)] (m)	Entitlement limit (ML/year)[(3)]	Licensed entitlement[(4)] (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10 [(5)]	Total licensed groundwater use (ML) 2008–09
Kinglake GMA (19%)	All depths	379	351	38	-	38	260
Moorabbin GMA (39%)	All depths	1,040	1,007	464	-	464	455
Wandin Yallock WSPA (100%)	All depths	2,924	2,936	377	-	377	600
Total[(5)]		**4,344**	**4,294**	**878**	**-**	**878**	**1,316**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used. The PCV for Wandin Yallock is currently under review. The licensed entitlement is greater than PCV.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 24-8. Groundwater is not used to augment urban supplies in the Yarra basin.

Table 24-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores[(1)(2)]	Estimated domestic and stock use (assuming 2 ML per bore) (ML)[(3)]
Kinglake GMA (19%)	60	120
Moorabbin GMA (39%)	161	322
Wandin Yallock WSPA (100%)	107	214
Total	**328**	**656**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 24-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

24.8 Drought contingency measures

A number of drought contingency measures were implemented in the Yarra basin in 2009–10. These include:

- restricting urban and rural water use (discussed in section 24.9 below)
- temporary qualification of rights as detailed in Table 24-9.

24.9 Qualification of rights

One qualification carried into 2009–10 in response to the ongoing water shortage in Melbourne.

The qualification provided Melbourne with up to 37,000 ML of extra water per year by delaying the introduction of the Yarra Environmental Entitlement and reducing passing flows at a number of sites along the river and its tributaries.

On 10 March 2010, the Minister for Water remade the qualification after declaring that a water shortage still existed for Melbourne. This new qualification imposed the same provisions as its predecessor.

In April, the Government returned 7,000 ML per year to the environment following good spring rainfall and water saving efforts.

According to the Melbourne retail water business' annual report on the effectiveness of the Melbourne qualifications, the Yarra qualifications retained 35,000 ML in storage for Melbourne in 2009–10. This is equivalent to one month's water supply.

The environmental risks were managed by Melbourne Water in line with a water quality monitoring program and the Yarra River Environmental Emergency Contingency Plan. No additional environmental impacts were found to have occurred in the Yarra River as a result of the qualifications.

Table 24-9 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights in the Melbourne Water Supply System - Yarra October 2007	1 July 2009 to 10 March 2010 (continuing from 20 October 2007)	Differential access by priority entitlements Reduced passing-flow requirements	Delayed the introduction of the new environmental flow regime for the Yarra River to retain water in storages for supply to Melbourne and further reduced environmental flows by up to 10,000 ML per year	Expiry of declaration of water shortage in the Melbourne supply system	10 March 2010, following new declaration of water shortage in Melbourne system
Temporary Qualification of Rights in the Melbourne Water Supply System - Yarra 2010	10 March 2010 to 30 June 2010	Differential access by priority entitlements Reduced passing-flow requirements	Delayed the introduction of the new environmental flow regime for the Yarra River to retain water in storages for supply to Melbourne and further reduced environmental flows by up to 10,000 ML per year	When Melbourne is no longer subject to restrictions greater than Stage 2	

24.10 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions on unregulated streams are shown in Table 24-10.

Melbourne residents were subject to Stage 3a restrictions until they were eased to Stage 3 in March 2010. Licensed diverters on many of the Yarra basin's unregulated rivers were again banned or restricted in some form during the year, particularly over summer.

Groundwater use was unrestricted in the Yarra basin during 2009–10.

Table 24-10 Seasonal allocations and restrictions on water use in Yarra basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Yarra Valley Water, South East Water and City West Water customers	Stage 3a restrictions from July 2009 to March 2010, Stage 3 restrictions from April to June 2010. These restrictions were also supported by the Target 155 campaign.
Licensed diversions from unregulated streams	Darebin Creek	Irrigation ban in October 2009 and February 2010
	Diamond Creek	Irrigation ban in July 2009, and from January to March 2010
	Hoddles Creek	Irrigation ban from July 2009 to June 2010
	Yarra River (lower)	Restrictions from October 2009 to February 2010
	Yarra River (upper)	Restrictions from December 2009 to January 2010 and in March 2010,
	Little Yarra River	Restrictions in July, November and December 2009; Irrigation bans January to March 2010, and Restrictions in May 2010
	Don River	Irrigation ban from January to March 2010
	Pauls Creek	Irrigation ban from July 2009 to June 2010
	Plenty River	Irrigation ban from July to August 2009, in October 2009 and from December 2009 to March 2010
	Steels/Dixons Creek	Irrigation ban from October 2009 to June 2010
	Wandin Yallock Creek	Irrigation ban from July to August 2009, in October 2009 and from December 2009 to February 2010
	Woori Yallock Creek	Irrigation ban in July 2009, and from January to March 2010; restrictions in August 2009
	Mullum Mullum Creek	Irrigation ban in October 2009 and from January to February 2010
	Olinda Creek	Irrigation ban from January to February 2010
	Moonee Ponds Creek	Irrigation ban from December 2009 to February 2010
	Arundel Creek	Irrigation ban from December 2009 to February 2010
	Gardiners Creek	Irrigation ban in October 2009 and from January to February 2010

24.11 Recycled water

Yarra Valley Water operates eight wastewater treatment plants within the Yarra basin. A summary of the volume of recycled water is provided below in Table 24-11.

Wastewater was reused at five of the plants in 2009–10. Compared with 2008–09, the volume of wastewater entering the treatment plants and the volume of recycled water increased in 2009–10. Overall, 7% of wastewater was reused in the basin, which is an increase from the percentage recycled in 2008–09 (5%).

Table 24-11 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Aurora	339	249	33%	112	-	-	137	91	-
Brushy Creek	4,136	834	1%	43	-	-	791	3,302	-
Craigieburn	865	250	11%	95	-	-	155	615	-
Healesville	324	93	0%	-	-	-	93	231	-
Lilydale	2,380	537	0%	9	-	-	528	1,842	-
Monbulk	19	-	0%	-	-	-	-	19	-
Upper Yarra	815	196	0%	-	-	-	196	619	-
Wallan	455	335	74%	86	249	-	-	120	-
Whittlesea	225	146	54%	121	-	-	25	79	-
Total 2009–10	**9,557**	**2,639**	**7%**	**467**	**249**	**-**	**1,923**	**6,918**	**-**
Total 2008–09	**9,011**	**2,252**	**5%**	**302**	**157**	**-**	**1,792**	**6,760**	**0**

Notes:
(1) Volume used to deliver specific environmental flow benefits.
(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percent recycled, consistent with its treatment in the ESC's performance report.
(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

24.12 Water for the environment

24.12.1 Environmental Water Reserve (EWR)

Important environmental assets, such as the Australian Grayling, River Blackfish, Macquarie Perch and numerous billabongs and wetlands depend on the Yarra basin EWR. The Yarra River between Warburton and Warrandyte has been identified as a Victorian Heritage River and also depends on the EWR.

In 2009–10 the Yarra basin EWR comprised:

- the Yarra River Environmental Entitlement 2006
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Melbourne Water
- water set aside for the environment through the operation of streamflow management plans including operation of licensed diversions with passing-flow conditions
- all other water in the basin not allocated for consumptive use, that is water above the cap.

24.12.2 Environmental entitlements

The Yarra River Environmental Entitlement was granted to the environment Minister in 2006. However due to the ongoing water shortage in Melbourne, rights to water under this entitlement have been qualified since this time. The qualification withheld 17,000 GL of the entitlement in storage and passing flows were reduced to secure Melbourne's water supplies. An emergency contingency plan is in place to manage the environmental risks associated with the qualification.

In April, the government returned 7,000 ML per year to the environment following good spring rainfall and water saving efforts. As part of this, 401 ML of water was released down the Yarra River to increase passing flows. However, this was not considered as an allocation to the Yarra River Environmental Entitlement as the temporary qualification of rights remained in place.

24.12.3 Passing-flow compliance

Bulk entitlements require passing flows to be met at a number of points in the basin. There were reduced passing-flow requirements on the Yarra River during the 2009–10 year under the qualification of rights discussed in Section 24.9. Melbourne Water reported that is met all passing-flow requirements in the Yarra basin for 2009–10.

Table 24-12 shows a number of passing-flow requirements in the Yarra basin for selected compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. The location of these compliance points is presented in Figure 24-2.

Table 24-12 Selected passing-flow compliance in the Yarra basin at selected sites

River	Passing flow	
Yarra River	Instrument where passing flows are specified	Yarra River Environmental Entitlement 2006
	Responsible authority	Melbourne Water
	Compliance point	Upper Yarra Reservoir to Yarra River: Upper Yarra Dam (shown as 1 in Figure 24-2)
	Passing-flow compliance	• Passing-flow requirements were qualified during 2009–10 with Melbourne Water meeting the qualified requirements • Flows of 10 ML per day were passed downstream of Upper Yarra Reservoir
	Compliance point	Yering Gorge Pump Station (shown as 2 in Figure 24-2)
	Passing-flow compliance	• Passing-flow requirements were qualified during 2009–10, with Melbourne Water meeting the qualified requirements • Flows of 150 ML per day were passed downstream of Yering Gorge Pump Station

24.12.4 Streamflow management plans

The following streamflow management plans (SFMPs) are approved and were in operation in 2009–10:

- Diamond Creek SFMP
- Hoddles Creek SFMP
- Olinda Creek SFMP
- Plenty River SFMP
- Stringybark Creek SFMP
- Pauls, Steels and Dixons Creeks SFMP.

Development of the Woori Yallock WSPA SFMP and the Little Yarra and Don WSPA continued during 2009–10.

25 Maribyrnong basin

This chapter sets out the accounts for the Maribyrnong basin. For detailed information about how they have been compiled, refer to Chapter 5.

25.1 Maribyrnong basin summary

Once again, the Maribyrnong basin received rainfall, but inflows were extremely below average at just 21% of the long-term average.

Consequently, Rosslynne Reservoir remained effectively empty at less than 5% of total capacity and the qualification of rights retaining environmental passing flows in storage for emergency supplies continued.

Western Water again relied entirely on the Melbourne supply system to supply customers in the Maribyrnong basin throughout the year.

There was no allocation for licensed diverters on the regulated Maribyrnong River again in 2009–10.

The volume of licensed diversions from unregulated rivers was again extremely low as most users were subject to lengthy periods of ban. Licensed groundwater use in the basin was also lower than in 2008–09.

25.2 Responsibilities for management of water resources

Table 25-1 shows the responsibilities of various authorities within the Maribyrnong basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 25-1 Responsibilities for water resources management within the Maribyrnong basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Melbourne Water		Manages surface water licensed diversions in the lower Maribyrnong basin below the confluence with Deep Creek and the Maribyrnong River	Provides bulk water supplies to City West Water and Western Water (from Yarra/Thomson system)	Manages waterways, drainage and floodplains in part of the Maribyrnong basin
City West Water			Supplies part of metropolitan Melbourne area(1)	
Western Water			Supplies towns in the basin located outside metropolitan Melbourne	Operates Macedon reservoirs Obliged to meet passing-flow requirements
Southern Rural Water		Manages surface water licensed diversions in the upper Maribyrnong basin and groundwater licensed diversions in the whole of the basin		Operates Rosslynne Reservoir Obliged to meet passing-flow requirements

Notes:

(1) Melbourne is mostly supplied from the Yarra and Thomson basins.

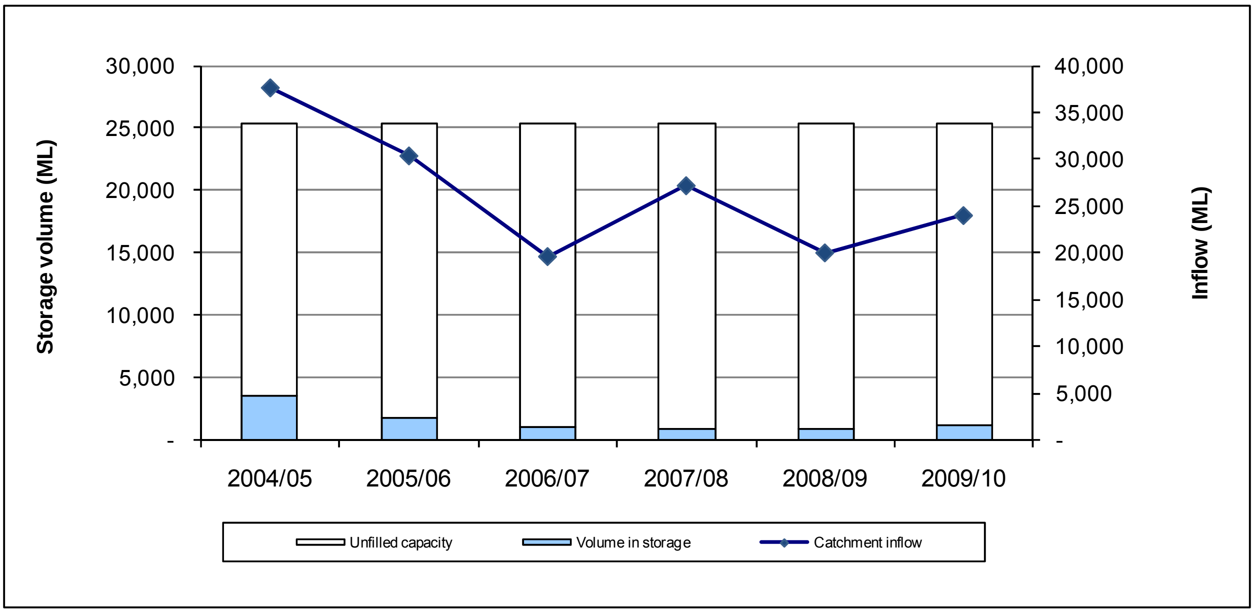
25.3 Rainfall, flows and storages in 2009–10

Most of the Maribyrnong basin experienced rainfall between 80% and 125% of the long-term average in 2009–10.

Basin inflows were again extremely low in 2009–10 at just 21% of the long-term average of 113,000 ML. This was similar to the volume recorded over the last four years. The amount of water flowing into Port Phillip Bay in 2009–10 was 9,100 ML, compared with 4,000 ML in 2008–09. This represents 38% of the catchment inflows into the basin.

Rosslynne Reservoir, with a capacity of 25,368 ML, is the only storage greater than 1,000 ML located within the basin. The storage volume increased from 800 ML in July 2009 to 1,200 ML (5% of capacity) by June 2010.

Figure 25-1 All major storages and catchment inflows in the Maribyrnong basin



25.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Maribyrnong basin are shown in Table 25-2.

An overview of the methodology used to derive the information presented in this chapter is set out in Chapter 5.

Table 25-2 Summary of total water resources and water use in the Maribyrnong basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	25,400	9,600
Groundwater(2)	1,700	500
Recycled water	2,800	1,900

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 25-6 and the estimated domestic and stock use presented in Table 25-7.

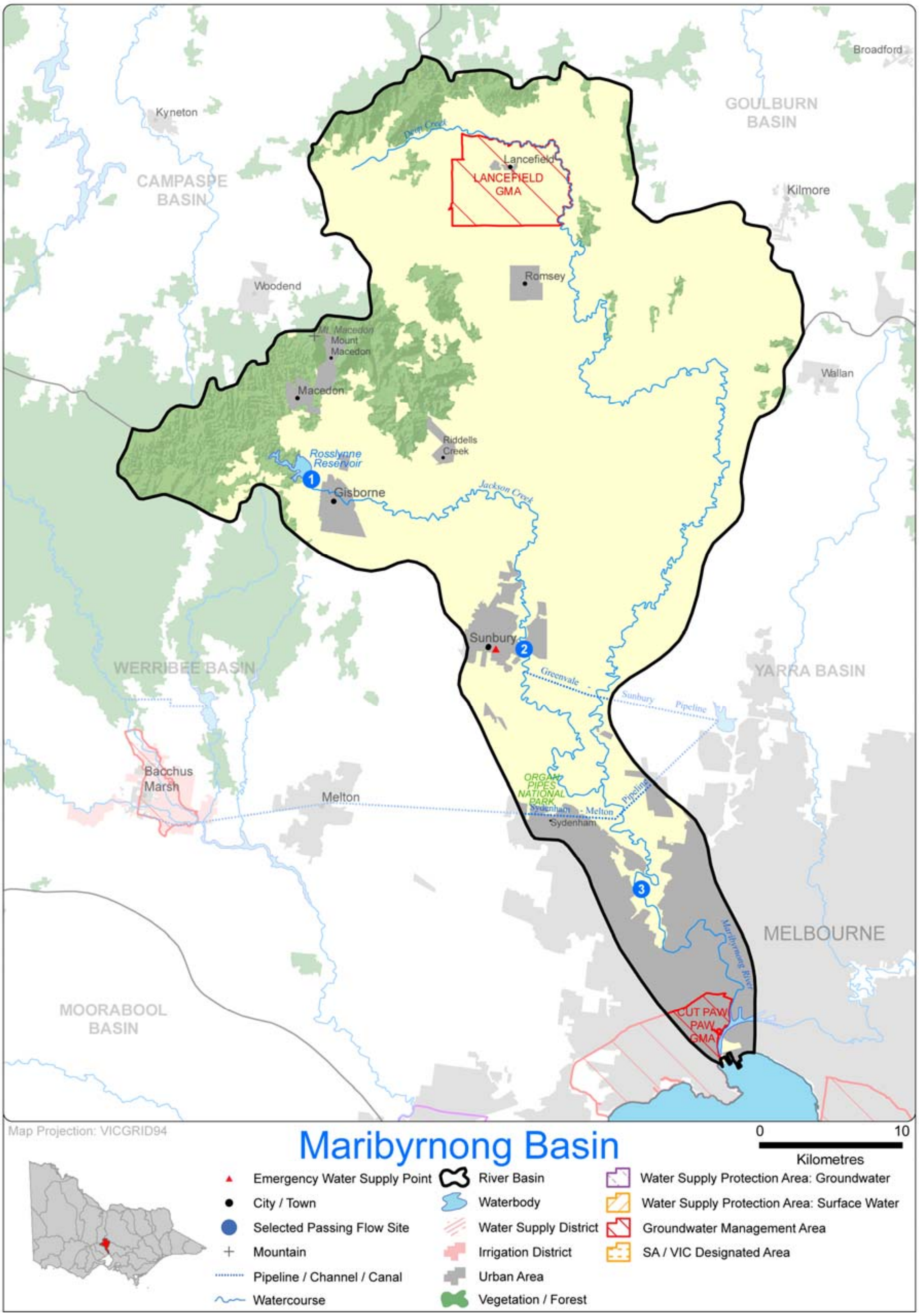
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

25.4.1 Infrastructure projects to improve water availability

No major infrastructure projects were undertaken in the Maribyrnong basin during 2009–10.

25.5 Location of water resources

Figure 25-2 Map of the Maribyrnong basin



25.6 Surface water resources

25.6.1 Water balance

A surface-water balance for the Maribyrnong basin is shown in Table 25-3.

Urban areas within the Maribyrnong basin do not rely heavily on the water resources of the basin. The area of the basin within the Melbourne metropolitan area receives its water supply from the Melbourne headworks system located in the Yarra, Thomson and Bunyip basins. Because the basin's local sources of water (for example Rosslynne Reservoir) have not received high inflows in recent years, Western Water relied almost totally on sourcing water under its Yarra River bulk entitlement. This volume is reported in the Yarra basin chapter. Small catchment dams were estimated to be the largest diversion of water in the Maribyrnong basin in 2009–10.

Table 25-3 Balance of surface water in the Maribyrnong basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	800	900
Volume in storage at end of year	1,200	800
Change in storage	**400**	**-100**
Inflows		
Catchment inflow(1)	24,000	20,000
Rainfall on major storages	400	n/a(3)
Transfers from other basins(2)	0	220
Return flow from irrigation	0	0
Treated wastewater discharged back to river	1,020	720
Sub-total	**25,400**	**20,900**
Usage		
Urban diversions	1,100	560
Licensed diversions from regulated streams	300	200
Licensed diversions from unregulated streams	400	400
Small catchment dams(4)	7,800	5,600
Sub-total	**9,600**	**6,800**
Losses		
Evaporation losses from major storages	300	300(3)
Evaporation from small catchment dams(4)	4,800	6,500
In-stream infiltration to groundwater, flows to floodplain and evaporation(5)	1,200	3,400
Sub-total	**6,300**	**10,200**
Water passed at outlet of basin		
River outflows to Port Phillip Bay	9,100	4,000

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Transfers from the Melbourne system to Rosslynne Reservoir to maintain a buffer of emergency storage.

(3) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

(4) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(5) Losses estimated using loss functions from the Maribyrnong REALM.

n/a: Not applicable.

25.7 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 25-4 are based on the estimates from the Department of Sustainability and Environment as per Chapter 5.

Table 25-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	5,800	2,900	n/a
Registered commercial and irrigation	5,800	4,900	n/a
Total	**11,600**	**7,800**	**12,600**

n/a: Information not available.

25.7.1 Water entitlement transfers

For the third consecutive year there were no transfers of water entitlements within the basin or across basin boundaries.

25.7.2 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 25-5. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. For multi-year entitlements, compliance is assessed based on the total volume of water diverted over the term of the entitlement. Therefore it is possible that the volume diverted in any given year may exceed the average bulk entitlement volume.

Similar to the past two years, almost no water was taken for irrigation from the regulated part of the Maribyrnong River during the year. Western Water sourced the majority of its water from its Yarra bulk entitlement which is reported in the Yarra Basin. Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 25-5 Volume of water diverted under surface water entitlements in the Maribyrnong basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance? (2)
Western Water					
Gisborne – Barringo Creek	1	320	-	1	Yes
Lancefield	1	315	-	58	Yes
Macedon and Mt Macedon(3)	1	645	-	363	Yes
Riddells Creek	1	300	-	35	Yes
Romsey	1	460	-	287	Yes
Maribyrnong (Rosslynne Reservoir)	1	6,100	-	356	Yes
Melbourne Water					
Maribyrnong	5	1,396	-	263	Yes
Southern Rural Water					
Maribyrnong	1	382	-	-	Yes
Total annual volume of bulk entitlements 2009–10		**9,918**	**-**	**1,363**	
Total annual volume of bulk entitlements 2008–09		**9,918**	**-**	**737**	
Licensed diversions from unregulated streams 2009–10		*1,795*		*427*	
Licensed diversions from unregulated streams 2008–09		*1,905*		*359*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(3) Average bulk entitlement is 645 ML per year, but up to 873 ML can be diverted in any one year.

25.8 Groundwater resources

The Maribyrnong basin contains the whole Lancefield GMA and part of the Cut Paw Paw GMA. Licensed groundwater entitlements and use for these GMAs in the Maribyrnong basin, excluding domestic and stock use, are presented in Table 25-6. Groundwater levels in the Lancefield GMA are declining, however insufficient observation bores are available to determine a trend for the Cut Paw Paw GMA. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Reported groundwater use in the Maribyrnong basin decreased in 2009–10 compared with 2008–09. This is largely as a result of decreased extractions from the Lancefield GMA during 2009–10.

Table 25-6 Licensed groundwater volumes, Maribyrnong basin 2009–10

WSPA/GMA(1)	GMA/WSPA depth limits(2) (m)	Entitlement limit (ML/year)(3)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Cut Paw Paw GMA (23%)	>50	848	124	6	-	6	16
Lancefield GMA (100%)	All depths	1,485	1,390	293	-	293	431
Total(5)		**2,333**	**1,514**	**299**	**-**	**299**	**447**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 25-7.

Table 25-7 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Cut Paw Paw GMA (23%)	9	18
Lancefield GMA (100%)	83	166
Total	**92**	**184**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 25-6.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Within the Maribyrnong basin, groundwater is used as an urban water supply for the township of Lancefield. The licensed entitlements and metered use for this supply are provided in Table 25-8.

Table 25-8 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Lancefield	585	111	133

25.9 Drought contingency measures

A number of drought contingency measures were implemented in the Maribyrnong basin in 2009–10. These include:

- restricting urban and rural water use (discussed below)
- temporary qualification of rights as detailed in Table 25-9.

25.10 Qualification of rights

The water shortage in the Maribyrnong basin continued into 2009–10. At 1 July 2009, Rosslynne Reservoir was at 3.1% of capacity, or 734 ML.

The qualification reduced passing flows below Rosslynne Reservoir to maintain water in storage for emergency supplies to towns such as Gisborne, Macedon, Riddells Creek and Sunbury, and for any potential environmental emergencies in Jacksons Creek and Maribyrnong River. Without the qualification, there was a significant risk that Rosslynne Reservoir would be emptied to meet passing-flows requirements.

To manage emergency environmental releases from Rosslynne Reservoir, Southern Rural Water, Melbourne Water and Western Water executed the Maribyrnong Environmental Emergency Contingency Plan and Monitoring Program (MEECP). Releases in 2009–10 targeted specific river water quality parameters at Settlement Road, Salesian College and at Gisborne Botanical Gardens in line with the MEECP. No water was released for irrigation or diverted for emergency urban supplies.

The qualification expired on 30 June 2010. The Minister for Water subsequently approved an amendment to Southern Rural Water's Maribyrnong bulk entitlement formalising the low flow sharing arrangements implemented through the qualification.

Table 25-9 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights to water in the Maribyrnong River 2008	1 July 2009 to 30 June 2010 (continuing from 1 December 2008)	Reduced passing-flow requirements Differential access by priority entitlements	Reduces passing-flow obligations to maintain levels in Rosslynne Reservoir for emergency supplies.	Rosslynne Reservoir fills above 2,500 ML, or expiry date: 30 June 2010.	30 June 2010

25.11 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions are shown in Table 25-10.

Melbourne residents were subject to Stage 3a restrictions until they were eased to Stage 3 in March 2010. With the exception of Lancefield, which remained on Stage 3 restrictions all year, towns supplied by Western Water were also placed on Stage 3a restrictions for most of 2009–10.

Licensed diverters on the regulated Maribyrnong River and Jacksons Creek again received no allocation, while bans were also in place across a number of major tributaries throughout the year.

Groundwater use was unrestricted in the Maribyrnong basin during 2009–10.

Table 25-10 Seasonal allocations and restrictions on water use in Maribyrnong basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	City West Water customers	Stage 3a restrictions from July 2009 to March 2010, Stage 3 restrictions from April to June 2010. These restrictions were also supported by the Target 155 L campaign
	Rosslynne supply system towns including Sunbury, Bulla, Romsey, Macedon, Mt Macedon, Riddells Creek and Gisborne	Stage 3a restrictions from July 2009 to May 2010, Stage 3 restrictions in June 2010
	Lancefield	Stage 3a restrictions from July 2009 to May 2010, Stage 3 restrictions in June 2010
Licensed diversions from unregulated streams	Barringo Creek, Bolinda Creek, Riddells Creek, Witch Creek, Jacksons Creek	Irrigation ban from July 2009 to June 2010
	Maribyrnong River	Irrigation ban on winter fill licences from April to June 2010; Irrigation ban from July to August 2009 and from October 2009 to March 2010
Regulated diversions (Southern Rural Water)	Jacksons Creek	0% allocation for the whole of 2009–10
Regulated diversions (Melbourne Water)	Maribyrnong River	0% allocation for the whole of 2009–10

25.12 Recycled water

All wastewater treatment plants within the basin are operated by Western Water. Overall, 45% of the wastewater was reused in 2009–10, a decrease of 10% on the proportion reused in 2008–09. There was an increase in the volume of water produced and recycled in 2009–10 compared to 2008–09.

Table 25-11 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Gisborne	506	291	13%	68	-	-	223	215	-
Riddells Creek	161	271	100%	-	161	-	110	-	(110)
Romsey	331	331	100%	53	278	-	-	-	-
Sunbury	1,805	1,004	40%	349	366	-	289	806	(5)
Total 2009–10	**2,803**	**1,897**	**45%**	**470**	**805**	**-**	**622**	**1,021**	**(115)**
Total 2008–09	**2,480**	**1,755**	**55%**	**672**	**694**	**-**	**389**	**715**	**9**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percent recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

25.13 Water for the environment

25.13.1 Environmental Water Reserve (EWR)

Important environmental assets such as the Australian Grayling and native grassland are dependent on the Maribyrnong EWR.

In 2009–10 the Maribyrnong basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Western Water and Southern Rural Water
- water set aside for the environment through the operation of licensed diversions with passing-flow conditions (regulated and unregulated waterways)
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

25.13.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin. All passing-flow requirements were met by all authorities in the Maribyrnong basin during 2009–10.

Table 25-12 shows the passing-flow requirements in the Maribyrnong basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest.

Table 25-12 Selected passing-flow requirements in the Maribyrnong basin

River	Passing flow	
Maribyrnong River, Jacksons Creek	Instrument where passing flows are specified	Bulk Entitlement (Maribyrnong – Southern Rural Water) Conversion Order 2000, amended 2004
	Responsible authority	Southern Rural Water
	Compliance point	Gisborne gauging station (shown as 1 in Figure 25-2)
	Passing-flow compliance	The lesser of 3 ML per day or natural flow was passed
	Compliance point	Sunbury gauging station (shown as 2 in Figure 25-2)
	Passing-flow compliance	The lesser of 10 ML per day or natural flow was passed
	Compliance point	Keilor gauging station (shown as 3 in Figure 25-2)
	Passing-flow compliance	The lesser of 5 ML per day or natural flow was passed

25.13.3 Streamflow management plans (SFMPs)

No further work was undertaken in preparation for the development of an SFMP for the upper Maribyrnong River. Instead, the need for a SFMP in the Maribyrnong River will be reviewed as part of the Central Region Sustainable Water Strategy Review.

26 Werribee basin

This chapter sets out the accounts for the Werribee basin. For detailed information about how they have been compiled, refer to Chapter 5.

26.1 Werribee basin summary

Despite average rainfall in 2009–10, inflows in the Werribee basin again were extremely low for the fifth year in a row.

Users within the Werribee basin were again severely restricted. Irrigators in the Bacchus Marsh and Werribee irrigation districts received only a 14% allocation, while Western Water relied completely on Melbourne's supplies to supply its towns, such as Melton and Bacchus Marsh. These towns were subject to Stage 3a restrictions, until May 2010 when restrictions were reduced to Stage 3 in line with Melbourne. Towns supplied by Central Highlands Water were subject to severe Stage 3 and 4 restrictions for the whole year.

In the Werribee irrigation district, rural customers continued to rely heavily on the Werribee Recycled Water Scheme, while Southern Rural Water again implemented a number of drought contingency measures to help supplement rural supplies in the Bacchus Marsh irrigation district. This included pumping dead storage from Pykes Creek reservoir and continuing to access unallocated water in Lake Merrimu through a qualification of rights. Southern Rural Water also delivered 524 ML to the Bacchus Marsh irrigation district from its drought reserve stored in the Thomson Reservoir.

Entitlements in the Deutgam Water Supply Protection Area were qualified during the year, restricting groundwater access around Werribee. Licensed diverters on the Lerderderg River and Kororoit Creek were banned the entire year.

26.2 Responsibilities for management of water resources

Table 26-1 shows the responsibilities of various authorities within the Werribee basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 26-1 Responsibilities for water resources management within the Werribee basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages Werribee and Bacchus Marsh irrigation districts	Manages groundwater and surface water licensed diversions		Operates Pykes Creek Reservoir, Melton Reservoir and Merrimu Reservoir Obliged to meet passing-flow requirements
Western Water			Supplies towns in the north of the basin including Melton and Bacchus Marsh	Operates Djerriwarrh Reservoir Obliged to meet passing-flow requirements
Melbourne Water		Manages surface water licensed diversions for lower reaches of Kororoit Creek	Provides bulk water to City West Water and Western Water from the Thomson–Yarra system Operates the Western Treatment Plant and supplies recycled water to Southern Rural Water	Manages waterways, drainage and floodplains in all of the Werribee basin
City West Water			Supplies towns and manages wastewater in metropolitan Melbourne	
Central Highlands Water			Supplies Blackwood and Ballan	Obliged to meet passing-flow requirements

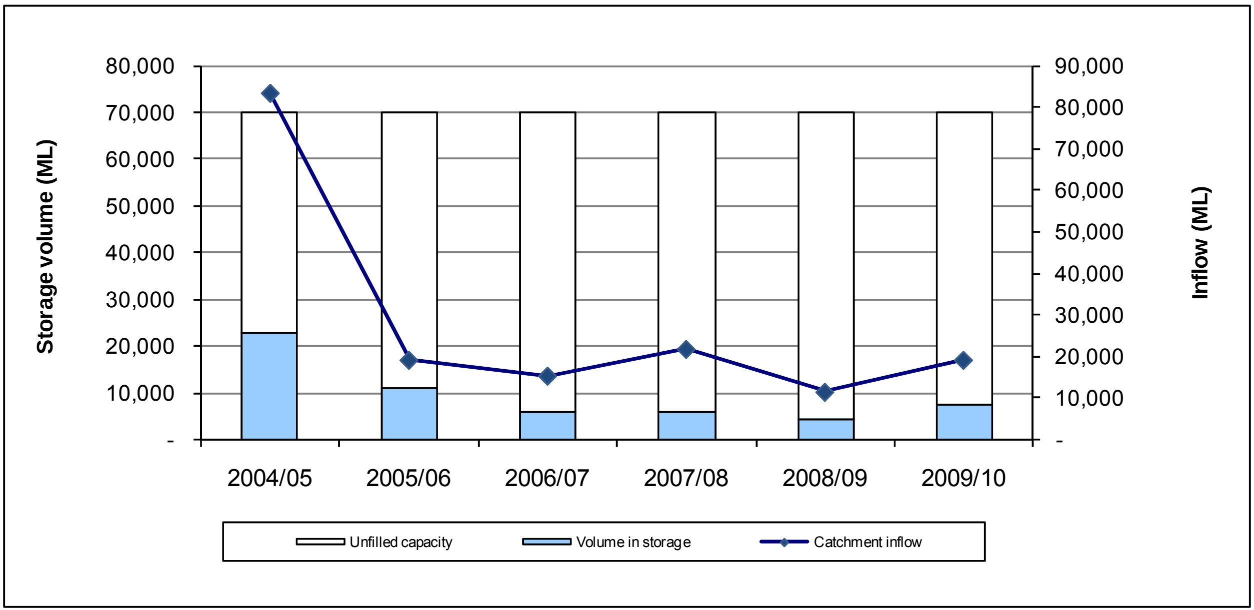
26.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Werribee basin ranged between 80% and 125% of the long-term average, however basin inflows were again extremely low at 22% of the long-term average (of 102,000 ML).

In 2009–10 600 ML of water flowed from the Werribee basin into Port Phillip Bay. This represents just 3% of the catchment inflows into the basin. About 300 ML flowed into Port Phillip Bay in 2008–09.

Storage levels for all major storages (greater than 1,000 ML capacity) in the basin increased from 4,400 ML in July 2009 to 7,500 ML (11% of capacity) by June 2010.

Figure 26-1 All major storages and catchment inflows in the Werribee basin



Only volumes for major on-stream storages have been included in the water balance. In the Werribee basin this includes the Melton, Merrimu and Pykes Creek Reservoir, as well as Djerriwarrh Reservoir.

26.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Werribee basin are shown in Table 26-2.

Table 26-2 Summary of total water resources and water use, Werribee basin, 2008–09

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	24,700	11,100
Groundwater(2)	6,100	300
Recycled water	156,970	58,810

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 26-8 and Table 26-9.

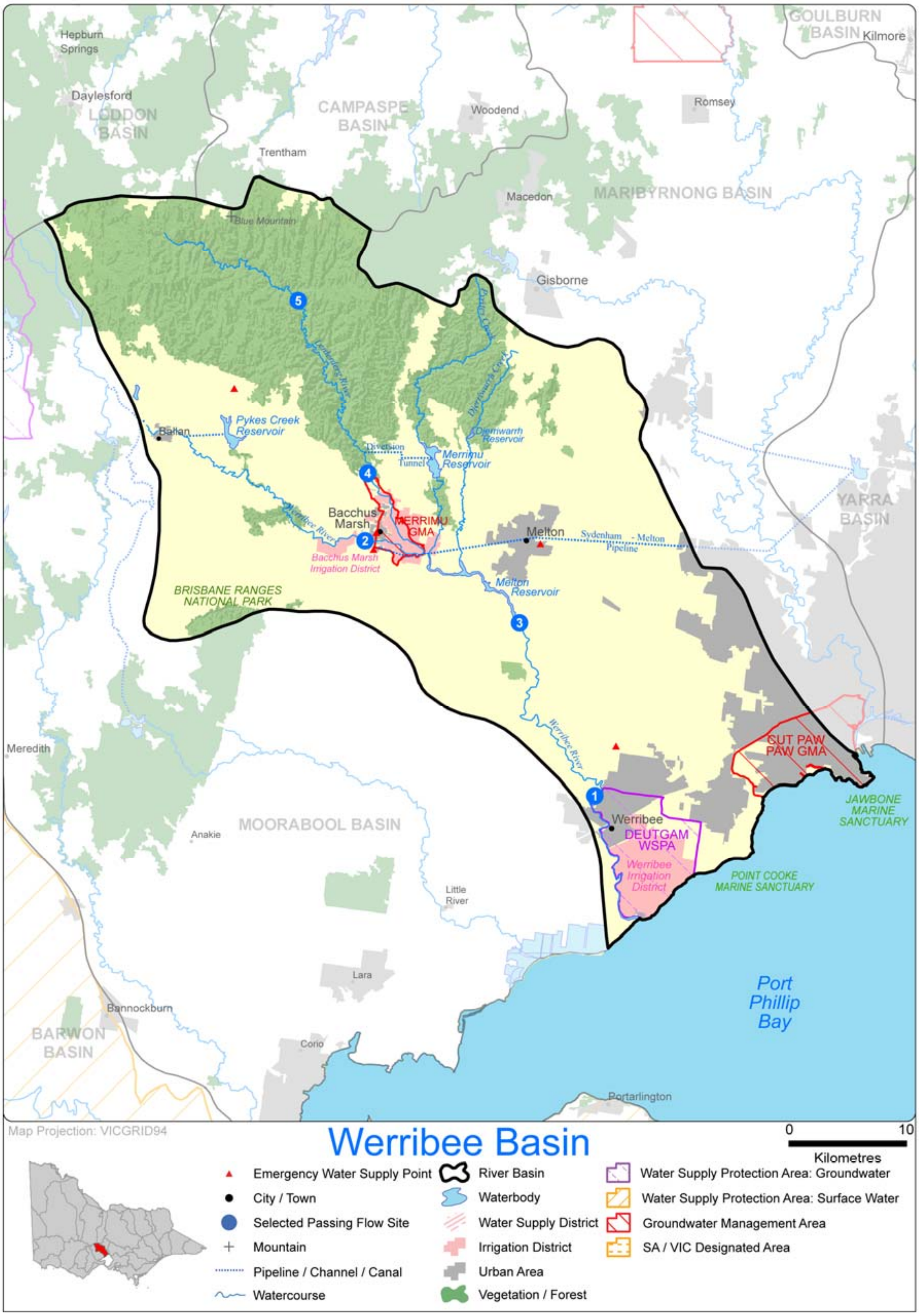
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

26.4.1 Infrastructure projects to improve water availability

There were no major infrastructure projects to improve water availability completed during 2009–10.

26.5 Location of water resources

Figure 26-2 Map of the Werribee basin



26.6 Surface water resources

26.6.1 Water balance

A surface-water balance for the Werribee basin is shown in Table 26-3. Note that only those on-stream storages greater than 1,000 ML capacity and the Djerriwarrh Reservoir have been included in the water balance. In the Werribee basin, storages that are greater than 1,000 ML include Melton Reservoir, Merrimu Reservoir and Pykes Creek Reservoir.

Table 26-3 Balance of surface water in the Werribee basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	4,400	6,000
Volume in storage at end of year	7,500	4,400
Change in storage	**3,100**	**-1,600**
Inflows		
Catchment inflow(1)	22,300	14,500
Rainfall on major storages	1,700	n/a(4)
Transfers from other basins(2)	737	0
Return flow from irrigation	0	100
Treated wastewater discharged back to river	0	0
Sub-total	**24,700**	**14,600**
Usage		
Urban diversions	320	130
Irrigation district diversions (6)	1,200	400
Licensed diversions from unregulated streams	300	200
Small catchment dams(3)	9,300	4,900
Sub-total	**11,100**	**5,600**
Losses		
Evaporation losses from major storages	700	1,200 (4)
Evaporation from small catchment dams(3)	5,400	2,500
In-stream infiltration to groundwater, flows to floodplain and evaporation(5)	3,800	3,600
Sub-total	**9,900**	**7,300**
Water passed at outlet of basin		
River outflows to Port Phillip Bay	600	300

Notes:

(1) Inflows have been calculated from outflows plus diversions.

(2) Qualification of rights approved transfer of water to the Werribee and Bacchus Marsh Irrigation districts under Southern Rural Water's Irrigation Districts Diversion Bulk Entitlement.

(3) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

(5) Losses estimated using loss functions from the Werribee REALM.

(6) This value was reported incorrectly for 2008–09 in those accounts and has been updated.

n/a: Not applicable.

26.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 26-4 below have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 26-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	5,900	2,900	n/a
Registered commercial and irrigation	7,600	6,400	n/a
Total	**13,500**	**9,300**	**14,700**

n/a: Information not available.

26.6.3 Water entitlement transfers

Surface water was moved within the Werribee basin during 2009–10 through water share transfers and variations and allocation trade. There was no temporary or permanent trade of bundled entitlements within the basin in this year. There was no net movement of water into the Werribee basin during 2009–10.

Table 26-5 summarises the movement of water shares into and out of the Werribee basin delivery systems during 2009–10.

Table 26-5 Transfers and variations of water shares in the Werribee basin 2009–10 (1), (2)

Delivery System	High-reliability water shares			Low- and spill-reliability water shares		
	Bought (ML)	Sold (ML)	Net transfer to basin (ML)	Bought (ML)	Sold (ML)	Net transfer to basin (ML)
Bacchus Marsh irrigation district	451	451	0	212	212	0
Werribee irrigation district	292	292	0	144	144	0
Werribee River	0	0	0	0	0	0
Total 2009–10	**742**	**742**	**0**	**356**	**356**	**0**
Total 2008–09	274	274	0	93	93	0

Notes:

(1) This table summarises all recorded water share transfers and variations in the Werribee basin delivery systems during 2009–10. Trades that were in progress at the end of the year will be finalised in 2010–11.

(2) Transfer applications result in a change of ownership. In some cases the ownership occurs with a transfer of land. Transfers of ownership that are part of a water and land sale are also included in this table.

Table 26-6 summarises the trade of allocation in Victoria's share of the Werribee basin during 2009–10. The only trade in allocation that occurred in this year was within the Werribee basin.

Table 26-6 Allocation Trade in the Werribee basin (1), (2)

Allocation trade type	Volume traded 2009–10 (ML)	Volume traded 2008–09 (ML)
Trade within Werribee basin	68	53
Trade from other Victorian basins	0	0
Trade to other Victorian basins	0	0
Interstate trade – inbound	0	0
Interstate trade – outbound	0	0
Total trade in the Werribee basin	68	53
Net trade into the Werribee basin	0	0

Notes:

(1) This table summarises allocation trades approved into, out of and within the Victorian Werribee basin trading zones (Zone 31AD Bacchus Marsh District, Zone 31 BR Lower Werribee Diverters and Zone 31 BD Werribee District) compared with trade in other Victorian and interstate basins. Data on allocation trade between New South Wales and South Australian basins is not relevant to this report and therefore not included.

(2) This table includes trades into and out of the trading pool. This means that when someone sold 10 ML of allocation to the pool, and another person bought that 10 ML from the pool, it is reported as a total of 20 ML traded.

26.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 26-7. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 26-7 Volume of water diverted under surface water entitlements in the Werribee basin

Bulk entitlement	Bulk entitlement period (years)	Average bulk entitlement over period (ML per year)[1]	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
Central Highlands Water					
Ballan	1	451	-	-	Yes
Blackwood and Barry's Reef	1	140	-	43	Yes
Western Water					
Myrniong	1	58	-	32	Yes
Werribee system – Western Water	1	9,986[2]	-	250	Yes
Southern Rural Water					
Werribee system – Irrigation	1	27,040	-	1,157	Yes
Total annual volume of bulk entitlements 2009–10		**37,675**	**-**	**1,482**	
Total annual volume of bulk entitlements 2008–09		**36,189**	**-**	**566**	
Licensed diversions from unregulated streams 2009–10		*1,244*		*282*	
Licensed diversions from unregulated streams 2008–09		*1,221*		*224*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) Previous editions of the Victorian Water Accounts reported this volume as 8,500 ML. The figure has been revised to incorporate Western Water's 1,486 ML entitlement from Djerriwarrh Reservoir.

26.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Werribee basin, excluding domestic and stock use, is presented in Table 26-8.

The Werribee basin contains the whole Deutgam WSPA and Merrimu GMA as well as part of the Cut Paw Paw GMA. Groundwater levels in the Deutgam WSPA and Merrimu GMA are declining. Insufficient observation bores were available to determine water levels trends for the Cut Paw Paw GMA. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Licensed groundwater use across the Werribee basin decreased by approximately of 31% in 2009–10 compared with 2008–09. The Deutgam WSPA was subject to a total use ban for 2009–10, based on the continuing threat to the quality and quantity of groundwater within the WSPA. The qualification of rights allows for exemptions of 35 ML in the Deutgam WSPA, in addition to a dewatering licence of 52 ML.

Table 26-8 Licensed groundwater volumes, Werribee basin 2009–10

WSPA/GMA(1)	GMA/WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Cut Paw Paw GMA (77%)	>50	2,802	411	19	-	19	52
Merrimu GMA (100%)	≤30	451	451	217	-	217	266
Deutgam WSPA (100%)	≤30	87	5,100	15	-	15	49
Total(5)		**3,340**	**5,962**	**251**	**-**	**251**	**366**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used. The Deutgam WSPA was subject to a total use ban for 2009/2010. As such, the entitlement limit is represented by qualification of rights exemptions of 35 plus a dewatering licence of 52 ML.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 26-9.

Table 26-9 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Cut Paw Paw GMA (77%)	29	58
Merrimu GMA (100%)	16	32
Deutgam WSPA (100%)(4)	233	0
Total	**278**	**90**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the Table 26-8.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

(4) Rights on extractions from Deutgam WSPA qualified during 2009–10, including for domestic and stock use.

In the Werribee basin, groundwater is used as an urban water supply for the township of Blackwood. The licensed entitlements and metered use for this groundwater supply are provided in Table 28-10.

Table 26-10 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Blackwood	50	5	0

26.8 Drought contingency measures

A number of drought contingency measures were implemented in the Werribee basin in 2009–10 in response to the ongoing dry conditions. These included:

- restricting urban and rural water use (discussed below)
- continuation of temporary qualifications of rights as detailed in Table 26-11.
- pumping dead storage
- transferring entitlement
- supplementing supplies with recycled water.

In the Werribee irrigation district, rural customers continued to rely heavily on the Werribee Recycled Water Scheme, with 8,352 ML of recycled water supplied to customers. In the Bacchus Marsh irrigation district, Southern Rural Water again implemented a number of drought contingency measures to help supplement supplies including pumping up to

1,000 ML of dead storage from Pykes Creek Reservoir and continuing to access unallocated water in Lake Merrimu through a qualification of rights. Southern Rural Water also transferred 737 ML of its Thomson drought reserve into the Werribee basin, and delivered 534 ML to farmers in Bacchus Marsh. These measures enabled farming to continue in the district while allocations remained extremely low.

26.9 Qualification of rights

There were two qualifications of rights in place in the Werribee basin during 2009–10.

The qualification allowing SRW access to up to 800 ML of unallocated water in Lake Merrimu continued because seasonal allocations in the Werribee system again failed to reach 50%. However, it was ineffective in 2009–10 because Bacchus Marsh irrigators were supplied this water in previous years.

There was also a qualification of rights to groundwater in the Deutgam Water Supply Protection Area. The qualification banned groundwater extraction for irrigators and domestic and stock users in the region all year due to very low groundwater levels and the subsequent threat of saline intrusion into the aquifer. Exemptions were provided for licence holders using groundwater for chicken fogging, school grounds and underpass watering, as well as for an aquaculture facility. With the exception of underpass water, use was restricted under these licences.

Table 26-11 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Temporary Qualification of Rights in the Werribee Water System 2007	1 July 2009 to 30 June 2010 (continuing from 20 October 2007)	Access to unallocated water provided	Provides Southern Rural Water access to 800 ML of unallocated water in Lake Merrimu to maintain viability of critical businesses in the Bacchus Marsh irrigation district.	When allocations in the Werribee and Bacchus Marsh system are 50% or higher.	
Temporary Qualification of Rights in the Deutgam Water Supply Protection Area June 2009	1 July 2009 to 30 June 2010	Differential access by priority entitlements	Due to continuing risk saline intrusion, all groundwater irrigation and domestic and stock rights suspended except for 4 cases: chicken fogging, underpass dewatering, school grounds, aquaculture facility. In these cases reductions instead of suspensions, except for underpass where no change to entitlement.	Expiry date: 30 June 2010	

26.10 Seasonal allocations and restrictions on water use, diversions and extractions

Irrigation allocations and restrictions applying to urban customers, licensed diversions on unregulated streams and groundwater extractions are shown in Table 26-12.

The lack of water reserves and system recovery meant that water users within the Werribee basin were again severely restricted. Irrigators in the Bacchus Marsh and Werribee irrigation districts received only a 14% allocation.

Western Water relied completely on Melbourne’s supplies to supply its towns, such as Melton and Bacchus Marsh.

These towns were subject to Stage 3a restrictions for most of the year in line with Melbourne. Towns supplied by Central Highlands Water were also placed on severe restrictions for most of the year.

Groundwater entitlements in the Deutgam Water Supply Protection Area were qualified during the year, restricting groundwater access around Werribee.

Licensed diverters on the Lerderderg River and Kororoit Creek were banned the entire year.

Table 26-12 Seasonal allocations and restrictions on water use in Werribee basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Ballan (Ballarat supply system)	Stage 4 restrictions July to October 2009, Stage 4e restrictions November to December 2009, Stage 3 restrictions January to June 2010
	Barry's Reef and Blackwood	Stage 3 restrictions from July 2009 to June 2010
	Myrniong, Bacchus Marsh and Melton	Stage 3a restrictions from July 2009 to May 2010, Stage 3 restrictions in June 2010
	Metropolitan Melbourne	Stage 3a restrictions from July 2009 to March 2010, Stage 3 restrictions from April to June 2010
Licensed diversions from unregulated streams	Lerderderg River	Irrigation ban from July 2009 to June 2010
	Kororoit Creek	Irrigation ban from July 2009 to June 2010
Irrigation and regulated diversions	Werribee system (Werribee irrigation district and Bacchus Marsh irrigation district)	Opening allocation of 2% of high-reliability water shares in July 2009, increasing to 12% allocation by February 2010, final allocation announcement of 14% of high-reliability water shares in May 2010
Groundwater	Deutgam WSPA	Access to groundwater restricted throughout 2009–10. Exemptions apply

26.11 Recycled water

Five wastewater treatment plants operate within the Werribee basin. The volume of wastewater produced during 2009–10 was 157,970 ML, an increase of 10,285 ML compared with 2008–09. Thirty-seven per cent of wastewater was reused in 2009–10 which has decreased slightly from 2008–09. An additional 427 ML of water was treated in 2009–10 when compared with 2008–09.

The majority of water recycling in the basin occurs at Melbourne Water's Western Treatment Plant, which reused 37% of wastewater. This included 24,260 ML for on-site irrigation and environmental management and 17,199 ML for habitat management at Ramsar-listed wetlands, which represented a slight increase from 2008–09.

Table 26-13 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)					Volume discharged to the environment (ML)	Release to ocean/ other (ML)[(3)]
				To retailers	Urban and industrial	Agriculture	Beneficial allocation[(1)]	Within process[(2)]		
Altona	4,584	90	0%	-	-	-	-	90	-	4,494
Ballan	59	59	100%	-	-	59	-	-	-	-
Melton	3,644	3,644	95%	-	203	3,274	-	167	-	-
Parwan (Bacchus Marsh)	698	698	100%	-	-	698	-	-	-	-
Western Treatment Plant	147,985	54,322	37%	12,785	78	24,260	17,199	-	-	93,663
Total 2009–10	**156,970**	**58,812**	**37%**	**12,785**	**281**	**28,291**	**17,199**	**257**	**-**	**98,157**
Total 2008–09	**146,685**	**58,385**	**40%**	**13,876**	**1,058**	**26,295**	**16,825**	**330**	**-**	**88,301**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

26.12 Water for the environment

26.12.1 Environmental Water Reserve (EWR)

Important environmental assets, such as the Australian Grayling, Tupong and Red Gums, are dependent on the Werribee basin EWR.

In 2009–10 the Werribee basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Central Highlands Water, Western Water and Southern Rural Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions (regulated and unregulated waterways)
- all other water in the basin not allocated for consumptive use.

26.12.2 Passing-flow compliance

Bulk entitlements require passing flows to be met at a number of points in the basin.

Western Water reported that it met all passing-flow requirements under its bulk entitlements at all sites in the Werribee basin.

Southern Rural Water did not report any incidences of non-compliance of its passing-flow obligations.

Table 26-14 shows the passing-flow compliance in the Werribee basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest.

Table 26-14 Selected passing-flow compliance in the Werribee basin

River	Passing flow	
Werribee River and tributaries	Instrument where passing flows are specified	Bulk Entitlement (Werribee System – Irrigation) Conversion Order 1997 (amended 2005)
	Responsible authority	Southern Rural Water
	Compliance point	Upper Werribee Diversion Weir (shown as 1 in Figure 26-2)
	Passing-flow compliance	• The lesser of 5 ML per day or the natural inflow were passed downstream of the Upper Werribee diversion weir
	Compliance point	Bacchus Marsh Diversion Weir (gauging station) (shown as 2 in Figure 26-2)
	Passing-flow compliance	The following passing flow rules were applied: • the lesser of 12 ML per day continuous flow (averaged over any seven-day period) or the natural inflow, or • the sum of the lesser of at least 5 ML per day continuous flow or the natural inflow AND other intermittent flows from deliberate releases or spills. Passing-flow requirements were met during 2009–10
	Compliance point	Melton Reservoir (shown as 3 in Figure 26-2)
	Passing-flow compliance	Passing flows were based on the following rules for May–August: • the lesser of 15 ML per day continuous flow or the natural inflow if the reservoir is above target for that month, or • the lesser of 15 ML per day (averaged over any 7 day period) or the natural inflow averaged over the same period if the level is at or below the following target for that month: • targets in May, June and July are 6500 ML, target in August is 9,000 ML • if the natural flow here is less than 15 ML per day, the passing flow is to be shared between all authorities having a share of Lake Merrimu capacity and their volume of storage will be adjusted accordingly. Passing-flow requirements were met during 2009–10
	Compliance point	Below the Lerderderg Diversion Weir (shown as 4 in Figure 26-2)
	Passing-flow compliance	The storage operator had to release passing flow according to the following passing flow rules: • a low flow equal to the lesser of 30 ML per day and the natural inflow • a fresh flow during the months of June to December inclusive of: • 150 ML per day up to 5 times a year, and • 1500 ML per day for 24 hours in 3 out of 4 years if the

		instantaneous flow at this location exceeds 1500 ML per day. Passing-flow requirements were met during 2009–10.
	Compliance point	Below Werribee Diversion Weir (shown as 5 in Figure 26-2)
	Passing-flow compliance	Passing flows were determined according to the following operational tolerances: • 10 ML per day if the declared seasonal allocation for the Werribee irrigation district exceeds 130% of water right • 1 ML per day averaged over any 30 day period, if the declared seasonal allocation for the Werribee irrigation district is equal to or less than 130% of water right. Passing-flow requirements were met during 2009–10.

27 Moorabool basin

This chapter sets out the accounts for the Moorabool basin. For detailed information about how they have been compiled, refer to Chapter 5.

27.1 Moorabool basin summary

Despite close to average rainfall, catchment inflows in 2009–10 were still just 40% of the long-term average. However these inflows were 45% higher than in 2008–09.

Storage levels for all major storages in the basin almost doubled by the end of June 2010, but were still low at only 8,400 ML (27% of capacity).

Central Highlands Water maintained Stage 4 restrictions for Ballarat and surrounding towns for the first half of the year. Supplies to Ballarat were supplemented by transfers from Goulburn and Campaspe basins via the Goldfields Superpipe. This enabled restrictions to be eased to Stage 3 from January 2010.

Licensed diverters on the Moorabool River were subject to an irrigation ban for the whole year. Licensed groundwater use was unrestricted, but decreased by 11% compared to 2008–09.

Environmental water was retained in Lal Lal and Upper West Moorabool reservoirs under a qualification of rights, for emergency supplies to Ballarat, until restrictions were eased from Stage 4.

27.2 Responsibilities for management of water resources

Table 27-1 shows the responsibilities of various authorities within the Moorabool basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 27-1 Responsibilities for water resources management within the Moorabool basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water diversions		
Barwon Water			Supplies Geelong and surrounding towns(1)	Manages reservoirs on the East Moorabool River and has a third of the share of Lal Lal Reservoir on the West Moorabool River Manages Stony Creek Reservoir on Stony Creek Obligation to meet passing-flow requirements
Central Highlands Water			Supplies Ballarat and surrounding towns(2)	Manages reservoirs on the West Moorabool River and has a two-thirds of the share of Lal Lal Reservoir Obliged to meet passing-flow requirements
Corangamite Catchment Management Authority				Responsible for waterway management in Moorabool basin

Note:

(1) Geelong water supply is mainly sourced from the Barwon basin.

(2) Ballarat's water supply is sourced from both the Barwon and Moorabool basins.

27.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Moorabool basin was generally between 80% and 125% of the long-term average. This was higher than rainfall in 2008–09, which was between 40 to 80% of the long-term average.

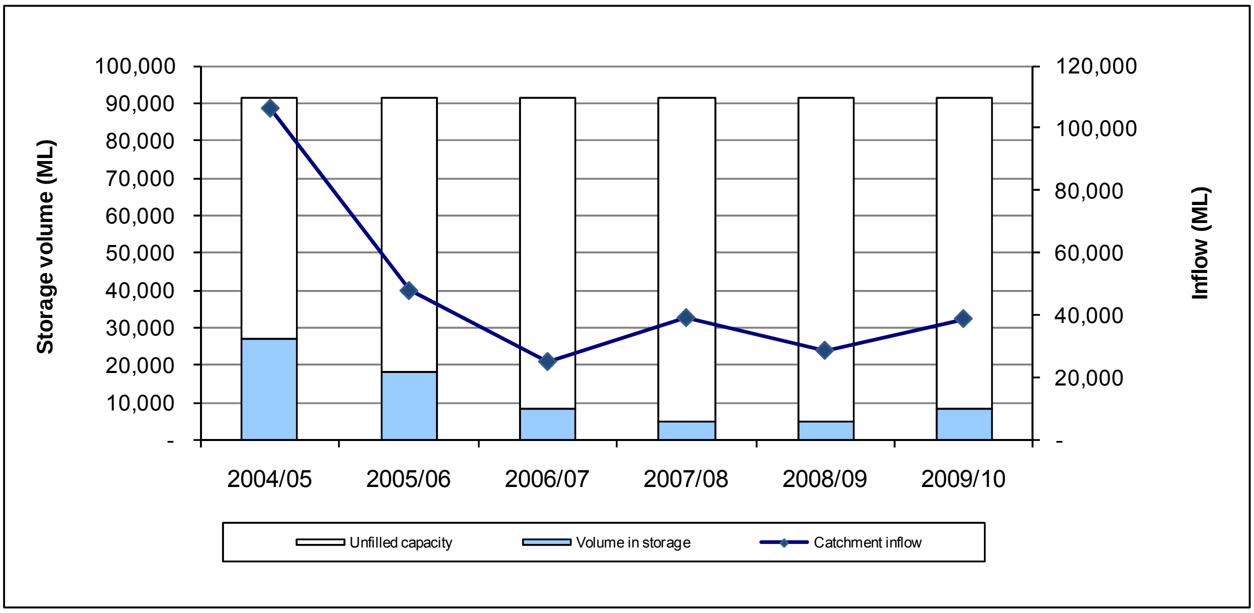
Despite close to average rainfall, catchment inflows in 2009–10 were still just 40% of the long-term average of 97,000 ML.

The amount of water flowing from the Moorabool basin into Port Phillip Bay and the Barwon River was 1,700 ML in 2009–10, or 4% of the catchment inflows into the basin. This is around 700 ML higher than the outflow in 2008–09.

The Moorabool basin has six main storages: the Bostock, Upper Stony Creek, Korweinguboora, Lal Lal, Wilsons and Moorabool reservoirs. Lal Lal Reservoir accounts for about two thirds of total storage capacity in the basin. Storage levels for all major storages (greater than 1,000 ML) in the basin increased from 4,800 ML in July 2009 to 8,400 ML (27% of capacity) by the end of June 2010.

Only volumes for major on-stream storages have been included in the water balance, and as such, Upper Stony Creek Reservoir has not been included. The volume of water in the basin's major on-stream storages increased by 4,100 ML in 2009–10 to 7,500 ML.

Figure 27-1 All major storages and catchment inflows in the Moorabool basin



27.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Moorabool basin are shown in Table 27-2.

Table 27-2 Summary of total water resources and water use in the Moorabool basin, 2009–10

Water source	Total water resource (ML)[1]	Total use (ML)
Surface water	41,800	24,600
Groundwater[2]	3,900	2,100
Recycled water	-	-

Notes:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 27-7 and estimated domestic and stock use presented in Table 27-8.

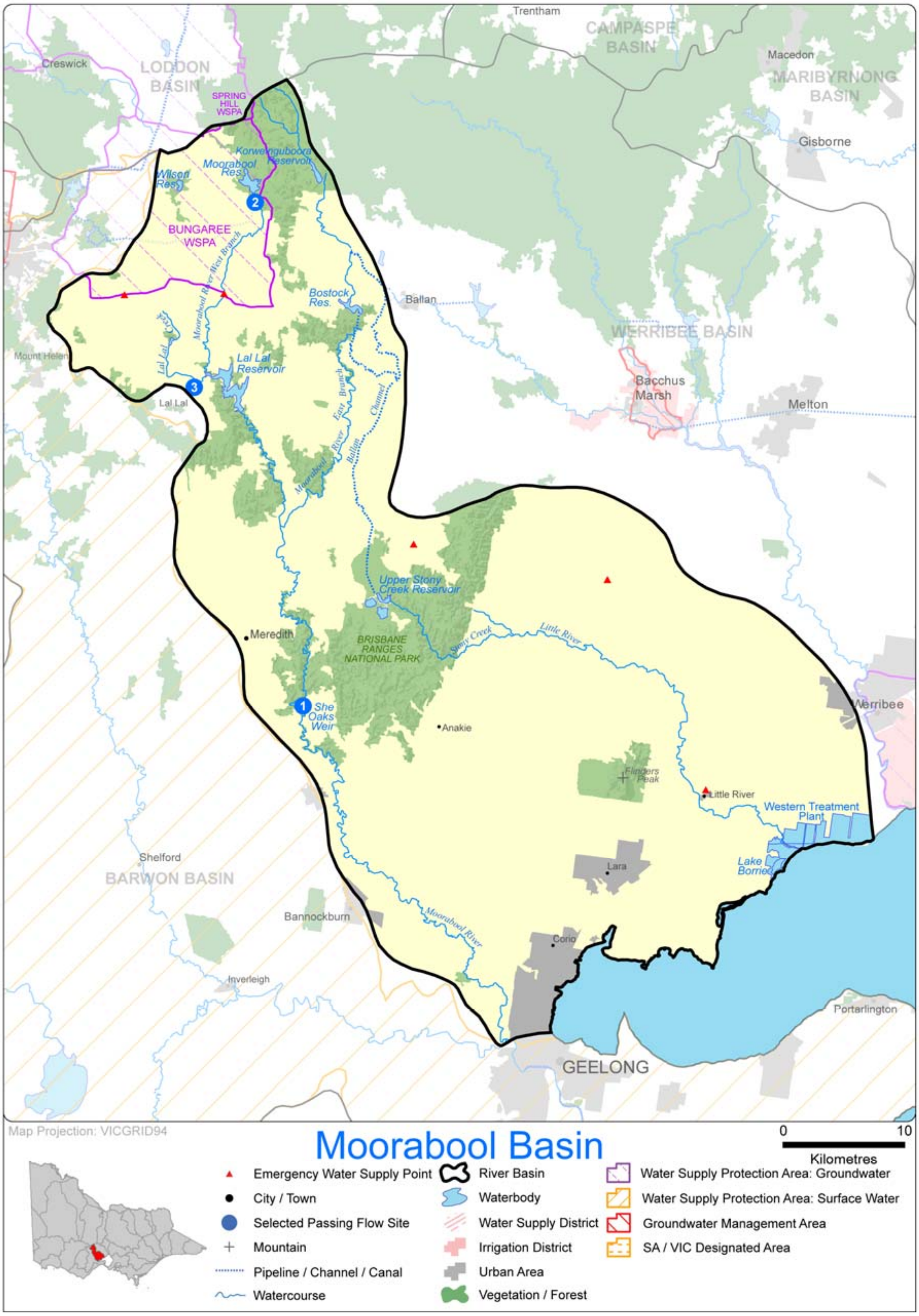
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

27.4.1 Infrastructure projects to improve water availability

There were no major infrastructure projects to improve water availability completed during 2009–10.

27.5 Location of water resources

Figure 27-2 Map of the Moorabool basin



27.6 Surface water resources

27.6.1 Water balance

A surface-water balance for the Moorabool basin is shown in Table 27-3.

The majority of water used for consumptive purposes in the basin was sourced from small catchment dams.

Table 27-3 Balance of surface water in the Moorabool basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	3,400	3,100
Volume in storage at end of year	7,500	3,400
Change in storage	**4,100**	**300**
Inflows		
Catchment inflow(1)	38,900	28,700
Rainfall on major storages	2,900	n/a(5)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	0	0
Sub-total	**41,800**	**28,700**
Usage		
Urban diversions(2)	450	980
Transfers to Barwon basin (White Swan Reservoir)(2)	1,040	1,820
Licensed diversions from unregulated streams	900	1,500
Small catchment dams(3)	22,200	15,300
Sub-total	**24,600**	**19,600**
Losses		
Evaporation losses from major storages	3,100	1,200 (5)
Evaporation from small catchment dams(3)	7,300	5,700
In-stream infiltration to groundwater, flows to floodplain and evaporation(4)	1,000	900
Sub-total	**11,400**	**7,800**
Water passed at outlet of basin		
River outflows to Port Phillip Bay (Little River)	1,500	600
River outflows to the Barwon River (Moorabool River)	200	400

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) The urban diversions figure of 450 ML represents water diverted from the Moorabool basin to directly supply urban customers in the Barwon basin and in the Ballarat area (which falls in both the Moorabool and Barwon basins), The 1,040 ML transfer to the Barwon basin represents water transferred to White Swan Reservoir before being supplied to urban customers in the Ballarat area.

(3) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(4) Losses estimated using loss functions from the Lower Barwon REALM and Moorabool REALM. The losses accounted for in the water balance do not include losses occurring between the point of water diversion from the Moorabool basin and the point of use.

(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

27.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 27-4 below are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 27-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	6,100	3,000	n/a
Registered commercial and irrigation	22,800	19,200	n/a
Total	**28,900**	**22,200**	**29,500**

n/a: Information not available.

27.6.3 Water entitlement transfers

There are no declared systems in the Moorabool basin. Surface water movement was limited to a temporary licence transfer of only 1 ML within the basin. No trade took place on a permanent basis. There was no net movement of water into the Moorabool basin in this water year.

Table 27-5 summarises the movement of bundled entitlements in the Moorabool basin during 2009–10.

Table 27-5 Transfers of surface water bundled entitlements in the Moorabool basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
Moorabool Unregulated	0	0	0	1	1	0
Total 2009–10	0	0	0	1	1	0
Total 2008–09	0	0	0	2	2	0

27.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 27-6.

Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 27-6 Volume of water diverted under surface water entitlements in the Moorabool basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)
Barwon Water					
Lal Lal – Barwon	3	7,000	-	97	Yes
Meredith	1	600	-	35	Yes
Upper East Moorabool System	1	9,000	-	320	Yes
She Oaks	3	2,000	-	-	Yes
Central Highlands Water					
Lal Lal	3	14,000	300 (3)	0	Yes
Upper West Moorabool System	1	10,500	-	1,044	Yes
Total annual volume of bulk entitlements 2009–10		**43,100**	**300**	**1,497**	
Total annual volume of bulk entitlements 2008–09		**43,100**	**-**	**2,804**	
Licensed diversions from unregulated streams 2009–10		*3,752*		*869*	
Licensed diversions from unregulated streams 2008–09		*2,047*		*1,507*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(3) Barwon Water purchased 300 ML of water in the Goulburn system in 2009–10, which was transferred to Ballarat via the Goldfields Superpipe. This enabled Barwon Water to access the equivalent volume from Central Highlands Water's share of Lal Lal Reservoir for use in the Moorabool basin.

27.7 Groundwater resources

A summary of the licensed entitlements and use for the Bungaree WSPA in the Moorabool basin, excluding domestic and stock use, is presented in Table 27-7. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

During 2009–10 usage within the Bungaree WSPA decreased by approximately 11% compared with 2008–09.

Table 27-7 Licensed groundwater volumes, Moorabool basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Bungaree WSPA (67%)	All depths	3,544	3,497	1,745	-	1,745	2,929
Total(5)		**3,544**	**3,497**	**1,745**	**-**	**1,745**	**2,929**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 27-8.

Table 27-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Bungaree WSPA (67%)	188	377
Total	**188**	**377**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the Table 27-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

27.8 Drought contingency measures

A number of drought contingency measures were undertaken in the Moorabool basin in 2009–10. These include:

- restricting urban and rural water use (discussed in section 27.10)
- water carting
- temporary qualifications of rights as detailed in Table 27-9.

Barwon Water carted water to Meredith from Lethbridge between July and October 2009 due to low flow and poor water quality in the Moorabool River. Barwon Water also purchased water from the Goulburn system to supplement storage in Lal Lal Reservoir on two occasions, in December 2009 and in March 2010. This purchased water was transferred to Ballarat via the Goldfields Superpipe and enabled Barwon Water to access the equivalent volume from Central Highlands Water's share of Lal Lal Reservoir for use in the Moorabool basin.

27.9 Qualification of rights

At the beginning of 2009–10, Ballarat's combined storage volume was at just 17.8% of capacity. The temporary qualification of rights in the Moorabool–White Swan supply system continued in 2009–10 to help secure Ballarat's water supplies, prior to receiving the full benefits of its long-term augmentations such as the Goldfields Superpipe.

In 2009–10, the qualification provided Ballarat with an extra 564 ML of water in storage by ceasing passing flows on the Moorabool River, downstream of Lal Lal and Moorabool reservoirs, and on Clarkes Creek, downstream of Central Highlands Water's diversion weir.

The environmental impacts of the qualification were managed by Corangamite Catchment Management Authority, in partnership with Central Highlands Water and Barwon Water. In line with the qualification and an emergency watering plan, 240 ML was released down the Moorabool River from Lal Lal Reservoir during the year to help meet a range of environmental objectives such as maintaining fish habitat and improving water quality. Corangamite Catchment Management Authority also monitored water quality throughout the year and undertook a fish survey which found the Moorabool still supported populations of native fish.

Passing flows were reinstated in accordance with bulk entitlement rules from 1 January 2010 when Ballarat came off Stage 4 restrictions.

Table 27-9 Qualifications of rights

Legal instruments	Dates	Qualification type	Qualification description	Triggers for resuming normal sharing rules	Date trigger reached
Declaration of Temporary Qualification of Rights in the Moorabool White Swan Water Supply System July 2007	1 July 2009 to 1 January 2010 (continued from 1 July 2007)	Reduced passing-flow requirements / Differential access by priority entitlements	Ceases passing flows from the Upper West Moorabool Reservoir, Lal Lal Reservoir and White Swan Reservoir (located in the Barwon basin), as short term emergency relief for the Ballarat water supply system	When Ballarat is no longer subject to Stage 4 water restrictions	1 January 2010

27.10 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions are shown in Table 27-10.

Ballarat and Geelong are both partly supplied from the Moorabool basin. The lack of water available in the basin contributed to these towns being subject to water restrictions the entire year. Both towns began the year on Stage 4 Ex, but restrictions were reduced to Stage 2 by the end of 2009–10. Licensed diverters on the Moorabool River were subject to an irrigation ban for the entire year.

Groundwater use was unrestricted in the Moorabool basin during 2009–10.

Table 27-10 Seasonal allocations and restrictions on water use in Moorabool basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Geelong and surrounding towns	Stage 4 Ex restrictions from July 2009 to February 2010 and Stage 3 restrictions from March to June 2010
	Ballarat and surrounding towns	Stage 4 restrictions from July to October 2009, Stage 4 Ex restrictions from November to December 2009, Stage 3 restrictions from January to June 2010
Licensed diversions from unregulated streams	Moorabool River	Irrigation ban from June 2009 to July 2010

27.11 Recycled water

There are no wastewater treatment plants within the Moorabool basin.

27.12 Water for the environment

27.12.1 Environmental Water Reserve (EWR)

Important environmental assets such as River Blackfish and Australian Grayling and other fish between Lal Lal Reservoir and She Oakes depend on the Moorabool basin EWR, as well as the Hovells Creek Estuary, which is part of Port Phillip Bay and Bellarine Peninsula Ramsar site.

In 2009–10 the Moorabool basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Barwon Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

In 2009–10, 240 ML of water was released down the Moorabool River to maintain water quality in remnant habitat pools. These releases of 80 ML each, occurred in November 2009, January 2010 and March–April 2010.

27.12.2 Passing-flow compliance

As discussed in Section 27.9, Barwon Water and Central Highlands Water's passing-flow obligations in the Moorabool basin were temporarily qualified in 2009–10 to provide additional supplies for Ballarat. Passing flows were reinstated in accordance with bulk entitlement rules from 1 January 2010 when Stage 4 restrictions for Ballarat were reduced.

Central Highlands Water reported compliance with minimum passing-flow requirements for 2009–10. Barwon Water reported 98% compliance with minimum passing-flow requirements in 2009–10, with minor instances of non-compliance with daily passing flows occurring at some sites where streamflow variation made it difficult to set releases to match streamflows.

Table 27-11 shows the passing-flow compliance in the Moorabool basin for selected bulk entitlement compliance points. While there are other compliance points in the basin, the points below have been chosen as they were judged to be of community interest.

Table 27-11 Selected passing-flow compliance in the Moorabool basin

River	Passing flow	
Moorabool River	Instrument where passing flows are specified	Bulk Entitlement (She Oaks) Conversion Order 1995
	Responsible authority	Barwon Water
	Compliance point	She Oaks diversion weir (shown as 1 in Figure 27-2)
	Passing-flow compliance	• Qualification of rights in place until 1 January 2010, hence no flows were passed until this date. • Requirement of the lesser of 40 ML per day or natural flow was provided from 1 January 2010.
West Moorabool River	Instrument where passing flows are specified	Bulk Entitlement (Upper West Moorabool System) Conversion Order 1995
	Responsible authority	Central Highlands Water
	Compliance point	Moorabool reservoir (shown as 2 in Figure 27-2)
	Passing-flow compliance	• Qualification of rights in place until 1 January 2010, hence no flows were passed until this date. • Requirement of the lesser of 3 ML per day or natural flow was provided after 1 January 2010.
West Branch Moorabool River	Instrument where passing flows are specified	Bulk Entitlement (Lal Lal – Central Highlands) Conversion Order 1995
	Responsible authority	Central Highlands Water
	Compliance point	Lal Lal Reservoir (shown as 3 in Figure 27-2)
	Passing-flow compliance	Qualification of rights in place until 1 January 2010, hence no flows were passed until this date. Requirement under the bulk entitlement was provided from 1 January 2010. Under normal conditions this is 20 ML per day. Under dry conditions (when cumulative flow into the reservoir over the previous 24 months is less than 43,000 ML), it is the lesser of 5 ML per day or natural flow.

28 Barwon basin

This chapter sets out the accounts for the Barwon basin. For detailed information about how they have been compiled, refer to Chapter 5.

28.1 Barwon basin summary

Inflows in the Barwon basin were low at just 41% of the long-term average, however they were nearly double the annual inflows in 2008–09,

Storage levels in the Barwon basin consequently increased over the year, but were still low at 47% of capacity at the end of June 2010. Geelong's storages in the Moorabool basin were also very low, finishing the year at just 27% of capacity.

The Barwon Downs borefield again reduced the demand on surface water, contributing a large amount to Geelong's supplies in 2009–10.

Stage 4 Ex restrictions were in place for most of the year for Geelong and surrounding towns, and were eased to Stage 3 in March 2010.

Licensed diverters from the Barwon and Leigh rivers, and Boundary Creek were again placed on severe restrictions or banned for periods throughout 2009–10.

28.2 Responsibilities for management of water resources

Table 28-1 shows the responsibilities of various authorities within the Barwon basin.

Table 28-1 Responsibilities for water resources management within the Barwon basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions		
Barwon Water			Geelong and surrounding towns(1)	Operates West Barwon Reservoir and Lake Wurdee Boluc. Obliged to meet passing-flow requirements
Central Highlands Water			Ballarat and surrounding towns (2)	Operates White Swan and Gong Gong reservoirs Obliged to meet passing-flow requirements
Corangamite Catchment Authority				Manages waterways for the whole of the Barwon basin

Note:

(1) Geelong's water supply is also sourced from the Moorabool basin.

(2) Ballarat's water supply is mainly sourced from the Moorabool basin.

28.3 Rainfall, flows and storages in 2009–10

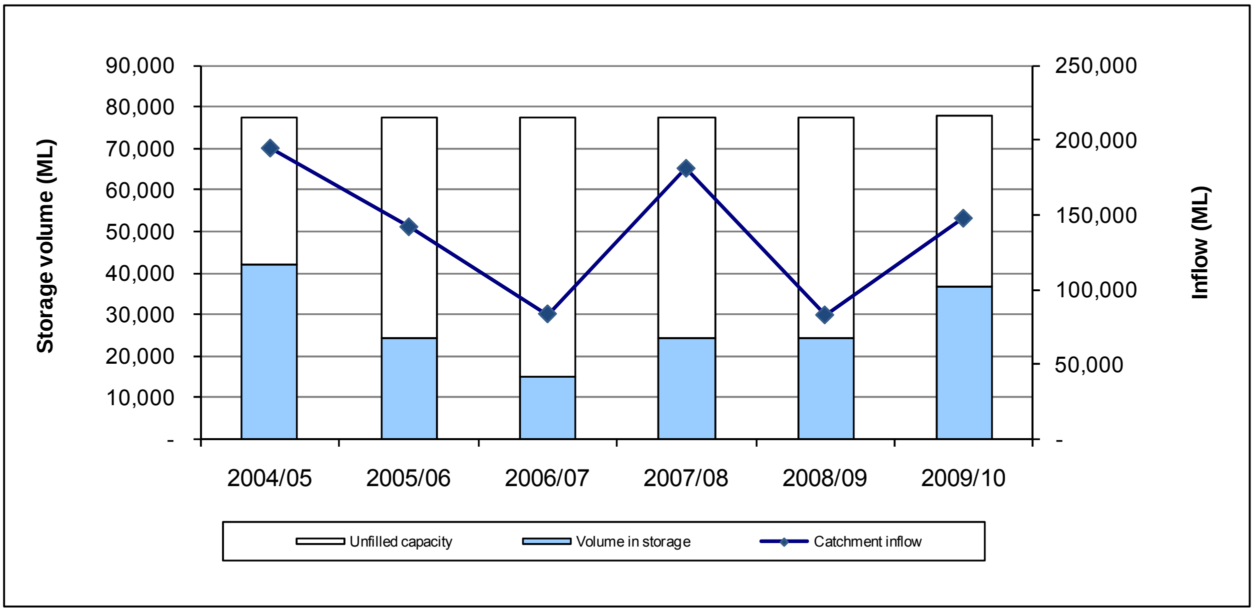
In 2009–10, rainfall in the Barwon basin ranged between 80% and 125% of the long-term average, compared with 40% and 80% experienced in 2008–09. Inflows in 2009–10 were again moderate at 41% of the long-term average of 360,000 ML, however were nearly double those experienced in 2008–09.

The amount of water flowing from the Barwon basin into Corio Bay and Bass Strait was 91,300 ML in 2009–10. This represents 62% of the catchment inflows into the basin.

Storage levels for all major storages (greater than 1,000 ML capacity) in the basin increased from 24,300 ML in July 2009 to 36,800 ML (47% of capacity) by June 2010.

Only volumes for major on-stream storages have been included in the water balance, and as such, Wurdee Boluc Reservoir has not been included. The volume of water in the major on-stream storages in the basin - West Barwon, White Swan and Gong Gong Reservoir increased by 4,000 ML in 2009–10, from 11,100 ML to 15,100 ML.

Figure 28-1 All major storages and catchment inflows in the Barwon basin



28.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Barwon basin are summarised in Table 28-2.

The Greater Geelong area, serviced by Barwon Water, is a major water user in the Barwon basin. Water supplied to Geelong is also sourced from the Moorabool basin.

Table 28-2 Summary of total water resources and water use in the Barwon basin, 2009–10

Water source	Total water resource (ML)[1]	Total use (ML)
Surface water	182,600	69,400
Groundwater[2]	21,900	13,500
Recycled water	24,520	3,700

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 28-7 and estimated domestic and stock use presented in Table 28-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5. The Gerangamete GMA is one exception in the Barwon basin and this is discussed in note 7 beneath Table 28-7.

28.5 Location of water resources

Figure 28-2 Map of the Barwon basin

28.6 Surface water resources

28.6.1 Water balance

A surface-water balance for the Barwon Basin is shown in Table 28-3. Note that only on-stream storages with capacity greater than 1,000 ML have been included in the water balance. The major on-stream storages in the Barwon basin are the West Barwon Reservoir operated by Barwon Water and the White Swan and Gong Gong Reservoirs operated by Central Highlands Water.

Transfers from the Moorabool Basin to the Barwon Basin decreased from 1,820 ML in 2008–09 to 1,040 ML in 2009–10. This water was transferred to White Swan Reservoir and used to supply the Ballarat system. The Goldfields Superpipe was used to transfer 10,400 ML from the Campaspe Basin to White Swan Reservoir to further augment the Ballarat supply.

Table 28-3 Balance of surface water in the Barwon basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	11,100	8,200
Volume in storage at end of year	15,100	11,100
Change in storage	**4,000**	**2,900**
Inflows		
Catchment inflow(1)	147,800	82,700
Rainfall on major storages	1,000	n/a(4)
Inflows from the Moorabool River	200	400
Transfers from Moorabool basin to White Swan Reservoir	1,040	1,820
Transfers from Campaspe basin to White Swan Reservoir	10,400	11,420
Return flow from irrigation	0	0
Treated wastewater discharged back to river	22,200	20,730
Sub-total	**182,600**	**117,100**
Usage		
Urban diversions	36,470	24,230
Licensed diversions from unregulated streams	2,000	1,700
Small catchment dams(2)	30,900	30,900
Sub-total	**69,400**	**56,800**
Losses		
Net evaporation losses from major storages	1,300	1,300 (4)
Evaporation from small catchment dams(2)	12,500	12,500
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	4,100	2,500
Sub-total	**17,900**	**16,300**
Water passed at outlet of basin		
River outflows to the ocean	91,300	41,100

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(3) Losses estimated using loss functions from the Lower Barwon Simulation Model (REALM).

(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

28.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 28-4 are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 28-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,400	5,200	n/a
Registered commercial and irrigation	30,600	25,700	n/a
Total	**41,000**	**30,900**	**43,400**

n/a – Information not available.

28.6.3 Water entitlement transfers

There are no declared systems in the Barwon basin. Surface water movement was limited to transfers of licences within the basin. In 2009–10, 333 ML of licenses were traded on a temporary basis. There was no net movement of water into the basin during the year.

Table 28-5 summarises the movement of bundled entitlements in the Barwon basin during 2009–10.

Table 28-5 Transfers of surface water bundled entitlements in the Barwon basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
Barwon Unregulated	0	0	0	333	333	0
Total 2009–10	0	0	0	333	333	0
Total 2008–09	0	0	0	543	543	0

28.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 28-6.

Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. For multi-year entitlements, compliance is assessed based on the total volume of water diverted over the term of the entitlement. Therefore it is possible that the volume diverted in any given year may exceed the average bulk entitlement volume but still be compliant.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

The bulk entitlement volumes within the Barwon basin refer to the total volume that can be extracted over any consecutive three-year period. The Yarrowee-White Swan bulk entitlement includes up to 10,500 ML extracted from the Upper West Moorabool system as specified in the Upper West Moorabool bulk entitlement in the Moorabool basin.

Table 28-6 Volume of water diverted under surface water entitlements in the Barwon basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)
Barwon Water					
Upper Barwon system	3	43,467	-	27,278	Yes
Central Highlands Water					
Yarrowee-White Swan system(3)	3	12,267		9,189	Yes
Total annual volume of bulk entitlements 2009–10		**55,733**	**-**	**36,467**	
Total annual volume of bulk entitlements 2008–09		**55,733**	**2,482**	**24,232**	
Licensed diversions from unregulated streams 2009–10		*5,523*		*2,005*	
Licensed diversions from unregulated streams 2008–09		*4,871*		*1,675*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(3) This bulk entitlement overlaps with Central Highlands Water's Upper West Moorabool system bulk entitlement in the Moorabool basin.

28.7 Groundwater resources

A summary of licensed entitlements and use for groundwater management units that overlap the Barwon basin, excluding domestic and stock use, is presented in Table 28-7.

The Barwon basin contains part of the Cardigan GMA, Gellibrand GMA, Gerangamete GMA and Bungaree WSPA. Groundwater levels in all these groundwater management units are declining. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Groundwater extractions in the Barwon basin in 2009–10 were similar to that of 2008–09. The Gerangamete GMA is a key supply for Geelong and continued reliance on groundwater to supplement urban supplies in Geelong means that additional groundwater supplies may need to be considered in the future. The Gellibrand GMA's permissive consumptive volume (PCV) is currently set to zero, however it is a potential resource for augmenting urban water supplies in the future following further assessment.

Table 28-7 Licensed groundwater volumes, Barwon basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)(8)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Cardigan GMA (20%)	All depths	449	433	39	-	39	191
Gellibrand GMA (10%)	All depths	-	-	-	-	-	0
Gerangamete GMA (86%)(5)(6)	>60	20,000	20,000	12,692	-	12,692	12,440
Bungaree WSPA (24%)	All depths	1,258	1,241	619	-	619	1,039
Total(7)		**21,707**	**21,674**	**13,351**	**-**	**13,351**	**13,670**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage (with the exception of Gerangamete GMA – see note 6). Those GMAs/WSPAs with less than 5% surface area within the basin have not been included. In Cardigan, out of 3,887 ML of licensed entitlement, 1,700 ML is from urban use, of which 525 ML was extracted from the Cardigan GMA within the Hopkins Basin. The remaining 197 ML of metered use is shared on a proportional basis between Cardigan, Barwon and Corangamite basins. Cardigan GMA has 60.7% of its service area in the Hopkins Basin, 19.5% in the Corangamite Basin and 19.8% in the Barwon Basin. Only the non-urban licensed volume is allocated according to the surface area percentages.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) Entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) The PCV for the Gerangamete GMA has the following limits: 20,000 ML in one year, 80,000 ML over 10 years and 400,000 ML over 100 years. The entitlement limit in Table 28-7 represents the single year limit, however compliance would also need to be assessed at the 10 year and 100 year level.

(6) Barwon Water is the sole licence holder in the Gerangamete GMA and uses groundwater to supplement Geelong's water supply (see Table 28-9). As all of this groundwater would be used in the Barwon basin, all volumes have been 100% allocated to the Barwon basin despite the Gerangamete GMA having 14% of its surface area in the Corangamite basin.

(7) Total volumes are based on the sum of management unit data prior to rounding.

(8) Non-metered use includes dairy wash and low consumption commercial use only.

An estimate of domestic and stock groundwater use is provided in Table 28-8.

Table 28-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Cardigan GMA (20%)	22	44
Gellibrand GMA (10%)	-	-
Gerangamete GMA (86%)	3	6
Bungaree WSPA (24%)	67	134
Total	**92**	**184**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 28-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Groundwater was again a significant part of the urban water supply for Geelong in 2009–10. The licensed entitlements and metered use for this supply is provided in Table 28-9.

Table 28-9 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Greater Geelong area	20,000	12,692	12,438

28.8 Drought contingency measures

A number of drought contingency measures were undertaken in the Barwon basin in 2009–10. These include:

- restricting urban and rural water use (discussed below)
- temporary qualification of rights, which is detailed in Table 27-9 in the Moorabool basin chapter.

The Minister for Water qualified rights to water in the Moorabool system to secure supplies for Ballarat.

28.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions in 2009–10 are shown in Table 28-10.

Barwon Water maintained severe restrictions for Geelong the entire year to reduce demands on its surface water systems, this involved starting restrictions at Stage 4 restrictions and reducing to state 3 at the end of the year. Ballarat, which is partly supplied from the northern part of the Moorabool basin via White Swan Reservoir, was also kept on severe water restrictions by Central Highlands Water; the most severe restrictions were Stage 4 Ex, but ended the year on Stage 3.

Licensed diverters from the Barwon and Leigh Rivers, and Boundary Creek were again subject to severe restrictions or bans for periods throughout 2009–10.

Groundwater use was unrestricted in the Barwon basin during 2009–10.

Table 28-10 Seasonal allocations and restrictions on water use in Barwon basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Geelong and surrounding towns	Stage 4 Ex restrictions from July to February 2010, Stage 3 restrictions from March to June 2010
	Ballarat and surrounding towns	Stage 4 restrictions from July to October 2009, Stage 4 Ex restrictions from November to December 2009, Stage 3 restrictions from January to June 2010
Licensed diversions from unregulated streams	Boundary Creek	Irrigation ban from January to June 2010
	Barwon River	Irrigation ban in January 2010 Zone 1 & 2: Stage 3 restrictions in February 2010, Stage 1 restrictions in March 2010 and Stage 5 restrictions in April 2010 Zone 3: Irrigation ban from February to March 2010 and Stage 1 restrictions in April 2010
	Leigh River	Irrigation ban in January 2010, Stage 4 restrictions in February 2010, Stage 1 restrictions in March 2010 and Stage 3 restrictions in April 2010

28.10 Recycled water

Both Barwon Water and Central Highlands Water operate wastewater treatment plants within the Barwon basin.

In 2009–10, 7% or 3,704 ML of wastewater in the Barwon basin was recycled. This is a decrease from 9% in 2008–09. Volumes of water produced and recycled increased from 2008–09.

Table 28-11 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Ballarat North	2,574	852	14%	-	-	353	499	1,722	0
Ballarat South	5,773	81	0%	19	-	-	62	5,692	0
Bannockburn	48	48	100%	-	48	-	-	-	-
Black Rock	15,965	2,565	7%	-	1,176	-	1,389	14,789	(1,389)
Portarlington	138	138	100%	-	138	-	-	-	-
Winchelsea	21	21	100%	-	21	-	-	-	-
Total 2009–10	**24,519**	**3,704**	**7%**	**19**	**1,382**	**353**	**1,950**	**22,204**	**(1,389)**
Total 2008–09	**23,373**	**3,511**	**9%**	**24**	**2,035**	**-**	**1,453**	**20,727**	**(866)**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

28.11 Water for the environment

28.11.1 Environmental Water Reserve (EWR)

The Bellarine Peninsula contains internationally significant wetlands listed under the Ramsar convention which rely on the freshwater inputs from the Barwon basin to ecologically function. Other important environmental assets include:

- Lake Connewarre complex, which is part of the Port Phillip Bay (Western Shoreline)
- The native fish community, particularly Australian Grayling, Australian Mudfish and Tupong and Yarra Pygmy Perch which are all EPBC listed
- Native water bird population, particularly Greenshank, Eastern Golden Plover, Curlew Sandpiper and Red-necked Stint
- Platypus

In 2009–10 the Barwon basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Barwon Water and Central Highlands Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use, that is, water above cap.

28.11.2 Passing-flow compliance

Some bulk entitlements require passing flows to be met at a number of points in the basin.

Barwon Water and Central Highlands Water reported that all passing-flow requirements in the Barwon basin were met.

Table 28-12 shows the passing-flow compliance in the Barwon basin for a selected bulk entitlement compliance point. While there are other compliance points, the point below has been chosen as it was judged to be of community interest. The location of this point is presented in Figure 28-2.

Table 28-12 Selected passing-flow requirements in the Barwon basin

River	Passing flow	
West Barwon River, East Barwon River, Callahan Creek, Dewing Creek, Matthews Creek and Pennyroyal Creek	Instrument where passing flows are specified	Bulk Entitlement (Upper Barwon System) Conversion Order 2002
	Responsible authority	Barwon Water
	Compliance point	West Barwon diversion weir (West Barwon Dam) (shown as 1 in Figure 28-2)
	Passing-flow compliance	Passing flows were based on the storage volume in the West Barwon diversion weir • During April to December inclusive, a minimum flow of 4 ML per day was passed if the storage volume was less than 40,000 ML, or 5 ML per day if volume was greater than 40,000 ML • A minimum flow of 4 ML per day was passed in January, February and March

28.11.3 Streamflow management plans (SFMPs)

No further work will be undertaken in preparation for the development of an SFMP for the Barwon River which includes the main stem and tributaries to the south, including Leigh River, but excluding Moorabool River. The need for a SFMP will be considered as part of the review of the Central Region Sustainable Water Strategy.

29 Corangamite basin

This chapter sets out the accounts for the Corangamite basin. For detailed information about how they have been compiled, refer to Chapter 5.

29.1 Corangamite basin summary

Inflows in the Corangamite basin in 2009–10 were 46% of the long-term average, close to three times the volume of annual inflows in 2008–09.

Groundwater licenses remained unrestricted in 2009–10. Groundwater extractions were lower than in 2008–09 with licensed groundwater use in 2009–10 reduced by approximately 30%. However, groundwater extraction still accounted for 25% of total usage in the basin.

Urban users are not directly affected by inflows in the Corangamite basin, as all towns are supplied by other basins. Restrictions were only in place for the towns located in the north of the basin connected to Ballarat's water supply system.

Licensed diverters from the unregulated streams were also relatively unaffected by the low inflows, with the exception of diverters from Lake Tooliorook who were banned from taking water the entire year.

The amount of water flowing from the Corangamite basin into the Ramsar listed Western District Lakes was 126,600 ML in 2009–10. This volume is 88% of the total inflows in the basin.

29.2 Responsibilities for management of water resources

Table 29-1 shows the responsibilities of various authorities within the Corangamite basin.

Table 29-1 Responsibilities for water resources management within the Corangamite basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions		
Barwon Water			Supplies Colac and surrounding towns (from the Otway Coast basin)	
Central Highlands Water			Supplies Ballarat and surrounding towns (1)	
Wannon Water			Provides urban water supply to Camperdown, Lismore and Derrinallum (from the Otway Coast basin)	
Corangamite Catchment Management Authority				Manages waterways for the whole of the Corangamite basin

Notes:

(1) Ballarat's water supply is mainly sourced from the Barwon and Moorabool basins

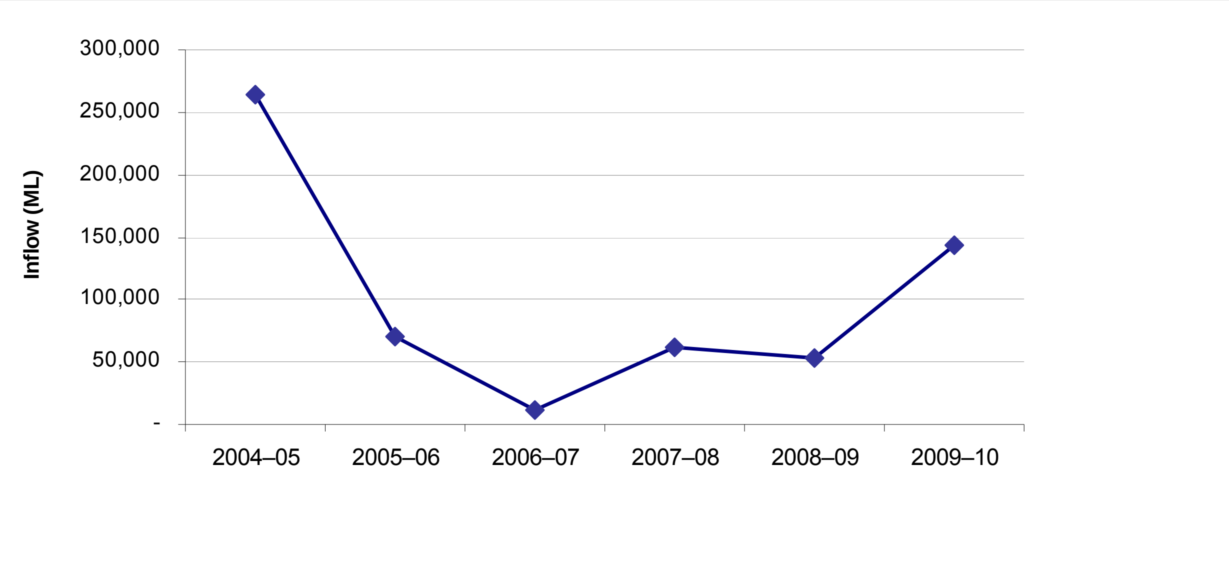
29.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Corangamite basin ranged between 80% and 125% of the long-term average. Inflows across the basin were 46% of the long-term average of 316,000 ML, which is significantly higher than the previous four years.

Flows from the Corangamite basin into the Western District Lakes during 2009–10 were 126,600 ML, or 88% of inflows. The percentage of outflow to inflows is reasonably consistent with the previous 4 years.

There are no major water supply storages in the Corangamite basin.

Figure 29-1 Catchment inflows in the Corangamite basin



29.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Corangamite basin are shown in Table 29-2. Water supplied to Colac, Camperdown, Lismore and Derrinallum is sourced from and accounted for within the Otway Coast basin.

Table 29-2 Summary of total water resources and water use in the Corangamite basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	145,600	12,400
Groundwater(2)	17,200	4,100
Recycled water	1,960	320

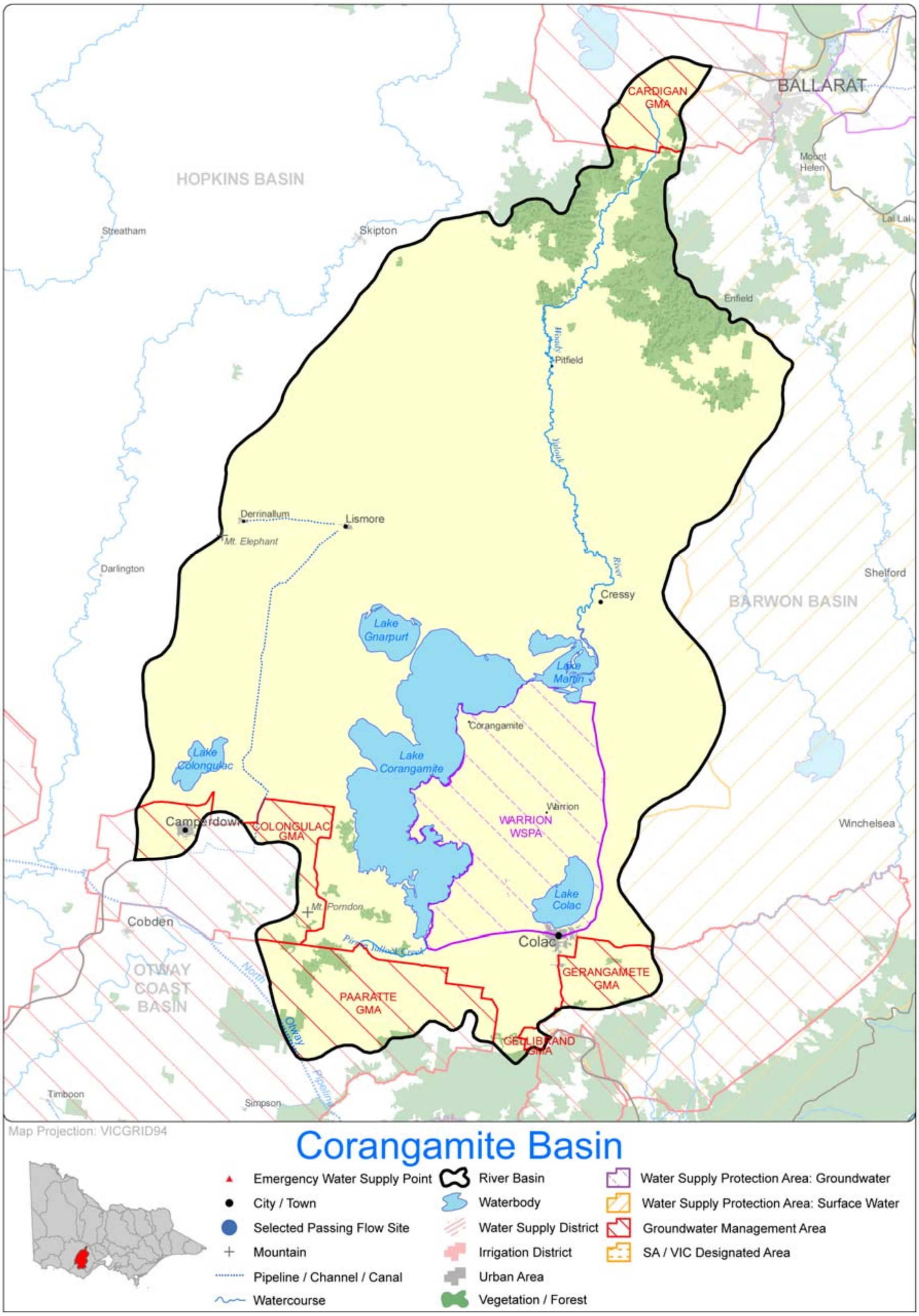
Notes:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 29-6 and the estimated domestic and stock use as presented in Table 29-7.

(2) The total groundwater available for consumption and total groundwater use have been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5. The Gerangamete GMA is one exception in the Corangamite basin and this is discussed in note 6 beneath Table 29-6.

29.5 Location of water resources

Figure 29-2 Map of the Corangamite basin



29.6 Surface water resources

29.6.1 Water balance

A surface-water balance for the Corangamite basin is shown in Table 29-3.

Urban water use within the Corangamite basin is supplied from the Otway Coast basin due to the better quality of water available.

Table 29-3 Balance of surface water in the Corangamite basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow(1)	144,100	53,200
Rainfall on major storages	0	n/a(4)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	1,490	1,290
Sub-total	**145,600**	**54,500**
Usage		
Urban diversions	0	0
Licensed diversions from unregulated streams	100	100
Small catchment dams(2)	12,300	6,800
Sub-total	**12,400**	**6,900**
Losses		
Evaporation losses from major storages	0	0(4)
Evaporation from small catchment dams(2)	6,600	4,000
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	0	0
Sub-total	**6,600**	**4,000**
Water passed at outlet of basin		
River outflows to the Corangamite Lakes	126,600	43,600

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(3) Losses estimated to be zero because data is not readily available.

(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

29.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 29-4 have been provided by the Department of Sustainability and Environment, as outlined in Chapter 5.

Table 29-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	8,100	4,000	n/a
Registered commercial and irrigation	9,900	8,300	n/a
Total	**18,000**	**12,300**	**18,900**

n/a: Information not available.

29.6.3 Water entitlement transfers

There are no declared systems in the Corangamite basin. As such, surface water movement was limited to transfers of licenses. In 2009–10, 15 ML of licensed entitlement 15 ML were traded on a temporary basis within the basin. No licences were permanently transferred.

Table 31-5 summarises the movement of bundled entitlements in the Corangamite basin during 2009–10.

Table 29-5 Transfers of surface water bundled entitlements in the Corangamite basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
Corangamite Unregulated	0	0	0	15	15	0
Total 2009–10	0	0	0	15	15	0
Total 2008–09	0	0	0	0	0	0

29.6.4 Volume diverted

The only surface water entitlements in the Corangamite basin are licences on unregulated streams. In 2009–10, the licensed volume totalled 1,155 ML and use was estimated to be 84 ML, which was higher than the 2008–09 volume of 992 ML and estimated use of 67 ML.

29.7 Groundwater resources

A summary of the licensed entitlements and use for groundwater management units that overlap the Corangamite basin, excluding domestic and stock use, is shown in Table 29-6.

The Corangamite basin contains the whole Warrion WSPA as well as part of the Colongulac GMA, Cardigan GMA, Gerangamete GMA and Paaratte GMA. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Reported groundwater use in the Corangamite basin decreased in 2009–10 compared with 2008–09, largely as a result of reduced extractions from the Warrion WSPA, which has the largest volume of entitlements within the basin. Extractions from the Gerangamete GMA are included in the Barwon basin. Groundwater levels in the Warrion WSPA and Cardigan GMA are declining, while levels in the Paaratte GMA are generally stable.

Table 29-6 Licensed groundwater volumes, Corangamite basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Cardigan GMA (19%)	All depths	442	426	38	-	38	187
Colongulac GMA (36%)	≤60	1,703	1,466	248	-	248	289
Gerangamete GMA (14%)(5)	>60	-	-	-	-	-	0
Paaratte GMA (15%)	>120	674	467	43	-	43	0
Warrion WSPA (100%)	All depths	13,836	13,835	2,781	-	2,781	3,968
Total (6)		**16,655**	**16,195**	**3,110**	**-**	**3,110**	**4,444**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. GMAs/WSPAs with less than 5% surface area within the basin have not been included. In Cardigan, out of 3,887 ML of licensed entitlement, 1,700 ML is from urban use, of which 525 ML was extracted from the Cardigan GMA within the Hopkins Basin. The remaining 197 ML of metered use is shared on a proportional basis between Cardigan, Barwon and Corangamite basins. Cardigan GMA has 60.7% of its service area in the Hopkins Basin, 19.5% in the Corangamite Basin and 19.8% in the Barwon Basin. Only the non-urban licensed volume is allocated according to the surface area percentages.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Barwon Water is the sole licence holder in the Gerangamete GMA and uses groundwater to supplement Geelong's water supply. As all of this groundwater would be used in the Barwon basin, all volumes have been 100% allocated to the Barwon basin despite the Gerangamete GMA having 14% of its surface area in the Corangamite basin. See Table 28-7 in the Barwon basin chapter for Gerangamete GMA volumes.

(6) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 29-7. Groundwater is not used to supply towns within the Corangamite basin.

Table 29-7 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Cardigan GMA (19%)	22	44
Colongulac GMA (36%)	66	132
Gerangamete GMA (14%)	-	-
Paaratte GMA (15%)	2	4
Warrion WSPA (100%)	422	844
Total	**512**	**1,024**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the Table 29-6.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

29.8 Drought contingency measures

The main drought contingency measure in place in the Corangamite basin was restrictions on urban and rural water use (discussed in section 29.9).

29.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions are shown in Table 29-8.

Water resources in the Corangamite basin are not used to supply towns, so urban water restrictions reflected the conditions of the respective supply systems outside the basin.

Licensed diverters from the unregulated streams were relatively unaffected by the low inflows, with the exception of diverters from Lake Tooliorook who were banned from taking water the entire year.

Groundwater use was unrestricted in the Corangamite basin during 2009–10.

Table 29-8 Seasonal allocations and restrictions on water use in Corangamite basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Linton, Rokewood, Smythesdale	Stage 4 restrictions from July to October 2009, Stage 4e restrictions from November to December 2009, Stage 3 restrictions from January to June 2010
Licensed diversions from unregulated streams	Lake Tooliorook	Irrigation ban from July 2009 to June 2010

29.10 Recycled water

A wastewater treatment plant at Colac is operated by Barwon Water and a treatment plant at Camperdown is operated by Wannon Water. Recycled water was used for agricultural purposes. Compared to 2008–09 the volume and percentage of recycled water reused decreased in 2009–10, with around 15% recycled.

Table 29-9 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Camperdown Industrial	420	283	67%	-	283	-	-	-	137
Camperdown Municipal	26	17	66%	-	17	-	-	-	9
Colac	1,515	22	0%	-	-	-	22	1,493	-
Total 2009–10	**1,961**	**322**	**15%**	**-**	**300**	**-**	**22**	**1,493**	**146**
Total 2008–09	**1,624**	**432**	**24%**	**20**	**378**	**-**	**35**	**1,290**	**(98)**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

29.11 Water for the environment

29.11.1 Environmental Water Reserve (EWR)

The Western District Lakes are internationally significant wetlands listed under the Ramsar convention and rely on the freshwater inputs from the Corangamite basin to ecologically function. These lakes include Lake Corangamite, Lake Gnarpurt, Lake Milangil, Lake Terangpom, Lake Beeac, Lake Colongulac, and Lake Cundare. Wetlands of national importance include the Koorwwera Lakes, Lough Calvert, Lake Thurrumbong and Cundare Pool. The native fish community and the Corangamite Water Skink also rely on the EWR.

In 2009–10 the Corangamite basin EWR comprised:

- the component of water in the basin not allocated for consumptive use, that is, water above cap
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions.

29.11.2 Compliance with passing-flow requirements

There are currently no bulk entitlements in operation in the Corangamite basin.

30 Otway Coast basin

This chapter sets out the accounts for the Otway Coast basin. For detailed information regarding the manner in which they have been compiled, refer to Chapter 5.

30.1 Otway Coast basin summary

Inflows in the Otway Coast basin in 2009–10 were 87% of the long-term average. This is significantly higher than inflows experienced in 2008–09.

Consumptive use is only a small proportion of total available surface water resources, however many urban and rural supplies rely on reliable flows throughout the entire year.

Due to storage constraints, Apollo Bay was placed on Stage 2 restrictions between November and March to reduce the risk of water shortage over the tourist season. Licensed diverters from Lake Purrumbete were banned from taking water the entire year.

The Anglesea borefield was commissioned in October 2009 to supplement the Geelong water supply system. Towns supplied from the Geelong system were on Stage 4 Ex restrictions until March 2010 when restrictions were eased to Stage 3.

The total volume of surface water and groundwater taken under entitlements in the basin was slightly less compared to 2008–09.

30.2 Responsibilities for management of water resources

Table 30-1 shows the responsibilities of various authorities within the Otway Coast basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 30-1 Responsibilities for water resources management within the Otway Coast basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions		
Wannon Water	Provides domestic and stock supplies to farms across parts of the Otway Coast, Corangamite, Hopkins and Portland Coast basins[(1)]		Supplies towns in the west of the basin including Cobden, Timboon, Peterborough and Port Campbell[(1)]	Obliged to meet passing-flow requirements
Barwon Water			Supplies the majority of towns in the basin including, Lorne Aireys Inlet, Apollo Bay and part of the Geelong area. Also transfers to Colac	Operates West Gellibrand Reservoir Obliged to meet passing-flow requirements
Corangamite Catchment Management Authority				Manages waterways for the whole of the Otway Coast basin

Note:

(1) The Otway water supply system extends westward to Warrnambool and Koroit and north to Lismore and Derrinallum, supplying Cobden, Camperdown, Terang and Allansford on the way. Port Campbell, Timboon and Peterborough are supplied via a separate linked system drawing on the Dilwyn aquifer at Port Campbell.

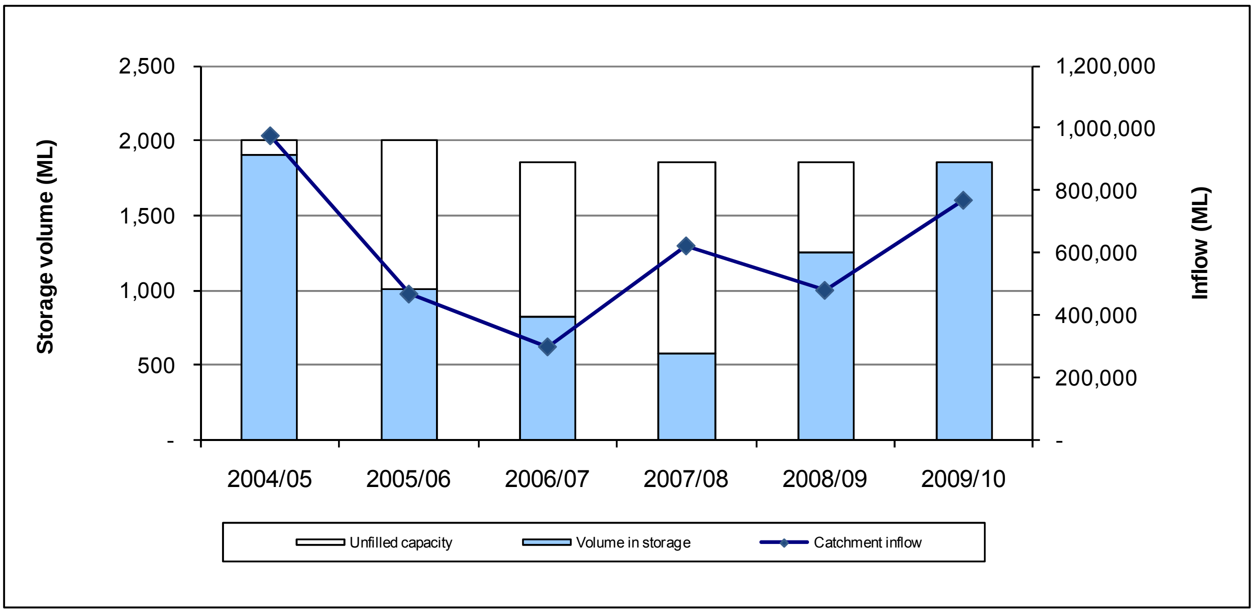
30.3 Rainfall, flows and storages in 2009–10

In 2009–10 rainfall in the Otway Coast basin ranged between 80% and 125% of the long-term average. Inflows in 2009–10 were 87% of the long-term average of 884,000 ML. Inflows in 2008–09 were only 54% of the long-term average.

The amount of water flowing from the Otway basin into Bass Strait increased to 738,900 ML in 2009–10. This represented 96% of the catchment inflows into the basin, compared with 93% in 2008–09.

The only major storage in the basin is the West Gellibrand Reservoir. By the end of the year the reservoir was full, having increased from 1,200 ML in July 2009.

Figure 30-1 All major storages and catchment inflows in the Otway Coast basin



30.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Otway Coast basin are shown in Table 30-2.

Table 30-2 Summary of total water resources and water use in the Otway Coast basin, 2009–10

Water source	Total water resource (ML)[1]	Total use (ML)
Surface water	771,400	28,400
Groundwater[2]	23,900	5,700
Recycled water	1,490	330

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 30-6 and the estimated domestic and stock use presented in Table 30-7.

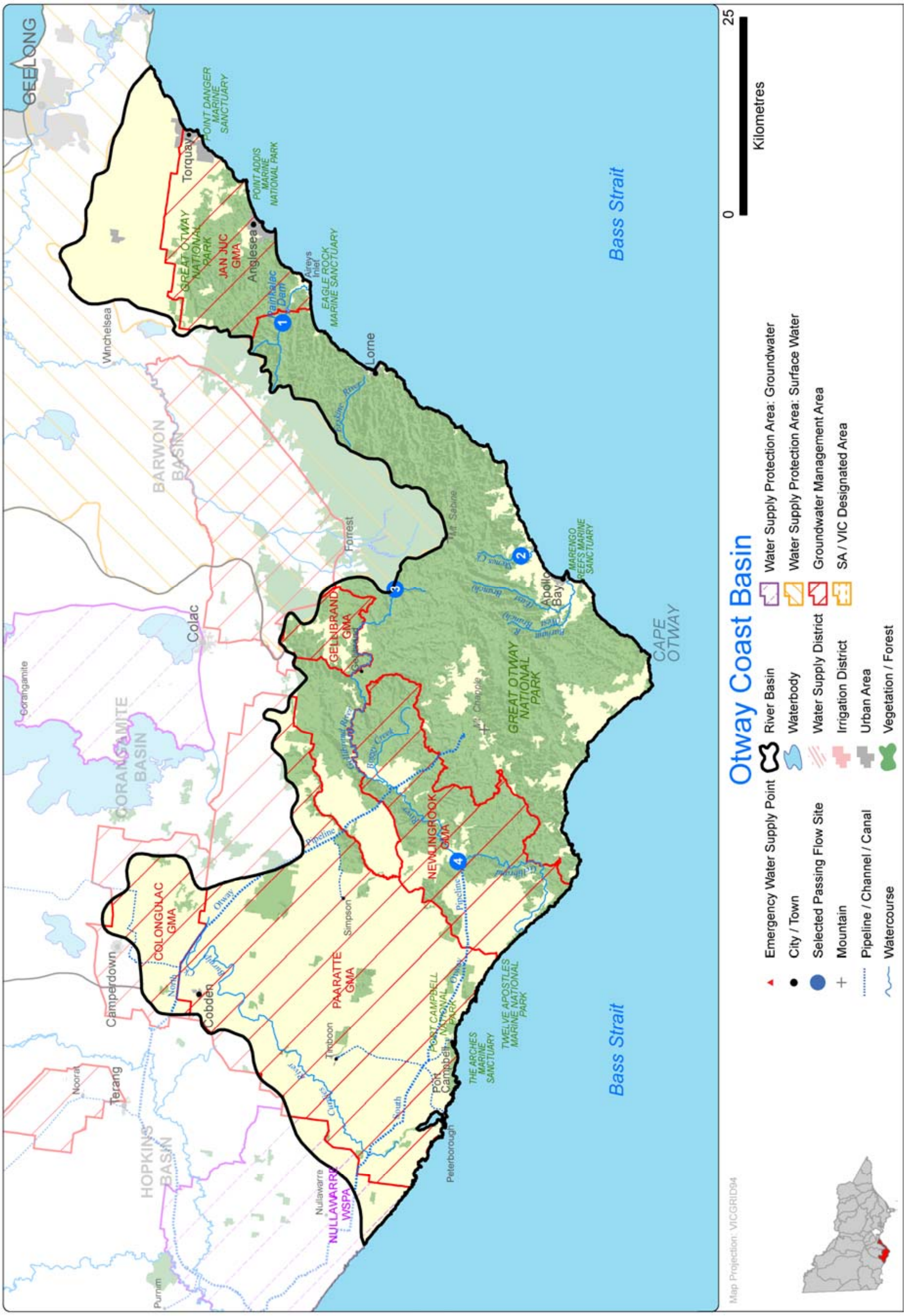
(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5. The Jan Juc bulk entitlement is based on a 5-year total of 35,000 ML.

30.4.1 Infrastructure projects to improve water availability

Barwon Water continued construction of groundwater bores, a pre- treatment plant, pump stations and transfer mains for the Anglesea Borefield project in 2009–10 to provide a new water resource for Geelong. During 2009–10, two additional bores were constructed and the transfer and treatment infrastructure was completed. Production commenced in October 2010. The project is likely to be completed in April 2011.

30.5 Location of water resources

Figure 30-2 Map of the Otway Coast basin



30.6 Surface water resources

30.6.1 Water balance

A surface-water balance for the Otway Coast basin is shown in Table 30-3.

Table 30-3 Balance of surface water in the Otway Coast basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	1,200	600
Volume in storage at end of year	1,900	1,200
Change in storage	**700**	**600**
Inflows		
Catchment inflow(1)	770,300	479,100
Rainfall on major storages	0	n/a (4)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	1,050	840
Sub-total	**771,400**	**479,900**
Usage		
Urban diversions	14,250	14,100
Licensed diversions from unregulated streams	1,300	2,700
Small catchment dams(2)	12,800	12,800
Sub-total	**28,400**	**29,600**
Losses		
Evaporation losses from major storages	0	200 (4)
Evaporation from small catchment dams(2)	3,400	3,400
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	0	0
Sub-total	**3,400**	**3,600**
Water passed at outlet of basin		
River outflows to the ocean	738,900	446,100

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(3) Assumed to be zero because data is not readily available.

(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

30.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 30-4 below are provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 30-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,700	5,400	n/a
Registered commercial and irrigation	8,800	7,400	n/a
Total	**19,500**	**12,800**	**16,200**

n/a: Information not available.

30.6.3 Water entitlement transfers

There were no transfers of water entitlements within the basin or across basin boundaries in 2009–10.

30.6.4 Volume diverted

The volume of water diverted under each bulk entitlement is shown in Table 30-5. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 30-5 Volume of water diverted under surface water entitlements in the Otway Coast basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
Barwon Water					
Aireys Inlet	1	317	-	173	Yes
Apollo Bay	1	365	-	331	Yes
Colac	1	5,400	-	4,020	Yes
Gellibrand	1	60	-	21	Yes
Lorne	1	510	-	344	Yes
Wannon Water					
Otway system	1	12,580	-	9,366	Yes
Total annual volume of bulk entitlements 2009–10		**19,232**	**-**	**14,254**	
Total annual volume of bulk entitlements 2008–09		**19,232**	**-**	**14,096**	
Licensed diversions from unregulated streams 2009–10		*5,533*		*1,254*	
Licensed diversions from unregulated streams 2008–09		*8,942*		*2,671*	

30.7 Groundwater resources

A summary of licensed entitlements and use from groundwater management units within the Otway Coast basin, excluding domestic and stock use, is presented in Table 30-6.

The Otway Coast basin contains all of the Jan Juc GMA and Newlingrook GMA as well as part of the Colongulac GMA, Gellibrand GMA, Paaratte GMA and Nullawarre WSPA. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Total groundwater use in the Otway Coast basin for 2009–10 was slightly reduced to that extracted in 2008–09. The first groundwater bulk entitlement was granted to Barwon Water on 1 July 2009. The Bulk Entitlement (Anglesea Groundwater) Order 2009 allows Barwon Water to extract a maximum of 10,000 ML of groundwater in any given year, however, an average of 7,000 ML per year over any five year period cannot be exceeded. The bulk entitlement will supplement supply to homes and businesses in the Greater Geelong region. Groundwater extraction under the bulk entitlement in 2009–10 was 1,615 ML.

Table 30-6 Licensed groundwater volumes, Otway Coast basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Colongulac GMA (55%)	≤60	2,577	2,219	376	-	376	437
Gellibrand GMA (90%)	All depths	-	-	-	-	-	0
Jan Juc GMA (100%)(5)	All depths	39,250	14,250(7)	3,457	-	3,457	3,361
Newlingrook GMA (100%)	All depths	1,977	1,947	95	-	95	559
Paaratte GMA (85%)	>120	3,932	2,726	249	-	249	0
Nullawarre WSPA (11%)	≤250	2,248	2,248	1,041	-	1,041	1,432
Total(6)		**49,984**	**23,390**	**5,218**	**-**	**5,218**	**5,789**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) The PCV for Jan Juc GMA is as follows: Zone 1 (all formations) at 250 ML per year, Zone 2 (Upper Easter View Formation) at 4,000 ML per year, Zone 2 (Lower Eastern View Formation (35,000 ML in total in any five year period) and Zone 2 (all formations other than Upper Eastern View and Lower Eastern View) at 0 ML per year.

(6) Total volumes are based on the sum of management unit data prior to rounding.

(7) The Jan Juc GMA includes the Bulk Entitlement (Anglesea Groundwater) 2009.

An estimate of domestic and stock groundwater use is provided in Table 30-7.

Table 30-7 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Colongulac GMA (55%)	100	200
Gellibrand GMA (90%)	4	8
Jan Juc GMA (100%)	6	12
Newlingrook GMA (100%)	12	24
Paaratte GMA (85%)	10	20
Nullawarre WSPA (11%)	107	214
Total	**239**	**478**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 30-6.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

In the Otway Coast basin, groundwater is used for urban water supply in the townships of Port Campbell, Timboon, Peterborough and Koroit as well as the areas around Carlisle and Curdie Vale. The licensed entitlements and metered use for these groundwater supplies is provided in Table 30-8.

Table 30-8 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Otway system (Carlisle)	1,800	7	437
Port Campbell, Timboon, Peterborough and Curdie Vale	3,159	335	334
Total	**4,959**	**342**	**771**

30.8 Drought contingency measures

One of the drought contingency measures implemented in the Otway Coast basin in 2009–10 was the imposition of restrictions on urban and rural water use (discussed in section 30.9)

30.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions are shown in Table 30-9.

Towns in the east of the basin faced higher restrictions than those in the south. Stage 4 restrictions were enforced in towns supplied by the Geelong water system, but reduced to Stage 3 towards the end of the year. Apollo Bay residents were placed on Stage 2 restrictions during the tourist season. Towns in the west of the basin are supplied by groundwater and were unrestricted during 2009–10.

Licensed diverters from Lake Purrumbete and Curdies River were banned from taking water the entire year, while Gellibrand River diverters experienced moderate restrictions.

Table 30-9 Seasonal allocations and restrictions on water use in Otway Coast basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Skenes Creek, Apollo Bay, Marengo	Stage 2 restrictions from November 2009 to April 2010
	Geelong and surrounding towns	Stage 4e restrictions from July 2009 to February 2010, Stage 3 restrictions from March to June 2010
Licensed diversions from unregulated streams	Lake Purrumbete	Irrigation ban from July 2009 to June 2010
	Curdies River	Irrigation ban from January to June 2010
	Gellibrand River	Stage 2 restrictions from January to June 2010

30.10 Recycled water

Wastewater treatment plants within the Otway Coast basin are operated by Barwon Water and Wannon Water, with the largest plants located at Lorne and Apollo Bay. In 2009–10, 18% of the volume of treated wastewater was used within the Otway Coast basin (Table 30-10), which represents a decrease in the percentage of recycled water from 2008–09. There was an increase in the volume of water produced, but a decrease in the volume recycled in 2009–10 when compared to 2008–09.

Table 30-10 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[3]
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Aireys Inlet	99	99	100%	-	99	-	-	-	-
Anglesea	277	95	22%	-	62	-	33	215	(33)
Apollo Bay	469	15	0%	-	0	-	15	468	(15)
Cobden	214	20	9%	-	20	-	-	66	128
Lorne	289	15	0%	-	-	-	15	289	(15)
Port Campbell	59	22	37%	-	22	-	-	-	37
Simpson	25	1	4%	-	1	-	-	9	15
Timboon	59	61	103%	-	61	-	-	-	(2)
Total 2009–10	**1,491**	**328**	**18%**	**-**	**265**	**-**	**63**	**1,047**	**116**
Total 2008–09	**1,259**	**382**	**26%**	**-**	**322**	**-**	**60**	**840**	**37**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage, or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

30.11 Water for the environment

30.11.1 Environmental Water Reserve (EWR)

There are several important environmental assets in the Otway Basin that depend on the EWR, these include:

- Aire River, which is considered to be a Heritage River, and more specifically the Lower Aire wetlands are of national significance, Aire River estuary of state significance, and Upper Aire River which is a Representative River
- Ecologically healthy rivers, including Elliot River, Parker River, Grey River, Carisbrook Creek and Smythes Creek
- Native fish community and their habitat such as river blackfish, remnant riparian vegetation and the Australian Grayling, and several others
- Lake Constin and Lake Craven
- endangered flow-dependent Ecological Vegetation Classes (EVCs) including estuarine wetland and swamp scrub
- Native bird population, including Great Egret (A Victorian Rare or Threatened Species), Cape Barren Goose, and Australasian Bittern
- Native mammal community including platypus and Swamp Antechinus
- Macroinvertebrate communities in areas compliant with SEPP including Elliott River, St Georges River and Wye River.

In 2009–10 the Otway Coast basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Barwon Water and Wannon Water
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions
- all other water in the basin not allocated for consumptive use.

30.11.2 Passing-flow compliance

Wannon Water reported that all passing-flow requirements under their bulk entitlements in the Otway Coast basin were met in 2009–10.

Barwon Water met all of its passing-flow requirements except during pipeline repairs at the West Gellibrand Reservoir. There is ongoing replacement of high risk sections of the main.

Table 30-11 shows the passing-flow requirements in the Otway Coast basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest.

Table 30-11 Selected passing-flow compliance in the Otway Coast basin

River	Passing flow	
Painkalac Creek	Instrument where passing flows are specified	Bulk Entitlement (Aireys Inlet) Conversion Order 1997
	Responsible authority	Barwon Water
	Compliance point	Painkalac Creek Reservoir (shown as 1 in Figure 30-2)
	Passing-flow compliance	• From December to February inclusive natural inflows were passed downstream of the reservoir • From March to November inclusive the lesser of 0.5 ML per day or natural flows were passed downstream of the reservoir
Barham River, Skenes Creek	Instrument where passing flows are specified	Bulk Entitlement (Apollo Bay and Skenes Creek) Conversion Order 1997
	Responsible authority	Barwon Water
	Compliance point	Skenes Creek diversion weir (shown as 2 in Figure 30-2)
	Passing-flow compliance	• The lesser of 1.5 ML per day or natural flows were passed below the weir • 1.5 ML per day were passed when flows were between 1.5 and 1.93 ML per day • When flows were greater than 1.93 ML per day, flows equal to the entire flow, less 0.43 ML per day, were passed • Note the minimum passing flow was 1.5 ML per day
Arkins Creek West, Arkins Creek East, First Creek, Gellibrand River	Instrument where passing flows are specified	Bulk Entitlement (Otway System) Conversion Order 1998
	Responsible authority	Wannon Water
	Compliance point	Gellibrand River – North Otway pump station (shown as 3 in Figure 30-2)
	Passing-flow compliance	• When flows were equal to or less than 12 ML per day, no passing flows were made • When flows were between 12 and 22.5 ML per day, 12 ML per day were passed below the pump station • When flows were between 22.5 and 44.9 ML per day, 17.5 ML per day were passed below the pump station • When flows were between 44.9 and 54.9 ML per day, 20 ML per day were passed below the pump station • When flows were 54.9 ML per day or greater, 22.5 ML per day were passed below the pump station
	Compliance point	Gellibrand River – South Otway pump station (shown as 4 in Figure 30-2)
	Passing-flow compliance	• When flows were equal to or less than 12 ML per day, no passing flows were made • When flows were between 12 and 22 ML per day, 12 ML per day were passed below the pump station • When flows were between 22 and 32.7 ML per day, 17 ML per day were passed below the pump station • When flows were between 32.7 and 41.2 ML per day, 19 ML per day were passed below the pump station • When flows were 41.2 ML per day or greater, 21.5 ML per day were passed below the pump station

30.11.3 Streamflow management plans (SFMPs)

A streamflow management plan was to be developed for the Gellibrand River. However recent environmental flow studies of the river and estuary showed that the Gellibrand River was generally compliant with the recommended environmental low flows. Management options for the Gellibrand River will be set in the Western Region Sustainable Water Strategy.

31 Hopkins basin

This chapter sets out the accounts for the Hopkins basin. For detailed information about how they have been compiled, refer to Chapter 5.

31.1 Hopkins basin summary

Inflows in 2009–10 were 41% of the long-term average (of 635,000 ML), which is the highest recorded since 2004–05.

Groundwater is a significant resource in the Hopkins basin, many of Wannon Water's towns are supplied solely by groundwater and groundwater is an important supplement for Central Highlands Water and Grampians Wimmera Mallee Water towns. Groundwater use was unrestricted during 2009–10, but use decreased compared to 2008–09, particularly in the Nullawarre WSPA. Central Highlands Water's reliance on the Ballarat West borefield also lessened in 2009–10 due to surface water transfers from the Goulburn basin via the Goldfields Superpipe.

Restrictions were reduced for most towns in the Hopkins basin over the year. At the end of June 2010 only Streatham and Westmere remained on severe Stage 4 restrictions due to capacity constraints of the groundwater bores.

The volume of diversions from unregulated streams also decreased compared to 2008–09. Unregulated diversions were banned for Lake Cartcarrong for the whole year, and restrictions were in place for a few rivers and creeks, mostly during the second half of the year

31.2 Responsibilities for management of water resources

Table 31-1 shows the responsibilities of various authorities within the Hopkins basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 31-1 Responsibilities for water resources management within the Hopkins basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions		
Wannon Water			Supplies towns in the south of the basin including Warrnambool	
Grampians Wimmera Mallee Water			Supplies towns in the north of the basin including Ararat	
Central Highlands Water			Supplies towns in the north east of the basin including Beaufort and Skipton	Obliged to meet passing-flow requirements
Glenelg Hopkins Catchment Management Authority				Manages waterways in the whole of the Hopkins basin

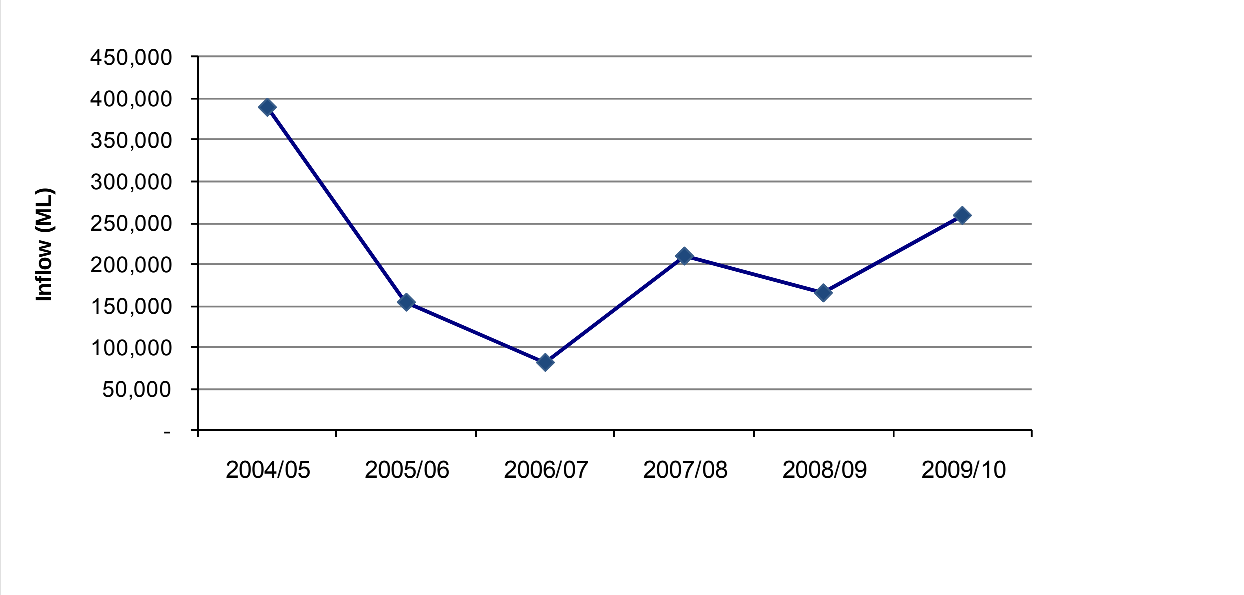
31.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Hopkins basin ranged between 80% and 125% of the long-term average. Inflows in 2009–10 were 41% of the long-term average (of 635,000 ML), which is the highest recorded since 2004–05.

The volume of water flowing from the Hopkins basin into Bass Strait was 167,800 ML in 2009–10 which represents 65% of the inflow. This is an increase from 121,500 ML in 2008–09, which represented 73% of catchment inflows.

There are no major storages (greater than 1,000 ML) in the Hopkins basin.

Figure 31-1 Catchment inflows in the Hopkins basin



31.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Hopkins basin are shown in Table 31-2.

Table 31-2 Summary of total water resources and water use in the Hopkins basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	264,600	66,700
Groundwater(2)	40,300	17,500
Recycled water	5,420	560

Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 31-7, and the estimated domestic and stock use presented in Table 31-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

31.5 Location of water resources

Figure 31-2 Map of the Hopkins basin

31.6 Surface water resources

31.6.1 Water balance

A water balance for the Hopkins basin is shown in Table 31-3. There are no major water storages (greater than 1,000 ML in size) in the basin.

Small catchment dams harvest most of the water used for consumptive purposes.

Transfers into the basin for urban water supply did not affect streamflows and are therefore not accounted for in the water balance for the Hopkins basin.

Table 31-3 Balance of surface water in the Hopkins basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow(1)	259,400	166,000
Rainfall on major storages	0	n/a(5)
Transfers from other basins(2)	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	5,220	4,290
Sub-total	**264,600**	**170,300**
Usage		
Urban diversions	300	220
Licensed diversions from unregulated streams	1,800	2,300
Small catchment dams(3)	64,600	31,000
Sub-total	**66,700**	**33,500**
Losses		
Evaporation losses from major storages	0	0(5)
Evaporation from small catchment dams(3)	30,100	15,300
In-stream infiltration to groundwater, flows to floodplain and evaporation(4)	0	0
Sub-total	**30,100**	**15,300**
Water passed at outlet of basin		
River outflows to the ocean	167,800	121,500

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Water from other basins used to supply urban needs are not shown as they were provided directly into the relevant urban supply systems and did not affect streamflows in the Hopkins basin.

(3) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(4) Assumed to be zero because data is not readily available.

(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

31.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 31-4 below have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 31-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	30,900	15,500	n/a
Registered commercial and irrigation	58,400	49,100	n/a
Total	**89,300**	**64,600**	**94,700**

n/a: Information not available.

31.6.3 Water entitlement transfers

There are no declared systems in the Hopkins basin. Surface water movement was limited to transfers of licences within the basin. In 2009–10, there were no entitlements transferred on a permanent basis, and 355 ML traded on a temporary basis. There was water imported into the basin.

Table 31-5 summarises the movement of bundled entitlements in the Hopkins basin during 2009–10.

Table 31-5 Transfers of surface water bundled entitlements in the Hopkins basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
Hopkins Unregulated	0	0	0	355	355	0
Total 2009–10	0	0	0	355	355	0
Total 2008–09	1	1	0	144	144	0

31.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 31-6. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10. No water was extracted under the Skipton bulk entitlement as the town was supplied from the Ballarat system.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 31-6 Volume of water diverted under surface water entitlements in the Hopkins basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?
Central Highlands Water					
Beaufort	1	419	-	295	Yes
Skipton(3)	1	210	-	-	Yes
GWMWater					
Willaura, Moyston, Lake Bolac and Wickliffe(2)	-	-	-	-	Yes
Total annual volume of bulk entitlements 2009–10		**629**	**-**	**295**	
Total annual volume of bulk entitlements 2008–09		**629**	**-**	**223**	
Licensed diversions from unregulated streams 2009–10		*10,348*		*1,798*	
Licensed diversions from unregulated streams 2008–09		*9,607*		*2,309*	

Note:

(1) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(2) These towns are supplied by the Mt William supply system and are yet to be converted to formalised bulk entitlements.

(3) No water was extracted under the Skipton bulk entitlement as the town was supplied from the Ballarat system.

31.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Hopkins basin, excluding domestic and stock use, is presented in Table 31-7.

The Hopkins basin contains all of the Glenormiston GMA as well as parts of the Nullawarre WSPA, Upper Loddon WSPA, Yangery WSPA, Cardigan GMA and Colongulac GMA. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A. Good quality groundwater of reasonable yields is found in the unincorporated areas around the Nullawarre and Yangery WSPAs, and use from these unincorporated areas is expected to increase in the future. Groundwater levels in Nullawarre and Yangery WSPAs are generally stable, with declining trends in Upper Loddon WSPA and Cardigan GMA. Insufficient observation bores were available to determine a trend for Colongulac and Glenormiston GMAs.

Groundwater use in the Hopkins basin has decreased by about 19% in 2009–10 compared with 2008–09. This is largely due to the decrease in extractions in the Nullawarre WSPA.

Table 31-7 Licensed groundwater volumes, Hopkins basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Cardigan GMA (61%)	All depths	3,076	3,028	644	-	644	2,273
Colongulac GMA (9%)	≤60	416	358	61	-	61	70
Glenormiston GMA (100%)	≤60	2,565	2,463	658	-	658	790
Nullawarre WSPA (89%)	≤250	19,032	19,031	8,818	-	8,818	12,128
Upper Loddon WSPA (24%)	All depths	3,282	3,190	1,184	-	1,184	1,218
Yangery WSPA (60%)	≤100	8,520	8,519	2,432	-	2,432	2,922
Total(5)		**36,891**	**36,589**	**13,796**	**-**	**13,796**	**19,401**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included. Cardigan GMA has 60.7% of its service area in the Hopkins Basin, 19.5% in the Corangamite Basin and 19.8% in the Barwon Basin. The Cardigan GMA has 3,887 ML of licensed entitlement of which 644 ML of metered groundwater use was extracted within the Hopkins Basin. The remaining 78 ML of metered use is shared on a proportional basis between Barwon and Corangamite basins. Only the non-urban licensed volume is allocated according to the surface area percentages.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV).

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 31-8.

Table 31-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Cardigan GMA (61%)	67	134
Colongulac GMA (9%)	16	32
Glenormiston GMA (100%)	110	220
Nullawarre WSPA (89%)	907	1,814
Upper Loddon WSPA (24%)	94	188
Yangery WSPA (60%)	659	1,318
Total	**1,853**	**3,706**

Notes:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the Table 31-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

In the Hopkins basin, groundwater is provided to the townships of Mortlake, Warrnambool, Koroit, Allansford, Caramu, Darlington and Willaura. Additionally, groundwater from the Willaura (Mt William) bores is supplied to Glenthompson in the Glenelg basin through an agreement between Wannon Water and GWMWater. The licensed entitlements and metered use for these groundwater supplies is provided in Table 31-9.

Table 31-9 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Caramut	50	23	31
Darlington	10	2	2
Koroit	524	2	0
Mortlake	335	19	26
Warrnambool, Allansford and Koroit	750	465	434
Willaura, Glenthompson	140	30	76
Ballarat(1)	1,700	525	1,689
Beaufort	200	1	3
Streatham	60	43	42
Total	**3,769**	**1,110**	**2,303**

Notes:

(1) The licensed volume is 1,700 ML, however, up to 3,000 ML can be taken during periods of water shortage.

31.8 Drought contingency measures

The main drought contingency measures in place in the Hopkins basin in 2009–10 was restrictions on urban and rural water use (discussed in section 31.9).

31.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions are shown in Table 31-10.

A number of towns located within the Hopkins basin were subjected to Stage 4 water restrictions for part of the year. However, some of these are supplied from systems that source water from outside the basin, such as the Grampians and Ballarat headworks.

Licensed diverters on a number of unregulated rivers were restricted at various times during the year, with restrictions generally being more severe over the summer months.

Groundwater use was unrestricted in the Hopkins basin during 2009–10.

Table 31-10 Seasonal allocations and restrictions on water use in Hopkins basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Beaufort, Raglan	Stage 4 restrictions in July 2009, Stage 3 restrictions from August to October 2009, Stage 1 restrictions from November 2009 to February 2010.
	Skipton (Ballarat system)	Stage 4 restrictions from July to October 2009, Stage 4 Ex restrictions from November to December 2009, Stage 3 restrictions from January to June 2010.
	Ararat	Stage 4 Ex restrictions from July to September 2009, Stage 1 restrictions from October 2009 to July 2010
	Buangor, Wickliffe and Willaura	Stage 2 restrictions from July to September 2009
	Lake Bolac	Stage 2restrictions from July to October 2009
	Streatham and Westmere	Stage 4 restrictions from July 2009 to June 2010
Licensed diversions from unregulated streams	Merri River	Stage 1 restrictions from July to September 2009 and from January to June 2010
	Mt Emu Creek	Stage 4 restrictions from January to May 2010
	Hopkins River	Stage 2 restrictions from January to June 2010
	Lake Cartcarrong	Irrigation ban from July 2009 to June 2010

31.10 Recycled water

Three separate water authorities operate wastewater treatment plants within the Hopkins basin. The largest volume of water is from the Warrnambool Treatment Plant. The volume of recycled water and percent recycled reduced slightly in 2009–10 when compared to the previous year.

Table 31-11 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Ararat	282	286	100%	125	157	-	4	-	(4)
Beaufort	63	-	0%	-	-	-	-	63	-
Cardigan Village	-	-	0%	-	-	-	-	-	-
Mortlake	130	61	47%	-	61	-	-	-	69
Terang(4)	239	214	89%	-	214	-	-	-	25
Warrnambool	4,676	-	0%	-	-	-	-	5,129	(453)
Willaura	29	-	0%	-	-	-	-	29	0
Total 2009–10	**5,421**	**561**	**10%**	**125**	**432**	**-**	**4**	**5,222**	**(362)**
Total 2008–09	**4,957**	**594**	**12%**	**96**	**490**	**-**	**9**	**4,293**	**70**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

31.11 Water for the environment

31.11.1 Environmental Water Reserve (EWR)

Important environmental assets, such as the coastal saltmarsh wetlands and the wetlands associated with the Merri River Estuary, depend on the Hopkins basin EWR.

In 2009–10 the Hopkins basin EWR comprised the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Central Highlands Water and GWMWater
- water set aside for the environment through the operation of licensed diversions in passing-flow conditions, particularly for Cudgee Creek and Mt Emu Creek.
- all other water in the basin not allocated for consumptive use.

31.11.2 Passing-flow requirements

Bulk entitlements require passing flows to be met at a number of points in the basin.

Table 31-12 shows the passing-flow requirements in the Hopkins basin for a selected bulk entitlement compliance point. While there are other compliance points, the point below has been chosen as it was judged to be of community interest. The location of these compliance points is presented in Figure 31-2.

Central Highlands Water did not report any non-compliance with their bulk entitlements within the Hopkins basin.

Table 31-12 Selected passing-flow compliance in the Hopkins basin at selected sites

River	Passing flow	
Cave Hill Creek, Glut Creek, Side Spring Creek	Instrument where passing flows are specified	Bulk Entitlement (Beaufort) Conversion Order 2005
	Responsible authority	Central Highlands Water
	Compliance point	Cave Hill Creek Weir (shown as 1 in Figure 31-2)
	Passing-flow compliance	The lesser of 0.2 ML per day or natural inflow were passed below Cave Hill Creek weir, when this did not affect supply to Raglan

.

31.11.3 Streamflow management plans (SFMPs)

The Western Region Sustainable Water Strategy will propose future management arrangements for the Merri River.

32 Portland Coast basin

This chapter sets out the accounts for the Portland Coast basin. For detailed information about how they have been compiled, refer to Chapter 5.

32.1 Portland Coast basin summary

Estimated inflows to the Portland Coast basin were 77% of the long-term average in 2009–10, almost double those recorded in 2008–09. .

As with other river basins in Western Victoria, groundwater is a significant resource in the Portland Coast basin. Groundwater extraction accounted for over 50% of the total water usage in the Porland Coast basin.

The major towns in the basin are also supplied by groundwater, and in particular the Dilwyn aquifer. The yields from these sources were adequate to provide unrestricted supplies to these towns.

Bans on licensed diversions were placed on a number of unregulated rivers in the basin in the second half of the year, following lower rainfall over the summer period.

32.2 Responsibilities for management of water resources

Table 32-1 shows the responsibilities of various authorities within the Portland Coast basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 32-1 Responsibilities for water resources management within the Portland Coast basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversion		
Wannon Water			Supplies Koroit, Port Fairy, Heywood and Portland	
Glenelg Hopkins Catchment Management Authority				Manages waterways in the whole Portland Coast basin

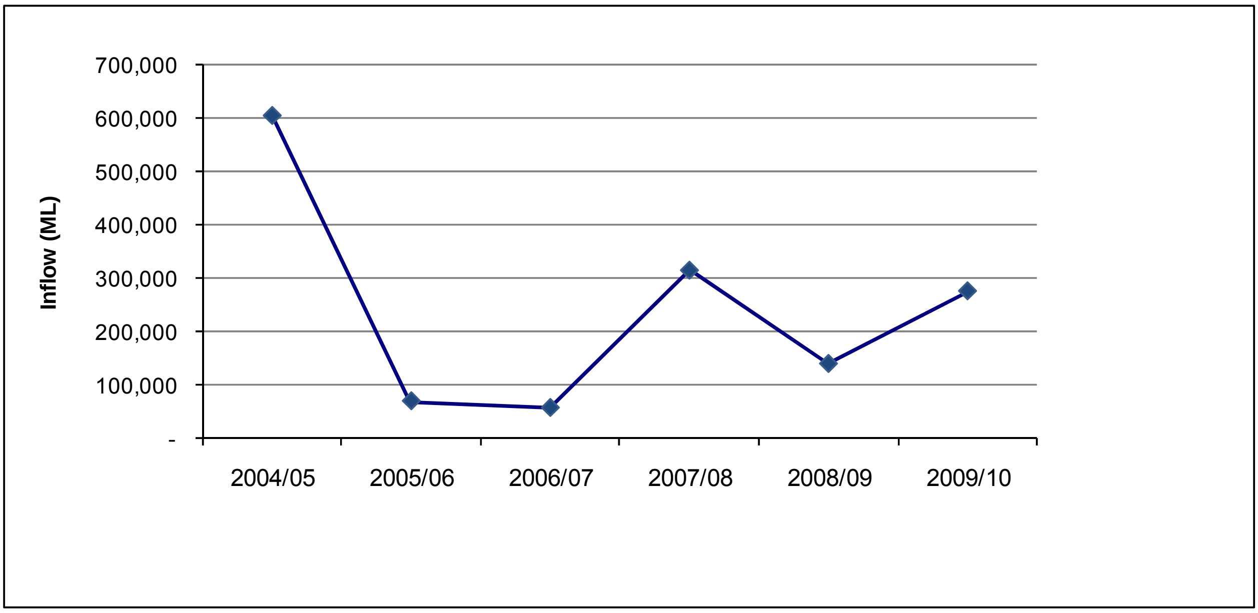
32.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall in the Portland Coast basin ranged between 80% and 125% of the long-term average, which was similar to 2008–09. However, estimated inflows of 276,500 ML in 2009–10 were about double those of the previous year. Overall, inflows were 77% of the long-term average in 2009–10, up from 39% in 2008–09.

The amount of water flowing from the Portland Coast basin into Bass Strait was 258,200 ML in 2009–10, a significant increase from the previous year. This represents 93% of the catchment inflows into the basin.

There are no major storages (greater than 1,000 ML) in the basin.

Figure 32-1 Catchment inflows in the Portland Coast basin



32.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Portland Coast basin are shown in Table 32-2.

Table 32-2 Summary of total water resources and water use in the Portland Coast basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	278,900	16,300
Groundwater(2)	42,100	19,000
Recycled water	2,560	140

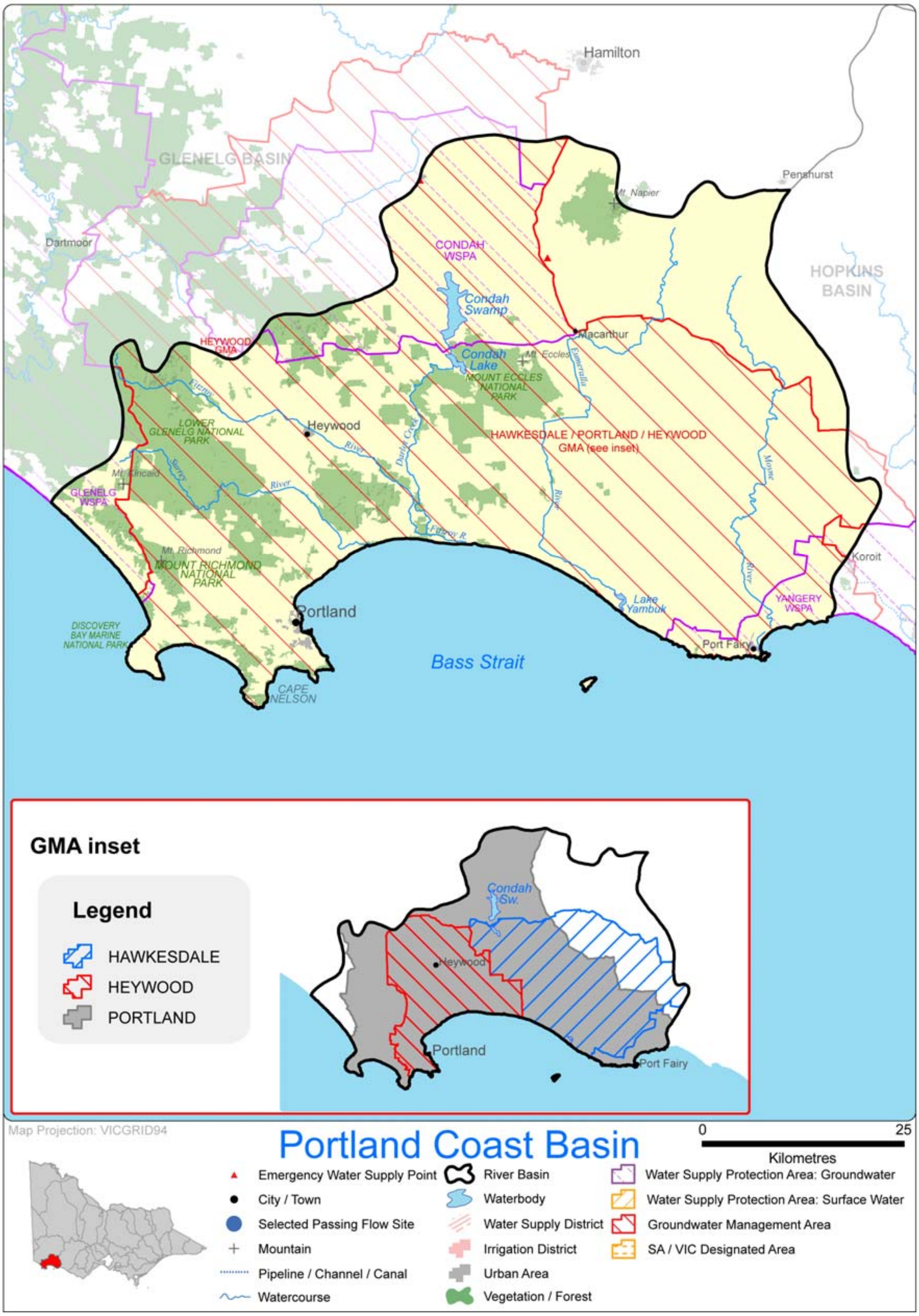
Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 32-5 and the estimated domestic and stock use presented in Table 32-6.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5 and footnote (1) beneath Table 32-5.

32.5 Location of water resources

Figure 32-2 Map of the Portland Coast basin



32.6 Surface water resources

32.6.1 Water balance

A water balance for the Portland Coast basin is shown in Table 32-3.

Of the total inflows approximately 6% were diverted for consumptive use, mainly from small catchment dams. All towns serviced by Wannon Water in this basin are supplied by groundwater or from other river basins.

Table 32-3 Balance of surface water in the Portland Coast basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	0	0
Volume in storage at end of year	0	0
Change in storage	**0**	**0**
Inflows		
Catchment inflow(1)	276,500	139,800
Rainfall on major storages	0	n/a(5)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river (4)	2,400	2,140
Sub-total	**278,900**	**141,900**
Usage		
Urban diversions	0	0
Licensed diversions from unregulated streams	100	100
Small catchment dams(2)	16,200	16,200
Sub-total	**16,300**	**16,300**
Losses		
Net evaporation losses from major storages	0	0(5)
Evaporation from small catchment dams(2)	4,400	4,400
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	0	0
Sub-total	**4,400**	**4,400**
Water passed at outlet of basin		
River outflows to the ocean	258,200	121,200

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(3) Assumed to be zero because data is not readily available.

(4) This value was reported incorrectly in the 2008–09 Accounts and has been updated in these accounts.

(5) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

32.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 32-4 below have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 32-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	4,500	2,300	n/a
Registered commercial and irrigation	16,500	13,900	n/a
Total	**21,000**	**16,200**	**20,600**

n/a: Information not available.

32.6.3 Water entitlement transfers

There were no transfers of water entitlements within the basin or across basin boundaries in 2009–10.

32.6.4 Volume diverted

There are no bulk entitlements for surface water in the Portland Coast basin. All surface water is diverted from unregulated streams under licences. In 2009–10, about 92 ML out of a total licence volume of 2,014 ML was diverted for use in the basin compared to 67 ML in 2008–09.

32.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Portland Coast basin, excluding domestic and stock use, is presented in Table 32-5.

The Portland Coast basin contains all of the Heywood GMA and Hawkesdale GMA as well as part of the Condah WSPA (52%), Yangery WSPA (40%) and Portland GMA (73%).

The Portland Coast basin recorded a decrease of 9% in groundwater use compared to 2008–09. Groundwater levels in the Condah WSPA, Portland GMA and Yangery WSPA are stable. Insufficient observation bores were available to determine trends for the Heywood and Hawkesdale GMA. New bores were drilled in 2008–09 to improve the network coverage. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

The Portland GMA comprises the deep, geothermal waters of the Dilwyn Formation aquifer, which is recharged in its northern parts where it is closer to the ground surface. The change in land use in its recharge zones has the potential to deplete recharge to the aquifer and its impact is being considered in the management of groundwater resources.

Table 32-5 Licensed groundwater volumes, Portland Coast basin 2009–10

WSPA/GMA(1)	GMA/ WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Hawkesdale GMA (100%)	Zone 1 All depths Zone 2 <200	16,161	11,753	5,214	-	5,214	5,622
Heywood GMA (100%)	≤70	8,500	6,564	1,578	-	1,578	1,360
Portland GMA (73%)	>200	7,736	7,736	2,726	-	2,726	3,114
Condah WSPA (52%)	70-200	3,902	3,901	1,379	-	1,379	1,664
Yangery WSPA (40%)	≤100	5,583	5,582	1,594	-	1,594	1,915
Total(5)		**41,882**	**35,536**	**12,490**	**-**	**12,490**	**13,675**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. The water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included. In Portland, out of 7,794 ML of licensed entitlement, 7,581 ML is from urban use, all extracted from the Portland Basin. The remaining 213 ML is shared on a proportional basis between Portland and Glenelg basins. Portland GMA has 73% of its service area in the Portland Basin and 27% in the Glenelg. Only the entitlement limit and non-urban licensed volume are allocated according to the surface area percentages.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 32-6.

Table 32-6 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Hawkesdale GMA (100%)	1,105	2,210
Heywood GMA (100%)	1,661	3,322
Portland GMA (73%)	37	74
Condah WSPA (52%)	44	88
Yangery WSPA (40%)	432	864
Total	**3,279**	**6,558**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the Table 32-5.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Groundwater is used as an urban water supply for the townships of Portland, Port Fairy and Heywood. The licensed entitlements and metered use for these groundwater supplies is provided in Table 32-7.

Table 32-7 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Heywood	333	172	186
Port Fairy	1,026	757	808
Portland	6,222	1,797	2,121
Total	**7,581**	**2,726**	**3,115**

32.8 Drought contingency measures

The main drought contingency measures in place in the Portland Coast basin in 2009–10 were restrictions on urban and rural water use (discussed in section 32.9).

32.9 Seasonal allocations and restrictions on water use, diversions and extractions

The major towns in the basin are supplied by groundwater, in particular the Dilwyn aquifer. The yields from these sources were adequate to provide unrestricted supplies to local towns.

A very dry summer however, meant that bans on licensed diversions were placed on a number of rivers in the basin in the second half of the year.

Restrictions applying to licensed diversions are shown in Table 32-8.

Table 32-8 Seasonal allocations and restrictions on water use in Portland Coast basin, 2009–10

Type of restriction	Area	Nature of restriction
Licensed diversions from unregulated streams	Surrey River	Irrigation ban from January to June 2010
	Fitzroy River, Eumarella River, Moyne River	Irrigation ban from January to June 2010
	Darlot Creek	Restrictions from April to May 2010

32.10 Recycled water

Wannon Water operates all treatment plants within the Portland Coast basin. In 2009–10, 6% of the total wastewater produced in the basin was reused, including 41% from the Heywood treatment plant for wood lot irrigation (a decrease from 52% in 2008–09). The percentage of recycled water (6%) has remained reasonably consistent for several years.

Table 32-9 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Heywood	346	143	41%	-	143	-	-	191	12
Port Fairy	977	0	0%	0	0	0	0	977	0
Portland	1,235	-	0%	-	-	-	-	1,235	-
Total 2009–10	**2,558**	**143**	**6%**	**-**	**143**	**-**	**-**	**2,402**	**12**
Total 2008–09	**2,330**	**144**	**6%**	**-**	**144**	**-**	**-**	**2,137**	**49**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

32.11 Water for the environment

32.11.1 Environmental Water Reserve (EWR)

In 2009–10 the Portland Coast basin EWR comprised:

- water in the basin not otherwise allocated for consumptive use, that is, water above cap

- water set aside for the environment through the operation of passing-flow conditions on licensed diversions, particularly for the Condah Drain and Darlot Creek, Fitzroy River, Moyne River and Surry River.

32.11.2 Passing-flow compliance

There are currently no bulk entitlements in operation and therefore no passing-flow obligations on water corporations in the Portland Coast basin.

33 Glenelg basin

This chapter sets out the accounts for the Glenelg basin. For detailed information about how they have been compiled, refer to Chapter 5.

33.1 Glenelg basin summary

Inflows in the Glenelg basin in 2009–10 were only 34% of the long-term average (of 964,000 ML) but more than double the inflows experienced in 2008–09. At the end of the year, the basin's largest water storage, Rocklands Reservoir, remained extremely low and was holding just 2% of capacity.

Towns supplied by the Grampians catchments, such as Balmoral and Hamilton, began the year on severe Stage 3 and Stage 4 restrictions, but restrictions were eased to lower levels in spring following improved streamflows in the lower Grampians.

Licensed diverters from the Wannon and the Glenelg Rivers were banned from taking water for the second half of the year; no diversions were permitted from a number of their tributaries throughout the whole year.

Groundwater use was unrestricted in the Glenelg basin during 2009–10.

33.2 Responsibilities for management of water resources

Table 33-1 shows the responsibilities of various authorities within the Glenelg basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 33-1 Responsibilities for water resources management within the Glenelg basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water		Manages groundwater and surface water licensed diversions for the entire basin except the Glenelg River north of the bridge on Casterton-Harrow Road		
Grampians Wimmera Mallee Water		Manages groundwater and surface water licensed diversions for the Glenelg River north of the bridge on Casterton-Harrow Road	Supplies Harrow	Operates the Wimmera Mallee supply system, which includes Rocklands and Moora Moora reservoirs, and several other small diversion weirs in the upper Glenelg and Wannon rivers
Wannon Water			Supplies all other towns in the basin	Operates reservoirs in the Hamilton supply systems Obliged to meet passing-flow requirements
Environment Minister				Manages environmental entitlement in the regulated Glenelg River
Glenelg-Hopkins Catchment Management Authority				Manages waterways in the whole of the Glenelg basin

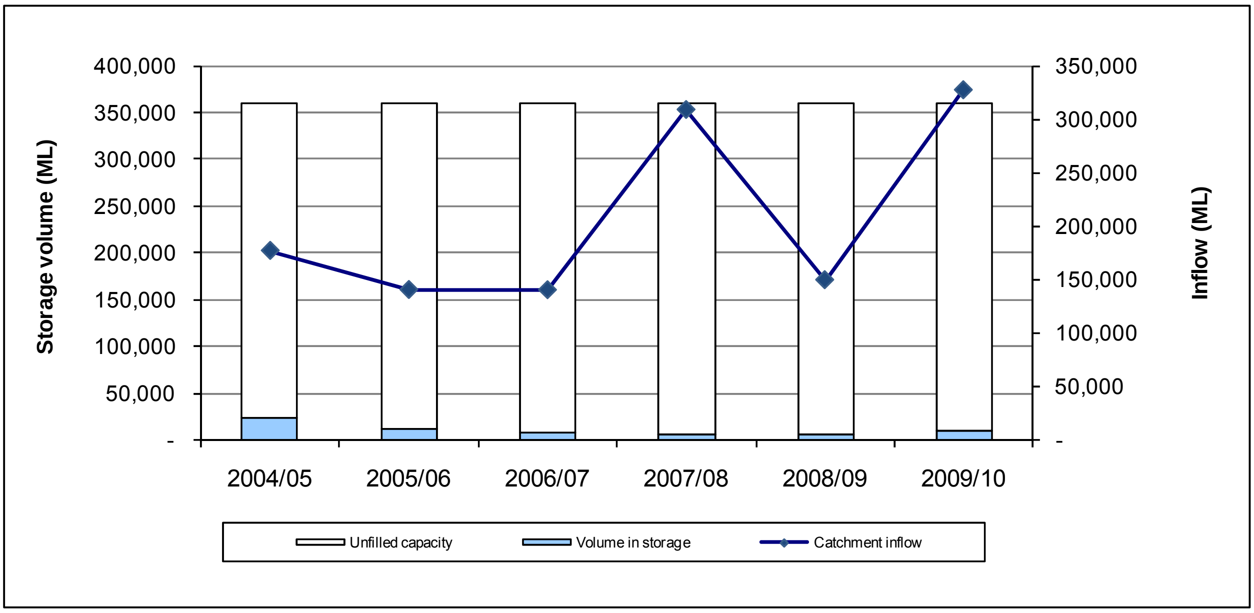
33.3 Rainfall, flows and storages in 2009–10

During 2009–10, rainfall in the Glenelg basin was between 80% and 125% of the long-term average. Inflows across the basin were 327,500 ML. This was 34% of the long-term average (of 964,000 ML) but more than double the inflows experienced in 2008–09.

The volume of water flowing from the Glenelg basin into Bass Strait was 217,200 ML in 2009–10, a significant increase from the previous year. This represented 66% of the catchment inflows into the basin, compared with 33% in 2008–09.

Four major storages are located within the basin. Rocklands Reservoir, which accounts for 97% of the total capacity of Glenelg basin storages, was holding just 2% of capacity at the end of 2009–10.

Figure 33-1 All major storages and catchment inflows in the Glenelg basin



33.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Glenelg basin are shown in Table 33-2.

Table 33-2 Summary of total water resources and water use in the Glenelg basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	332,100	60,200
Groundwater(2)	28,400	8,500
Recycled water	1,420	630

Notes:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 33-7 and the estimated domestic and stock use presented in Table 33-8.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5 and note (1) beneath Table 33-7.

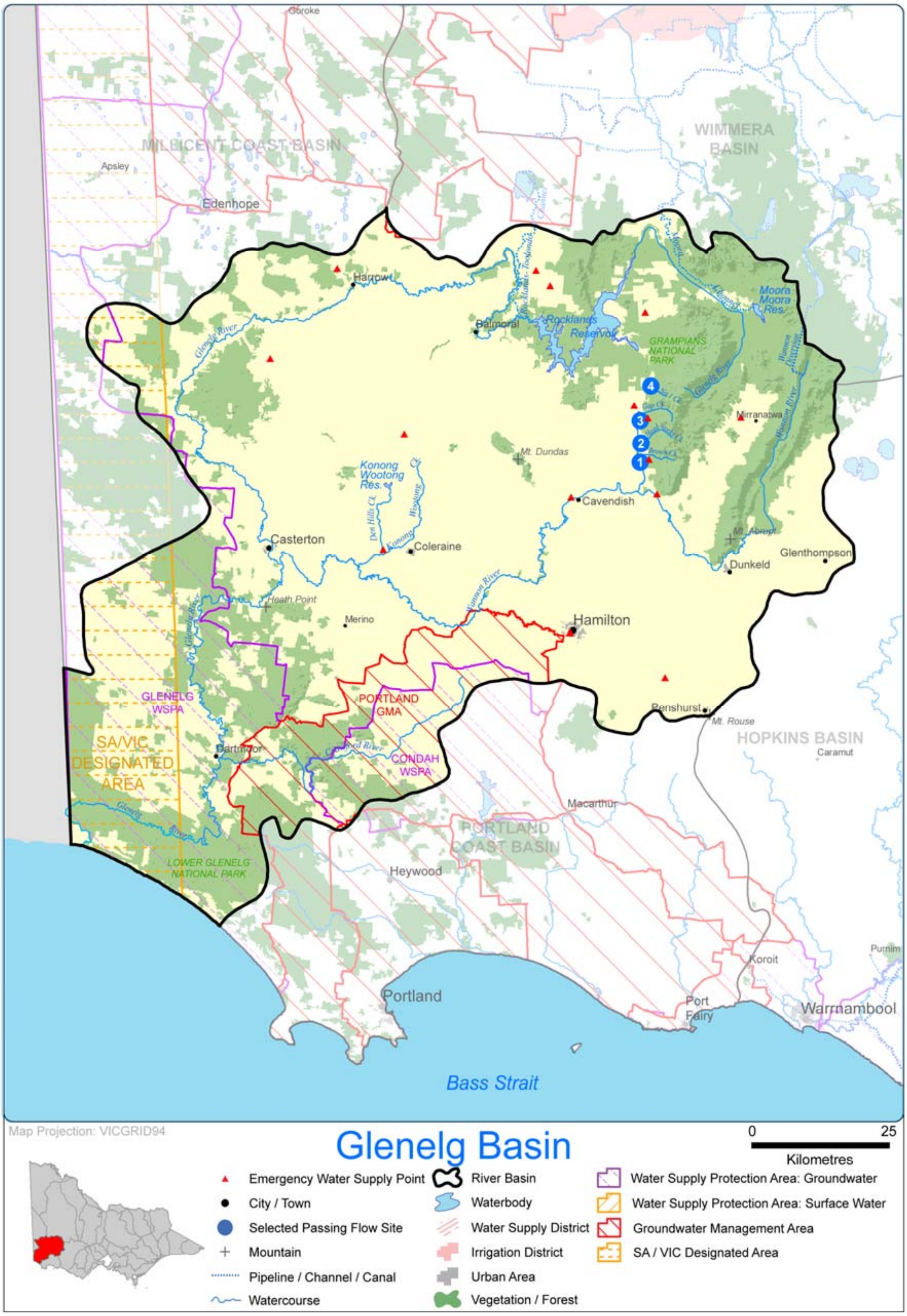
33.4.1 Infrastructure to improve water availability

Wannon Water completed construction of the 52-kilometre Hamilton-Grampians pipeline in June 2010. The pipeline was constructed to improve water security for Hamilton by connecting Hamilton to Rocklands Reservoir in the Wimmera-Mallee system.

Wannon Water also completed construction of the 29-kilometre pipeline from Casterton to Coleraine in January 2010. This pipeline will improve water quality and supply security for Coleraine. The project also included the construction of a clear water tank in Coleraine.

33.5 Location of water resources

Figure 33-2 Map of the Glenelg basin



33.6 Surface water resources

33.6.1 Water balance

A water balance for the Glenelg basin is shown in Table 33-3. A diversion of 3,300 ML occurred to the Wimmera Mallee System during 2009–10.

Table 33-3 Balance of surface water in the Glenelg basin

Water account component	2009–10 (ML)	2008–09 (ML)
Major on-stream storage		
Volume in storage at start of year	6,100	5,700
Volume in storage at end of year	10,300	6,100
Change in storage	**4,200**	**400**
Inflows		
Catchment inflow(1)	330,800	149,600
Rainfall on major storages	1,200	n/a(4)
Transfers from other basins	0	0
Return flow from irrigation	0	0
Treated wastewater discharged back to river	80	180
Sub-total	**332,100**	**149,800**
Usage		
Urban diversions	1,230	1,400
Diversions to the Wimmera Mallee Water System	3,300	4,700
Licensed diversions from unregulated streams	200	300
Small catchment dams(2)	55,500	28,300
Sub-total	**60,200**	**34,700**
Losses		
Evaporation losses from major storages	3,900	4,900 (4)
Evaporation from small catchment dams(2)	24,600	52,600
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	22,000	7,300
Sub-total	**50,500**	**64,800**
Water passed at outlet of basin		
River outflows to the ocean	217,200	49,900

Notes:

(1) Inflows have been back-calculated from outflows plus diversions.

(2) Data for water usage from small catchment dams is provided by the Department of Sustainability and Environment. Evaporation losses are calculated by subtracting estimated usage from the total water harvested.

(3) Estimated from loss functions in the Glenelg River REALM model.

(4) Evaporation loss from major storages reported for 2008–09 is actually net evaporation which accounts for rainfall.

n/a: Not applicable.

33.6.2 Small catchment dams

Specific information on usage and losses for small catchment dams for 2009–10 is not readily available. The values in Table 33-4 below have been provided by the Department of Sustainability and Environment as outlined in Chapter 5.

Table 33-4 Estimated small catchment dam information, 2009–10

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	27,100	13,600	n/a
Registered commercial and irrigation	49,900	41,900	n/a
Total	**77,000**	**55,500**	**80,100**

n/a: Information not available.

33.6.3 Water entitlement transfers

There are no declared systems in the Glenelg basin. Surface water movement was limited to transfers of licences within the basin. In 2009–10, 10 ML of entitlements were transferred on a permanent basis, and 7 ML was traded on a temporary basis. There was no net import of water into the basin in this water year.

Table 33-6 summarises the movement of bundled entitlements in the Glenelg basin during 2009–10.

Table 33-5 Transfers of surface water bundled entitlements in the Glenelg basin 2009–10

Trading Zone	Permanent Transfers			Temporary Transfers		
	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)	Bought (ML)	Sold (ML)	Net Transfer to Basin (ML)
Glenelg Unregulated	10	10	0	7	7	0
Total 2009–10	10	10	0	7	7	0
Total 2008–09	1	1	0	144	144	0

33.6.4 Volume diverted

The volume of water diverted under each bulk water entitlement is shown in Table 33-6. Compliance with individual bulk entitlement volumes is deemed to occur if water use is not more than the maximum volume allowed to be diverted in 2009–10.

The volume diverted for the Coleraine bulk entitlement is not directly measured and was estimated based on the metered volume of water supplied to customers. Although Casterton and Sandford are included in this bulk entitlement, these towns are supplied from the Tullich bore system.

Licences on unregulated streams are not fully metered and water usage is an estimate provided by Southern Rural Water.

Table 33-6 Volume of water diverted under surface water entitlements in the Glenelg basin

Bulk entitlement	Bulk entitlement period (years)	Average annual bulk entitlement volume (ML)(1)	Net temporary transfer (ML)	Volume diverted (ML)	Bulk entitlement volume compliance?(2)
Coliban Water					
Wimmera and Glenelg Rivers(3)	5	450	-	45	Yes
Wannon Water					
Coleraine, Casterton, Sandford	1	855	-	64	Yes
Dunkeld	1	170	-	-	Yes
Glenthompson	1	94	-	4	Yes
Hamilton	1	3,435	-	1,076	Yes
Wimmera and Glenelg Rivers(4)(6)	5	2,120	-	92	No
GWMWater					
Wimmera and Glenelg Rivers – Grampians Water(3)(7)	5	16,110	-	3,863	Yes
Wimmera and Glenelg Rivers – Wimmera Mallee Water(3)(5)(7)	5	109,640	-	9,110	Yes
Environment Minister					
Wimmera and Glenelg Rivers(3)(7)	5	40,560	-	3,480	Yes
Total annual volume of bulk entitlements 2009–10		**173,434**	**-**	**17,733**	
Total annual volume of bulk entitlements 2008–09		**210,967**	**-**	**16,497**	
Licensed diversions from unregulated streams 2009–10		*1,042*		*232*	
Licensed diversions from unregulated streams 2008–09		*1,034*		*252*	

Notes:

(1) For multi-year entitlements, average annual bulk entitlement volume is calculated as the total volume of water permitted to be diverted over a given (greater than one-year) period in the bulk entitlement, divided by the number of years in that period.

(2) For multi-year entitlements, the usage can exceed the average annual entitlement volume in a given year provided the average annual use over the specified period does not exceed the average annual entitlement volume.

(3) Diversions under these bulk entitlements are not included in the water balance for the Glenelg basin because diversions are taken from both the Glenelg and Wimmera river systems and cannot be disaggregated. They are included in the water balance for the Wimmera basin.

(4) Diversions under this bulk entitlement are included in the Glenelg basin water balance.

(5) This bulk entitlement was amended in 2009 to allocate water savings from the first stage of the Wimmera Mallee Pipeline Project.

(6) This bulk entitlement was amended in 2009 to include 2,000 ML of water savings from the first stage of the Wimmera Mallee Pipeline Project to augment supplies for Hamilton.

(7) Diversion is for the 1 November to 31 October period in line with the Glenelg-Wimmera entitlements year.

33.7 Groundwater resources

A summary of the licensed entitlements and use for groundwater management units that overlap the Glenelg basin, excluding domestic and stock use, is presented in Table 33-7.

The Glenelg basin contains part of the Condah WSPA, Glenelg WSPA and Portland GMA. Groundwater levels in Glenelg WSPA are declining, while levels in Portland GMA and Condah WSPA are stable. Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Groundwater use in the Glenelg basin reduced in 2009–10 compared with 2008–09.

Table 33-7 Licensed groundwater volumes, Glenelg basin 2009–10

WSPA/GMA(1)	GMA/WSPA depth limits(2) (m)	Entitlement limit(3) (ML/year)	Licensed entitlement(4) (ML/year)	Metered use (ML)	Estimated use in unmetered bores (ML)	Total licensed groundwater use (ML) 2009–10	Total licensed groundwater use (ML) 2008–09
Portland GMA (27%)	>200	59	58	-	-	-	0
Condah WSPA (48%)	70-200	3,535	3,535	1,249	-	1,249	1,508
Glenelg WSPA (70%)	All depths	23,017	23,017	5,468	-	5,468	6,432
Total(5)		**26,611**	**26,611**	**6,718**	**-**	**6,718**	**7,940**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. The water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included. The exception in this table is Portland GMA, which is known to have 7,581 ML of urban licensed volume. In Portland, out of 7,794 ML of licensed entitlement, 7,581 ML is from urban use, all extracted from the Portland Basin. The remaining 213 ML is shared on a proportional basis between Portland and Glenelg basins. Portland GMA has 73% of its service area in the Portland Basin and 27% in the Glenelg. Only the entitlement limit, non-urban licensed volume and the unmetered use from these licences are allocated according to the surface area percentages.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established, in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where it is part of an existing licence.

(5) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 33-8.

Table 33-8 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Portland GMA (27%)	14	28
Condah WSPA (48%)	39	78
Glenelg WSPA (70%)	849	1,698
Total	**902**	**1,804**

Note:

(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in the Table 33-7.

(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(3) Total volumes are based on the sum of management unit data prior to rounding.

Groundwater is used as an urban water supply for a number of townships in the basin. Urban groundwater usage was reduced slightly in 2009–10. The licensed entitlements and metered use for these groundwater supplies is provided in Table 33-9.

Table 33-9 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Casterton	1,000	271	294
Dartmoor	150	19	22
Hamilton Tarrington Dunkeld	1,102	213	238
Harrow(1)	29	51	46
Macarthur	130	40	25
Merino	100	0	0
Penshurst	250	112	144
Total	**2,761**	**707**	**769**

Note:
(1) Harrow's groundwater licence was insufficient to supply the town's needs in 2009–10. Groundwater has been temporarily traded for this usage. An application has been submitted to the Minister for Water to issue a groundwater licence.

33.8 Drought contingency measures

The main drought contingency measures in place in the Glenelg basin in 2009–10 were restrictions on urban and rural water use (discussed in section 33.9).

33.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions applying to urban customers and licensed diversions are shown in Table 33-10.

Towns supplied by the Grampians catchments, such as Balmoral and Hamilton, began the year on severe Stage 3 and Stage 4 restrictions, but restrictions were eased to lower levels in spring. Stage 2 restrictions for Glenthompson were also eased in spring.

Licensed diverters from the Wannon and the Glenelg Rivers were banned from taking water for the second half of the year; no diversions were permitted from a number of their tributaries throughout the whole year.

Groundwater use was unrestricted in the Glenelg basin during 2009–10.

Table 33-10 Seasonal allocations and restrictions on water use in Glenelg basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Harrow	Stage 1 restrictions from July 2009 to June 2010
	Glenthompson	Stage 2 restrictions from July to September 2009
	Balmoral	Stage 4 restrictions from July to September 2009
	Cavendish, Dunkeld, Hamilton and Tarrington	Stage 3 restrictions from July to October 2009, Stage 2 restrictions from November 2009 to June 2010
Licensed diversions from unregulated streams	Wannon River, Crawford River and Grange Burn River	Irrigation ban from January to June 2010
	Glenelg River	Irrigation ban from January to June 2010
	Glenelg River Upper, Jimmy Creek, McLeod Creek, Rocklands Reservoir	Irrigation ban from July 2009 to June 2010

33.10 Recycled water

Wannon Water operates four wastewater treatment plants in the Glenelg basin. There was an increase in the volume of wastewater produced in 2009–10 compared to 2008–09, however less was recycled. In 2009–10, 44% of wastewater was recycled, compared to 76% in 2008–09. Wannon Water gained approval from the Environmental Protection Authority to discharge treated effluent to streams at several reuse sites including Coleraine, Hamilton and Casterton. The discharges at Hamilton and Casterton were due to insufficient capacity to store increased winter flows. The discharge at Coleraine was required due to several years of saline water accumulation prohibiting sustainable recycled water reuse on land. The source of the saline water has since been removed.

Table 33-11 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML): Urban and industrial	Agriculture	Beneficial allocation[(1)]	Within process[(2)]	Volume discharged to the environment (ML)	Release to ocean/ Other (ML)[(3)]
Casterton	233	65	28%	-	65	-	-	30	138
Coleraine	61	-	0%	-	-	-	-	38	23
Dunkeld	35	17	48%	5	12	-	-	-	18
Hamilton	1,094	549	50%	143	406	-	-	14	531
Total 2009–10	**1,424**	**631**	**44%**	**148**	**483**	**-**	**-**	**83**	**710**
Total 2008–09	**1,147**	**866**	**76%**	**148**	**718**	**-**	**-**	**183**	**98**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage or other item affecting the annual water balance for recycled water that is not otherwise accounted for, such as Wannon Water holding wastewater in storage for the next year.

33.11 Water for the environment

33.11.1 Environmental Water Reserve (EWR)

The Lower Glenelg River is a heritage river and dependent on the Glenelg basin EWR to ecologically function. Other important environmental assets that also rely on the EWR of this basin are:

- Glenelg Spiny Crayfish (Threatened under the Flora and Fauna Guarantee (FFG) Act and only found in the Glenelg River basin)
- Yarra and Ewens Pigmy Perch (Vulnerable under the Environmental Protection and Biodiversity Conservation (EPBC) Act and Threatened under the FFG Act)
- Variegated Pygmy Perch (Vulnerable under the (EPBC) Act and Threatened under the FFG Act)
- A new subspecies of the Wimmera Bottlebrush (*Callistemon wimmerensis*) was discovered on the Glenelg River. This species appears to have similar characteristics to the Wimmera subspecies which is very dependent on flows. This species is listed as threatened under the FFG Act and has been nominated for listing under the EPBC Act.

In 2009–10 the Glenelg basin EWR comprised the following components:

- the Bulk Entitlement (Wimmera and Glenelg Rivers – Flora and Fauna) Order 2005.
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Wannon Water and GWMWater
- water set aside for the environment through the operation of passing-flow conditions on licensed diversions, particularly Condah Drain and Darlot Creek, Crawford River, Cudgee Creek, Glenelg River, Grange Burn, Fitzroy River, Moyne River, Mt Emu Creek, Surry River and Wannon River.
- all other water in the basin not allocated for consumptive use.

33.11.2 Entitlements for the environment

The Bulk Entitlement (Wimmera and Glenelg Rivers – Flora and Fauna) Order 2005 was in operation in the Glenelg basin in 2009–10.

The Inter Catchment Advisory Group (ICAG) determines the share of environmental allocations between the two catchments. The full volume for this entitlement is 75,299 ML, of which 40,560 ML is held in storage and 34,739 ML is rules based water. The volume of water allocated in storage under this entitlement in 2009–10 was 13,750 ML, of which 3,480 ML was released to the Glenelg River.

33.11.3 Passing-flow requirements

Bulk entitlements require passing flows to be met at a number of points in the basin.

Table 33-12 shows the passing-flow compliance in the Glenelg basin for selected bulk entitlement compliance points. While there are other compliance points, the points below have been chosen as they were judged to be of community interest. Wannon Water reported that it complied with all passing-flow obligations.

Table 33-12 Selected passing-flow compliance in the Glenelg basin

River	Passing flow	
Brown Creek, Headworks Creek, Gap Creek, Chimney Pot Creek, No 1 Creek, No 2 Creek, No 3 Creek	Instrument where passing flows are specified	Bulk Entitlement (Hamilton) Conversion Order 1997
	Responsible authority	Wannon Water
	Compliance point	Brown Creek (shown as 1 in Figure 33-2)
	Passing-flow compliance	The lesser of 0.4 ML per day or natural flows were passed from Brown Creek
	Compliance point	Headworks Creek (shown as 2 in Figure 33-2)
	Passing-flow compliance	The lesser of 0.4 ML per day or natural flow were passed from Headworks Creek
	Compliance point	Gap Creek (shown as 3 in Figure 33-2)
	Passing-flow compliance	The lesser of 0.4 ML per day or natural flow were passed from Gap Creek
	Compliance point	No 1 Creek (shown as 4 in Figure 33-2)
	Passing-flow compliance	The lesser of 0.4 ML per day or natural flow were passed from No 1 Creek

34 Millicent Coast basin

This chapter sets out the accounts for the Millicent Coast basin. For detailed information about how they have been compiled, refer to Chapter 5.

34.1 Millicent Coast basin summary

Rainfall across the Millicent Coast basin in 2009–10 ranged between 80% and 125% of the long-term average.

Groundwater is the main source of water supply in the Millicent Coast basin. Licensed groundwater use in the Millicent Coast basin was unrestricted in 2009–10, however use decreased by 16% in 2009–10 compared with 2008–09. The most significant decreases in groundwater use occurred in the Neuarpur WSPA and Kaniva WSPA.

Edenhope was the only town to experience restrictions, remaining on Stage 1 for the entire year. Towns that rely solely on groundwater for supplies were not subject to restrictions. Bans were in place for much of the year for licensed diverters from Lake Charlegrark, Lake Wallace and Lake Yampitcha.

34.2 Responsibilities for management of water resources

Table 34-1 shows the responsibilities of various authorities within the Millicent Coast basin. Where an area of responsibility is left blank, it is not applicable to the corresponding authority.

Table 34-1 Responsibilities for water resources management within the Millicent Coast basin, 2009–10

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Grampians Wimmera Mallee Water		Manages groundwater(1) and surface water licensed diversions within the Millicent Coast basin	Supplies all towns including Kaniva and Edenhope	
Southern Rural Water		Manages groundwater licensed diversions in the Glenelg WSPA		
Wimmera Catchment Management Authority				Manages waterways in the whole of the Millicent Coast basin

Note:

(1) Groundwater management is undertaken jointly by South Australia and Victoria under the Border agreement.

34.3 Rainfall, flows and storages in 2009–10

In 2009–10, rainfall across the Millicent Coast basin ranged between 80% and 125% of the long-term average. This is higher than 2008–09.

No reliable stream flow data exists for the Millicent Coast basin. As such, an estimate of the volume of water leaving the basin was not made. Any surface water not diverted flows to South Australia.

34.4 Total water resources in the basin

The total volumes of water available and supplied from water resources in the Millicent Coast basin are shown in Table 34-2. The volume of the surface water resource has notionally been set to the water diverted from streams in 2009–10.

Table 34-2 Summary of total water resources and water use in the Millicent Coast basin, 2009–10

Water source	Total water resource (ML)(1)	Total use (ML)
Surface water	100	100
Groundwater(2)	55,300	20,900
Recycled water	40	40

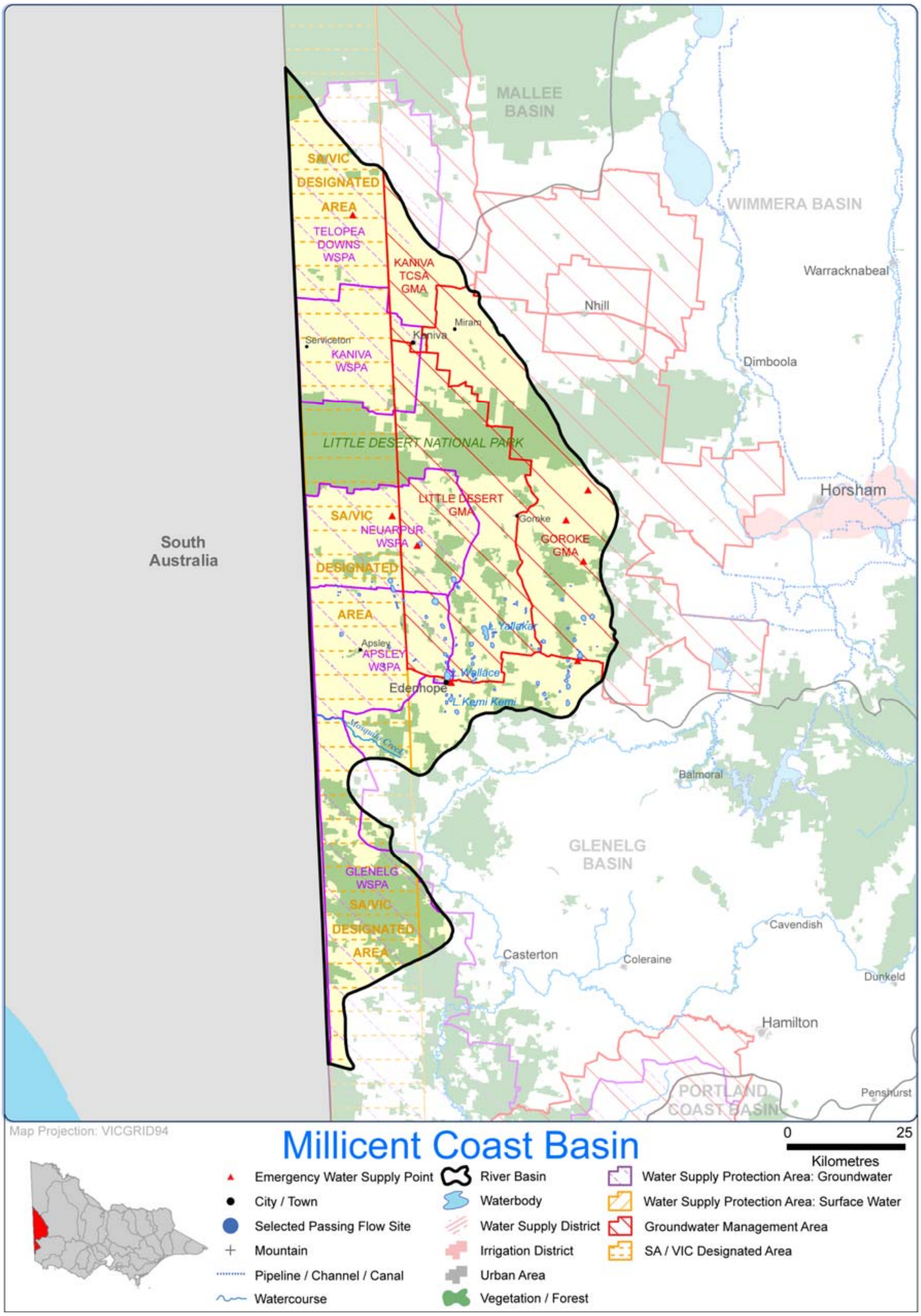
Note:

(1) For groundwater, the total water resource is the licensed entitlement volume as presented in Table 34-3 and estimate of domestic and stock use as presented in Table 34-4.

(2) The total groundwater available for consumption and total groundwater use has been apportioned based on the percentage of the total surface area of the individual groundwater management units within the basin, as discussed in Chapter 5.

34.5 Location of water resources

Figure 34-1 Map of the Millicent Coast basin



34.6 Surface water resources

34.6.1 Water balance

There is no reliable estimate of the average annual inflows in the Victorian Millicent Coast basin, although 4,000 ML a year was estimated for the National Land and Water Resources Audit (National Land and Water Audit, 2001). As there is no flow gauging within the Millicent Coast basin in Victoria, an estimate of 2009–10 inflows could not reliably be made.

Currently limited information is available for surface water availability and use, therefore a water balance has not been included for the Millicent Coast basin.

34.6.2 Small catchment dams

No information regarding small catchment dams is readily available within the Millicent Coast basin.

34.6.3 Water entitlement transfers

There were no transfers of water entitlements within the basin or across basin boundaries in 2009–10.

34.6.4 Volume diverted

There are no bulk entitlements to surface water in the Millicent Coast basin. All water is diverted from unregulated streams under licences. In 2009–10, all of the total licence volume of 100 ML was assumed to be diverted for use in the basin. The same volume was assumed to be diverted in 2008–09.

34.7 Groundwater resources

A summary of the licensed entitlements and use from groundwater management units within the Millicent Coast basin, excluding domestic and stock use, is shown in Table 34-3.

The main water supply in the Millicent Coast basin is groundwater. The Millicent Coast basin contains the whole Kaniva WSPA, Neuarpur WSPA, Apsley WSPA and Little Desert GMA, as well as part of the Glenelg WSPA, Telopea Downs WSPA, Kaniva TCSA GMA and Goroke GMA. Groundwater levels in Kaniva and Telopea Downs, as well as Little Desert, Goroke and Kaniva TCSA GMA are stable, with declining trends in the Glenelg, Neuarpur and Apsley WSPAs.

Groundwater entitlements and use for unincorporated areas are summarised in Appendix A.

Table 34-3 Licensed groundwater volumes, Millicent Coast basin 2009–10

WSPA/GMA(1)	**GMA/WSPA depth limits(2) (m)**	**Entitlement limit(3) (ML/year)**	**Licensed entitlement(4) (ML/year)**	**Metered use (ML)**	**Estimated use in unmetered bores (ML)(5)**	**Total licensed groundwater use (ML) 2009–10**	**Total licensed groundwater use (ML) 2008–09**
Goroke GMA (37%)	Tertiary confined sand aquifer	807	0	-	-	-	0
Kaniva TCSA GMA (17%)	Tertiary confined sand aquifer	187	0	-	-	-	0
Little Desert GMA (100%)	Tertiary confined sand aquifer	1,100	0	-	-	-	0
Apsley WSPA (100%)	All depths	5,591	5,591	1,356	-	1,356	1,532
Glenelg WSPA (30%)	All depths	9,643	9,643	2,291	-	2,291	2,695
Kaniva WSPA (100%)	25-140	7,659	7,659	1,383	608	1,991	3,027
Neuarpur WSPA (100%)	50-175	24,750	24,691	12,700	-	12,700	14,651
Telopea Downs WSPA (61%)	All depths	6,506	6,506	1,323	85	1,408	1,630
Total(6)		**56,243**	**54,090**	**19,053**	**693**	**19,746**	**23,534**

Notes:

(1) The percentage of the GMA/WSPA by surface area within the river basin is given in parentheses. All water volumes in this table represent the total volume for the GMA/WSPA multiplied by this percentage. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.

(2) This column indicates the aquifer depth limits for which the GMA/WSPA applies.

(3) The entitlement limit is represented by the permissible consumptive volume (PCV), except where a PCV has not been established (for example Telopea Downs WSPA, Kaniva TSCA GMA and Apsley WSPA), in which case the licensed entitlement is used.

(4) Licensed entitlement includes domestic and stock usage in those cases where this forms part of a licensed volume.
(5) Non-metered use includes dairy wash and low consumption commercial use only.
(6) Total volumes are based on the sum of management unit data prior to rounding.

An estimate of domestic and stock groundwater use is provided in Table 34-4.

Table 34-4 Number of domestic and stock bores and estimated use, 2009–10

WSPA/GMA	No. of domestic and stock bores(1)(2)	Estimated domestic and stock use (assuming 2 ML per bore) (ML)(3)
Goroke GMA	0	0
Kaniva TCSA GMA	0	0
Little Desert GMA	0	0
Apsley WSPA	102	204
Glenelg WSPA	356	712
Kaniva WSPA	82	164
Neuarpur WSPA	37	74
Telopea Downs WSPA	18	36
Total	**595**	**1,190**

Note:
(1) A number of licensed groundwater allocations also incorporate domestic and stock use. The estimated use for these bores is included in the licensed volume in Table 34-3.
(2) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs. The numbers reported are based on the surface area percentage within the basin. Those GMAs/WSPAs with less than 5% surface area within the basin have not been included.
(3) Total volumes are based on the sum of management unit data prior to rounding.

In the Millicent Coast basin, groundwater is used as an urban water supply for the townships of Apsley, Kaniva, Lillimur, Goroke, Leeor (Serviceton), Mirampiram (Miram), and as an emergency supply for Edenhope. The licensed entitlements and metered use for these groundwater supplies is provided in Table 34-5.

Table 34-5 Urban groundwater usage

Town supplied	Licensed volume (ML)	Metered use 2009–10 (ML)	Metered use 2008–09 (ML)
Boikerbert (Apsley)(1)	40	42	48
Edenhope (emergency bores)(2)	n/a	127	134
Goroke	86	65	67
Kaniva	600	218	232
Leeor (Serviceton)	25	9	9
Lillimur	32	10	13
Mirampiram (Miram)	7	2	1
Total	**790**	**473**	**504**

Note:
(1) Since Apsley is in a WSPA no new licenses can be considered. Temporary trade has been acquired for this over use, and a licence amendment application will be made to the minister to increase entitlement.
(2) Groundwater has been temporary traded for this usage. A groundwater Licence Application has been sent to the Minister for Water to issue a Licensed Entitlement

34.8 Drought contingency measures

The main drought contingency measures in place in the Millicent Coast basin in 2009–10 was restrictions on urban and rural water use (discussed in section 34.9).

34.9 Seasonal allocations and restrictions on water use, diversions and extractions

Restrictions on water use in the Millicent Coast basin are outlined in Table 34-6.

Edenhope was the only town to experience restrictions, which were minor at Stage 1. Towns that rely solely on groundwater for supplies were not subject to restrictions. Bans were in place for part of the year for licensed diverters from Lake Charlegrark, Lake Wallace and Lake Yampitcha.

Groundwater use was unrestricted in the basin during 2009–10.

Table 34-6 Seasonal allocations and restrictions on water use in Millicent Coast basin, 2009–10

Type of restriction	Area	Nature of restriction
Urban	Edenhope	Stage 1 restrictions from July 2009 to June 2010
Diversions from unregulated streams	Lake Charlegrark, Lake Wallace and Lake Yampitcha	Irrigation ban from July 2009 to January 2010 and May to June 2010

34.10 Recycled water

GWMWater operates wastewater treatment plants in three towns within the Millicent Coast basin. Wastewater from Edenhope was reused for a variety of urban and industrial purposes, including pasture improvement and watering recreational facilities and parks. Wastewater produced at Kaniva and Serviceton treatment plants was evaporated on-site and is not included in Table 34-7.

Table 34-7 Volume of recycled water

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled (excl. within process)	End use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean/ Other (ML)(3)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Edenhope	35	35	100%	35	-	-	-	-	(0)
Kaniva North	-	-	0%	-	-	-	-	-	-
Kaniva South	-	-	0%	-	-	-	-	-	-
Serviceton	-	-	0%	-	-	-	-	-	-
Total 2009–10	**35**	**35**	**100%**	**-**	**35**	**-**	**-**	**-**	**(0)**
Total 2008–09	**42**	**42**	**100%**	**42**	**-**	**-**	**-**	**-**	**-**

Notes:

(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example backflushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) Other refers to a change in on-site wastewater storage or other item affecting the annual water balance for recycled water that is not otherwise accounted for.

34.11 Water for the environment

34.11.1 Environmental Water Reserve (EWR)

The Millicent Coast basin contains numerous wetlands dependent on the basin's EWR.

In 2009–10 the Millicent Coast basin EWR comprised all water in the basin not allocated for consumptive use.

34.11.2 Passing flows

There are currently no bulk entitlements in operation and therefore no passing-flow obligations on water corporations in the Millicent Coast basin.

Appendix A

Groundwater entitlement and use

Groundwater management unit[1]	PCV	Allocation limit as of 30/06/10 (ML)	Licensed volumes (as at 30/06/10): Licensed entitlements (ML)	No. of licenses	No. of metered bores	Metering Program Complete	Metered volume (ML)	Estimated non- metered use (ML)[2]	Method used to estimate non-metered use	Domestic and stock: No. of D&S bores[3]	Estimated Use (ML)[4]	Total use (Licensed + domestic and stock)
Goulburn-Murray Water												
WSPA (approved plan)												
Campaspe Deep Lead WSPA	47,252	29,959	46,091	112	118	Yes	21,363	0		318	636	21,999
Shepparton WSPA		235,591	235,591	1,398	993	Yes	49,701	0		2,378	4,756	54,457
Spring Hill WSPA	5,062	3,068	4,909	55	59	Yes	1,524	0		198	396	1,920
Katunga WSPA	59,780	41,615	59,450	190	132	Yes	30,994	0		806	1,612	32,606
WSPA (draft plan)												
Mid Loddon WSPA	37,200	37,200	34,014	98	99	Yes	14,528	0		380	760	15,288
Upper Loddon WSPA	13,648	13,648	13,266	117	135	Yes	4,922	0		392	784	5,706
GMA												
Alexandra GMA	1,937	1,937	1,714	10	9	Yes	238	0		20	40	278
Barnawartha GMA	2,100	2,100	485	6	4	Yes	0	0		40	80	80
Kinglake GMA	2,015	2,015	1,864	56	29	Yes	202	0		320	640	842
Mullindolingong GMA	6,980	6,980	1,532	35	16	Yes	0	0		61	122	122
Upper Ovens WSPA	4,010	4,010	3,432	93	89	Yes	411	0		328	656	1,067
Lower Ovens GMA	25,200	25,200	17,421	259	166	Yes	2,684	0		1,883	3,766	6,450
Mid Goulburn GMA	14,900	14,900	12,330	63	44	Yes	3,725	0		226	452	4,177
Southern Campaspe Plains GMA	8,850	8,850	8,307	24	20	Yes	3,137	0		86	172	3,309
Unincorporated areas												
Goulburn-Murray Water		43,041	43,041	748	412	Yes	246	17,216	40% of entitlement	5,527	11,054	28,516
GWMWater												
WSPA (approved plan)												
Murrayville WSPA	10,883	10,883	9,634	37	46	Yes	5,123	292	6 pump hrs / ML	216	432	5,847
Neuarpur WSPA	24,750	24,750	24,691	48	139	Yes	12,700	0		37	74	12,774

WSPA (draft plan)												
Apsley WSPA		5,591	5,591	32	24	Yes	1,356	0		102	204	1,560
Kaniva WSPA		7,659	7,659	23	23	Yes	1,383	608	6 pump hrs / ML	82	164	2,155
Telopea Downs WSPA		10,682	10,682	14	15	Yes	2,172	140	6 pump hrs / ML	29	58	2,370
GMA												
Balrootan (Nhill) GMA		1,522	1,522	13	12	Yes	746	0		20	40	786
Goroke GMA	2,200	2,200	0	0	0	Yes	0	0		0	0	0
Kaniva TCSA GMA	1,100	1,100	0	0	0	Yes	0	0		0	0	0
Little Desert GMA	1,100	1,100	0	0	0	Yes	0	0		0	0	0
Nhill GMA	1,200	1,200	0	0	0	Yes	0	0		0	0	0
Unincorporated areas												
GWMWater		18,154	18,154	80		No		5,446	30% of entitlement	829	1,658	7,104
Southern Rural Water												
WSPA (approved plan)												
Nullawarre WSPA	21,280	21,280	21,279	210	163	Yes	9,859	0		1,014	2,028	11,887
Yangery WSPA	14,103	14,103	14,101	162	177	Yes	4,026	0		1,091	2,182	6,208
WSPA (draft plan)												
Bungaree WSPA	5,321	5,321	5,251	106	141	Yes	2,620	0		283	566	3,186
Condah WSPA	7,437	7,437	7,436	39	41	Yes	2,628	0		83	166	2,794
Denison WSPA	17,743	17,743	17,441	121	102	Yes	7,987	0		271	542	8,529
Deutgam WSPA	5,100	87	5,100	149	192	Yes	15	0		233	0	15
Glenelg WSPA	32,660	32,660	32,660	81	95	Yes	7,759	0		1,205	2,410	10,169
Koo-Wee-Rup WSPA	12,915	12,915	12,915	382	251	Yes	3,378	0		1,492	2,984	6,362
Wandin Yallock WSPA	2,924	2,924	2,936	190	208	Yes	377	0		107	214	591
Warrion WSPA	13,836	13,836	13,835	132	126	Yes	2,781	0		422	844	3,625
Wy Yung WSPA	7,463	7,463	7,462	60	73	Yes	798	0		39	78	876
Yarram WSPA	25,317	25,317	25,317	83	83	Yes	11,778	0		323	646	12,424
Sale WSPA	21,212	21,212	21,107	110	112	Yes	11,094	0		822	1,644	12,738
GMA												
Colongulac GMA	4,695	4,695	4,043	45	22	Yes	684	0		183	366	1,050
Cardigan GMA	3,967	3,967	3,887	25	22	Yes	722	0		111	222	944
Corinella GMA	2,550	2,550	146	12	9	Yes	129	0		131	262	391
Cut Paw Paw GMA	3,650	3,650	535	7	4	Yes	25	0		38	76	101
Frankston GMA	3,200	3,200	1,080	32	21	Yes	126	0		233	466	592

Gellibrand GMA		0	0	0	0	Yes	0	0		4	8	8
Gerangamete GMA(5)	20,000	20,000	20,000	1	6	Yes	12,692	0		3	6	12,698
Giffard GMA	5,670	5,670	5,670	16	17	Yes	1,717	0		109	218	1,935
Glenormiston GMA	2,565	2,565	2,463	32	9	Yes	658	0		110	220	878
Hawkesdale GMA	16,161	16,161	11,753	109	55	Yes	5,214	0		1,105	2,210	7,424
Heywood GMA	8,500	8,500	6,564	94	48	Yes	1,578	0		1,661	3,322	4,900
Jan Juc GMA(6)	39,250	39,250	14,250	2	6	Yes	3,457	0		6	12	3,469
Lancefield GMA	1,485	1,485	1,390	15	19	Yes	293	0		83	166	459
Leongatha GMA	6,500	6,500	1,693	30	12	Yes	158	0		106	212	370
Merrimu GMA	451	451	451	14	15	Yes	217	0		16	32	249
Moe GMA	8,200	8,200	3,803	87	26	Yes	1,095	0		179	358	1,453
Moorabbin GMA	2,700	2,700	2,614	55	66	Yes	1,203	0		418	836	2,039
Nepean GMA	6,013	6,013	6,012	69	74	Yes	3,521	0		2,297	1,149	4,669
Newlingrook GMA	1,977	1,977	1,947	5	5	Yes	95	0		12	24	119
Orbost GMA	1,201	1,201	1,201	4	4	Yes	333	0		5	10	343
Paaratte GMA	4,606	4,606	3,193	4	1	Yes	291	0		12	24	315
Portland GMA	7,795	7,795	7,794	8	7	Yes	2,726	0		51	102	2,828
Rosedale GMA	22,313	22,313	22,257	58	47	Yes	6,549	4,460	Estimated extraction Latrobe Valley Mines	221	442	11,451
Stratford GMA (7)	27,645	27,645	27,645	8	6	Yes	100	27,796		5	10	27,906
Tarwin GMA	1,300	1,300	38	3	1	Yes	6	0		761	1,522	1,528
Wa De Lock GMA	30,172	30,172	26,805	243	139	Yes	10,386	0		434	868	11,254
Unincorporated areas												
Southern Rural Water		68,252	68,252	1,384		Yes		30,713	45% of entitlement	9,617	19,234	49,947
Total	**690,044**	**1,038,071**	**993,703**	**7,698**	**4,989**	**No**	**276,230**	**86,672**		**39,574**	**75,237**	**438,138**

Notes:

(1) Areas with zones have been totalled.

(2) In non-metered areas, the water authorities' estimates have been adopted. Use in unincorporated areas has been estimated based on 45% of entitlement for SRW, 40% of entitlement for G-MW and 30% for GWMWater.

(3) The numbers of domestic and stock bores are all bores from the Groundwater Management System that are less than 30 years old and have been cross checked with the Victorian Water Register to ensure bores are not double counted. Bore depths (where recorded) have been taken into account to ensure that the domestic and stock bore is assigned to the appropriate GMU where overlap of management units occurs.

(4) Domestic and stock use is estimated as 2 ML per bore except in the Nepean GMA (0.5 ML per bore), which is a more accurate estimate for this GMA.

(5) Barwon Water's groundwater licence allows extraction of a maximum of 20,000 ML every one year, 80,000 ML over a consecutive 10-year period and 400,000 ML over a 100-year period from the Gerangamete GMA.

(6) The Jan Juc bulk entitlement is based on a five-year total of 35,000 ML with a maximum annual extraction of 10,000 ML. The total of 39,250 includes 4,250 ML and the 5-year BE of 35,000 ML.

(7) The estimated extraction from the Latrobe Valley Mines exceeds the Stratford GMA PCV. However this level of extraction is compliant with the licence conditions and the PCV for Stratford GMA is under investigation.

Appendix B

Storage levels

Basin	Reservoir	On stream or off-stream?	Full storage capacity (ML)	% full at 1 July 2009	% full at 30 June 2010
East Gippsland	None	n/a	n/a	n/a	n/a
Snowy	None	n/a	n/a	n/a	n/a
Tambo	None	n/a	n/a	n/a	n/a
Mitchell	None	n/a	n/a	n/a	n/a
Thomson	Lake Glenmaggie	on-stream	177,640	22%	54%
	Thomson Reservoir	on-stream	1,068,000	16%	22%
Latrobe	Blue Rock	on-stream	208,188	70%	80%
	Lake Narracan	on-stream	8,000	17%	74%
	Moondarra Reservoir	on-stream	30,300	59%	85%
South Gippsland	Lance Creek Reservoir	on-stream	4,200	67%	85%
	Hyland Reservoir	on-stream	671	71%	76%
	Western Reservoir	on-stream	1,137	41%	73%
	Candowie Reservoir	on-stream	2,263	33%	75%
Bunyip	Tarago Reservoir	on-stream	37,580	59%	58%
Yarra	Upper Yarra Reservoir	on-stream	200,579	41%	57%
	O'Shannassy Reservoir	on-stream	3,123	63%	101%
	Maroondah Reservoir	on-stream	22,179	29%	49%
	Yan Yean Reservoir	on-stream	30,266	19%	37%
	Cardinia Reservoir	off-stream	286,911	38%	35%
	Greenvale Reservoir	off-stream	26,839	75%	63%
	Silvan Reservoir	off-stream	40,445	87%	89%
	Sugarloaf Reservoir	off-stream	96,253	15%	61%
Maribyrnong	Rosslynne Reservoir	on-stream	25,368	3%	5%
Werribee	Melton Reservoir	on-stream	14,364	4%	20%
	Merrimu Reservoir	on-stream	32,516	10%	9%
	Pykes Creek Reservoir	on-stream	22,119	2%	5%
	Djerriwarrh Reservoir	on-stream	983	25%	40%
Moorabool	Korweinguboora Reservoir	on-stream	2,100	3%	24%
	Bostock Reservoir	on-stream	7,480	4%	23%
	Lal Lal Reservoir	on-stream	64,495	4%	6%
	Wilsons Reservoir	on-stream	1,010	5%	50%
	Moorabool Reservoir	on-stream	6,738	2%	13%
	Upper Stony Creek Reservoir	off-stream	9,494	15%	10%
Barwon	West Barwon Dam	on-stream	21,504	13%	20%
	White Swan Reservoir	on-stream	14,107	58%	75%
	Gong Gong Reservoir	on-stream	1,902	7%	7%
	Wurdee Boluc Reservoir	off-stream	40,431	33%	54%
Corangamite	None	n/a	n/a	n/a	n/a
Otway Coast	West Gellibrand Reservoir	on-stream	1,856	67%	100%
Hopkins	None	n/a	n/a	n/a	n/a
Portland Coast	None	n/a	n/a	n/a	n/a
Glenelg	Rocklands Reservoir	on-stream	348,500	1%	2%
	Moora Moora Reservoir	on-stream	6,300	15%	48%
	Konongwootong Reservoir	on-stream	1,920	16%	28%
	Hamilton System Reservoirs	on-stream	2,716	31%	31%
Millicent Coast	None	n/a	n/a	n/a	n/a

Basin	Reservoir	On stream or off-stream?	Full storage capacity (ML)	% full at 1 July 2009	% full at 30 June 2010
Murray	Lake Victoria (Victoria's share only)	on-stream	338,500	45%	36%
	Menindee Lakes (Victoria's share only)(1)	on-stream	865,500	0%	69%
	Lake Hume (Victoria's share only)	on-stream	1,518,250	12%	27%
	Lake Dartmouth (Victoria's share only)	on-stream	1,953,795	22%	33%
	Lake Cullulleraine	on-stream	5,270	83%	83%
Kiewa	Rocky Valley	on-stream	28,294	74%	51%
	Lake Guy	on-stream	1,416	46%	43%
	Clover Pondage	off-stream	255	59%	86%
	Pretty Valley Basin	off-stream	500	100%	100%
Ovens	Lake William Hovell	on-stream	13,710	59%	101%
	Lake Buffalo	on-stream	23,900	63%	61%
Broken	Lake Mokoan (2)	on-stream	362,450	1%	n/a
	Lake Nillahcootie	on-stream	39,950	12%	29%
	Loombah-McCall Say	on-stream	1,747	55%	100%
Goulburn	Lake Eildon	on-stream	3,334,158	13%	27%
	Goulburn Weir	on-stream	25,500	99%	98%
	Sunday Creek Reservoir	on-stream	1,700	26%	97%
	Greens' Lake	off-stream	32,440	50%	51%
	Waranga Basin	off-stream	432,362	17%	46%
Campaspe	Upper Coliban Reservoir	on-stream	37,480	0%	1%
	Lauriston Reservoir	on-stream	19,790	31%	77%
	Malmsbury Reservoir	on-stream	17,780	2%	3%
	Lake Eppalock	on-stream	304,651	6%	9%
	Campaspe Weir	off-stream	2,624	74%	86%
Loddon	Newlyn Reservoir	on-stream	3,012	9%	17%
	Tullaroop Reservoir	on-stream	72,950	4%	6%
	Cairn Curran Reservoir	on-stream	147,130	2%	4%
	Laanecoorie Reservoir	on-stream	7,940	4%	21%
	Hepburn Lagoon	on-stream	2,457	0%	4%
	Evansford Reservoir	off-stream	1,351	4%	40%
	Sandhurst Reservoir	off-stream	2,590	68%	81%
	Spring Gully Reservoir	off-stream	1,680	26%	40%
Avoca	None	n/a	n/a	n/a	n/a
Mallee	None	n/a	n/a	n/a	n/a
Wimmera	Taylors Lake	on-stream	33,700	11%	68%
	Lake Lonsdale	on-stream	65,480	0%	4%
	Wartook Reservoir	on-stream	29,360	35%	56%
	Lake Bellfield	on-stream	78,560	17%	28%
	Fyans Lake	on-stream	18,460	20%	31%
	Batyo Lake	on-stream	2,250	0%	0%
	Dock Lake	on-stream	4,420	0%	0%
	Green Lake	on-stream	5,350	0%	0%
	Pine Lake	on-stream	62,000	0%	0%
	Toolondo Reservoir	on-stream	92,430	0%	0%

Note:

(1) When the volume held in storage in the Menindee Lakes drops below 480,000 ML, the entire volume is held by New South Wales. Victoria regained its share of the water in the Menindee Lakes when the volume exceeded 640,000 ML.

(2) Lake Mokoan was decommissioned as a storage in February 2010. No water was supplied from this storage after January 2010. As such, no end of year volume is provided.

n/a: Not applicable.

Appendix C

Groundwater trades

Groundwater management unit	Permanent trade		Temporary trade	
	No. trades	Total volume (ML)	No. trades	Total volume (ML)
Goulburn Murray Water				
Campaspe Deep Lead WSPA	0	0	31	4051
Shepparton WSPA	0	0	0	0
Spring Hill WSPA	0	0	10	213
Katunga WSPA	3	256	37	2951
Mid Loddon WSPA	0	0	9	904
Upper Loddon WSPA	0	0	18	1854
Alexandra	0	0	0	0
Barnawartha	0	0	0	0
Ellesmere	0	0	0	0
Goorambat	0	0	0	0
Kialla (1+2)	0	0	0	0
Kinglake	0	0	2	40
Mullindolingong Zone 1	0	0	0	0
Mullindolingong Zone 2	0	0	0	0
Murmungee	0	0	0	0
Nagambie	0	0	0	0
Upper Ovens GMA	0	0	2	11
Lower Ovens GMA	0	0	5	129
Mid-Goulburn GMA	0	0	5	480
Southern Campaspe Plains GMA	0	0	2	350
Southern Rural Water				
Nullawarre	0	0	3	150
Yangery	3	101	2	25
Bungaree	1	20	11	245.6
Condah	0	0	0	0
Denison	0	0	4	460
Deutgam	0	0	0	0
Koo-Wee-Rup	0	0	17	306.8
Glenelg	0	0	3	380
Sale	4	330	11	974.5
Wandin Yallock	0	0	6	67
Warrion	0	0	1	150
Wy Yung	0	0	0	0
Yarram	0	0	0	0
Cardigan	0	0	2	6
Colongulac	0	0	0	0
Corinella	0	0	0	0
Cut Paw Paw	0	0	0	0
Frankston	0	0	0	0
Gellibrand	0	0	0	0
Gerangamete	0	0	0	0
Giffard	1	195	0	0
Glenormiston	0	0	0	0
Hawkesdale	0	0	2	300

Groundwater management unit	Permanent trade		Temporary trade	
	No. trades	Total volume (ML)	No. trades	Total volume (ML)
Heywood	0	0	0	0
Jan Juc	0	0	0	0
Lancefield	0	0	0	0
Leongatha	0	0	0	0
Merrimu	2	6.5	1	18.5
Moe	0	0	0	0
Moorabbin	0	0	1	20
Nepean	0	0	3	221
Newlingrook	0	0	0	0
Orbost	1	200	0	0
Paaratte	0	0	0	0
Portland	0	0	0	0
Rosedale	5	361.2	2	60
Stratford	0	0	0	0
Tarwin	0	0	0	0
Wa De Lock	2	63	5	591.8
GWMWater				
Murrayville	0	0	2	800
Neuarpur	0	0	5	660
Apsley	0	0	3	895
Kaniva	0	0	1	200
Telopea Downs	0	0	0	0
Balrootan (Nhill)	0	0	0	0
Goroke	0	0	0	0
Kaniva Tertiary Confined Sand Aquifer	0	0	0	0
Little Desert	0	0	0	0
Nhill	0	0	0	0
Total	**22**	**1,533**	**206**	**17,514**

Abbreviations

AWRC	Australian Water Resources Council
BE	Bulk entitlement
BoM	Bureau of Meteorology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CMA	Catchment management authority
D&S	Domestic and stock
DSE	Department of Sustainability and Environment
EC	Electrical conductivity
ESC	Essential Services Commission
EWR	Environmental Water Reserve
GL	Gigalitre
GMA	Groundwater management area
GMU	Groundwater management unit
ISC	Index of Stream Condition
MDBA	Murray-Darling Basin Authority
MDBC	Murray-Darling Basin Commission
ML	Megalitre
NTU	Nephelometric turbidity unit
PAV	Permissible annual volume
PCV	Permissible consumptive volume
REALM	Resource Allocation Model
SDL	Sustainable diversion limit
SFMP	Streamflow management plan
SWR	State Water Report
TCSA	Tertiary confined sand aquifer
UA	Unincorporated area
WSPA	Water supply protection area

Glossary of terms

Above cap water: Any water in a basin in excess of water corporations' and other entitlement holders' water entitlements, and any other defined elements of the EWR.

Allocation: The assignment of a water entitlement to a person or authority by government. See also 'seasonal irrigation water allocation'.

Aquifer: A layer of underground sediments which holds groundwater and allows water to flow through it.

Baseflows: The component of streamflow supplied by groundwater discharge.

Basin (river basin): The area of land which a river and its tributaries drain. In the Victorian Water Accounts river basins are consistent with those defined by the Australian Water Resource Council (AWRC). The exception is the Murray basin which, for the purposes of this report, includes the Upper Murray basin as defined by AWRC and areas in Victoria supplied from the River Murray downstream of Lake Hume. See also 'river basin'.

Bulk entitlement: The right to water held by water and other authorities defined in the *Water Act 1989*. The bulk entitlement defines the amount of water from a river or storage to which an authority is entitled, and may include the rate at which it may be taken and the reliability of the entitlement.

Bulk entitlement conversion order: The statutory instrument used to issue the bulk entitlement under the provisions in the *Water Act 1989*.

Consumptive entitlement: A water entitlement that permits the holder to use the water taken under the entitlement for the purposes of consumption.

Call (calling of water): See 'order'.

Cap: A limit placed on the amount of water that can be taken from a system within a specific timeframe.

Carry-over: Provides the right to take unused allocations at the end of one season into the subsequent season. Carry-over is available under rules to the holders of permanent entitlements, including water shares, supplies by agreement and specified bulk and environmental entitlements, in the regulated water systems of northern Victoria.

Catchment: An area of land where run-off from rainfall goes into one river system.

Catchment management authorities (CMAs): Statutory bodies established under the *Catchment and Land Protection Act 1994*. CMAs have responsibilities under both the Catchment and Land Protection Act and the *Water Act 1989* which include river health, regional and catchment planning and coordination, and waterway, floodplain, salinity and water quality management.

Compliance point: The location where passing-flow requirements are established. Compliance points may include gauging stations, weirs, reservoirs or a section of a river.

Dead storage: Water in a storage that is below the elevation of the lowest constructed outlet.

Drainage division: An aggregation of river basins in an area, as in 'Murray-Darling Drainage Division', 'South-East Coast Drainage Division', et cetera. Australia has been divided into 12 drainage divisions.

EC: Electrical conductivity, which is a measure of water salinity.

Entitlement: See 'water entitlement'.

Environment: Surroundings in which an organisation operates including air, water, land, natural resources, flora, fauna, humans and their interdependence.

Environmental (bulk) entitlement: A water entitlement held by the Minister for the Environment that permits the use of water in a river or storage for a purpose that benefits the environment.

Environmental flow: The streamflow required to maintain appropriate environmental conditions in a waterway.

Environmental Water Reserve (EWR): The share of water resources set aside to maintain the environmental values of a water system and other water services that are dependent on the environmental condition of the system.

Evapotranspiration: The process of water being transpired by vegetation.

Floodplain: Land adjacent to rivers which is subject to overflow during flood events. Floodplains are often valuable for their ecological assets.

Flow Stress Ranking Project: Undertaken by the Department of Sustainability and Environment, the project provided a measure of how much current flow conditions of a stream differs from the flow conditions if no water was extracted from the stream.

Flush: See 'fresh'.

Fresh: A flow pulse in a river which is higher than the median flow at that time of year. It may occur naturally or be the result of a decision to release water from a reservoir. A fresh can occur at any time of year.

Gigalitre: One thousand megalitres.

Groundwater: Groundwater is the reserve of water that is located beneath the earth's surface in pores and crevices of rocks and soil. These areas vary in size and volume throughout Victoria and are known as aquifers.

Groundwater entitlement limit: The amount of water which can be allocated in an aquifer under licences and is defined by the permissible consumptive volume.

Groundwater management unit (GMU): Either a groundwater management area (GMA) or a water supply protection area (WSPA).

Groundwater management area (GMA): A discrete area where groundwater resources of a suitable quality for irrigation, commercial or domestic and stock use are available or expected to be available.

Heritage river: A river protected in Victoria for its special features under the *Heritage River Act 1992*.

Irrigation district: An area declared under the *Water Act 1989* supplied with water by channels and pipelines used mainly for irrigation purposes.

Irrigation return flows: Water that is returned to a water course subsequent to being used in an irrigation area (for example outflows from irrigation drainage systems).

Long term average annual rainfall (expressed as a percentage): The amount of rainfall across the geographical spread of an area, which is averaged over a grid of approximately 25 x 25 kilometres.

Living Murray Initiative: A program to improve the health of the River Murray, established by the Murray-Darling Basin Ministerial Council in 2002 and funded by the New South Wales, Victorian, South Australian, Australian Capital Territory and Australian Governments.

Megalitre: One million litres.

Murray-Darling Basin Cap: The climatically adjusted limit on surface water diversions in the Murray-Darling Basin, agreed by a Ministerial Council under the Murray-Darling Basin Agreement.

NTU: Nephelometric turbidity units, which is a measure of the turbidity of water.

Nutrient: Generally refers to nitrogen and phosphorous in water.

Order (ordering of water): The advance notification given by individual entitlement holders to the storage operator to enable the storage operator to regulate water flows so that all entitlement holders' needs can be met at the agreed time.

Passing-flow requirements: The flows that a water authority must pass at its weirs or reservoirs before it can take water for other uses. Passing-flow requirements are specified as obligations in bulk entitlements, and entitlement holders must report on the level of compliance with these requirements.

Permissible consumptive volume (PCV): The total amount of water that can be taken in a groundwater management area under a Ministerial declaration.

Potable water: Water that is suitable for drinking.

Precautionary principle: Erring on the side of caution in favour of a given entity. For example, where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Qualification of rights: The Minister for Water has the power (under section 33AAA of the *Water Act 1989*) to qualify rights to water to maintain essential supplies to towns and rural communities. The Minister may declare a temporary qualification of rights where a water shortage exists in an area or water system. Where the water shortage is due to a long term change to water availability, a permanent qualification of rights may be declared but only following a long term water resources assessment which finds the long term water availability will have a disproportionate effect on water allocated for consumptive purposes or the Environmental Water Reserve. All rights qualified in 2006–07 were of a temporary nature.

Ramsar Convention: An international treaty that aims to conserve wetlands which have been listed for their international significance and ensure they are managed wisely, signed in Ramsar, Iran, in 1971.

REALM model: A computer-based water supply system model used by the Department of Sustainability and Environment to aid the allocation of Victoria's water resources. Its name is an abbreviation of REsource ALlocation Model.

Recycled water: Water derived from sewerage systems or industry processes which is treated to a standard that is appropriate for its intended use.

Regulated river: A river containing structures such as dams or major diversion weirs which control the flow of water in the river for licensed diverters or users in an irrigation district.

Reticulation: The network of pipelines used to deliver water to end users.

Riparian: Situated alongside a river or stream.

River: Large stream of water flowing to sea or lake or marsh or another river.

River basin: The land which a river and its tributaries drain. See also 'basin'.

Run-off: The volume of water that enters streams and lakes from rainfall.

Salinity: The total amount of water-soluble salts present in the soil or in a stream.

Seasonal irrigation water allocation: An irrigator's share of the water available for an irrigation season, determined by the water corporation and expressed as a percentage of the irrigator's water share. Sometimes shortened to 'allocation'.

Sedimentation: Process where solid particles in water sink to the bottom, forming sediment.

Sewage: The waterborne wastes of a community.

Sewerage system: A physical arrangement of pipes and plant for the collection, removal, treatment and disposal of sewage, trade and liquid waste.

Small catchment dam: A farm dam that is filled from its own catchment and is not located on a waterway. This includes small catchment dams used for domestic and stock purposes which are not required to be licensed. It also includes dams used for commercial and irrigation use which are now required to be registered (under the *Water Act 1989*). Not all small catchment dams are registered as yet.

Spill: An uncontrolled flow of water past a reservoir or a weir.

Stormwater: Untreated rainfall run-off from urban areas.

Stream: A body of water flowing in bed, river or brook.

Streamflow management plan: A management plan prepared for a water supply protection area to manage the surface water resources of the area.

Sustainable diversion limit: The maximum volume which can be diverted from a catchment while protecting the environmental values of the catchment's waterways.

Statewide sustainable diversion limits: Precautionary estimates of the sustainable diversion limit for 1,600 small Victorian catchments using a statewide methodology.

Terminal lakes: Lakes which form the end point of all surface water flow within a basin.

Unincorporated area: An area of Victoria which contains substantial and often unquantified groundwater of varying yield and quality that has not been designated as either a groundwater management area or a water supply protection area.

Unregulated river: A river that does not contain any dams or major diversion weirs which control the flow of water in the river.

Use (water use): The water use data presented in this edition of the Victorian Water Accounts is reported as the volume of water diverted from a stream or groundwater bore. It is not reflective of 'use' on a farm or in a town.

Wastewater: For the purposes of this document, wastewater refers to the volume of sewage that enters a treatment plant.

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 balance: A statement of the water flows in a given area and time period, in which the sum of the outflows from the area equals the sum of the inflows less the water accumulated in the area.

Water entitlement: The volume of water authorised to be taken and used by an irrigator or water authority. Water entitlements include bulk entitlements, environmental entitlements, water rights, sales water, surface water and groundwater licences.

Water leaving the basin: The volume of water that is calculated to flow out of the basin. This amount is typically derived from both gauged streamflow information and calculated information.

Water right: A water entitlement held by an irrigator in an irrigation district.

Water shares: A water entitlement held by a water corporation or person. The government passed legislation enabling all water rights and licences to be converted into water shares, beginning July 2007. For more information, refer to the *Our Water Our Future* action plan.

Water supply protection area: An area declared under Section 27 of the *Water Act 1989* to protect the area's groundwater or surface water resources through the development of a management plan which aims for equitable management and long term sustainability.

Waterway: The *Water Act 1989* defines a waterway as a river, creek, stream, watercourse and a natural channel where water regularly flows, whether or not the flow is continuous.

Wetlands: Inland, standing, shallow bodies of water that may be permanent or temporary, fresh or saline.

Yield: The quantity of water that a storage or aquifer produces.