Victorian Water Accounts

2013–2014

A statement of Victorian water resources

Department of Environment, Land, Water & Planning

State Government Victoria

Victorian Water Accounts 2013–2014

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Foreword

The Victorian Government is committed to managing our precious water resources to prepare for the challenges of climate change, El Niño and population growth.

The information in the Victorian Water Accounts is an important resource in water management, providing insight into water availability, entitlement, distribution and use across Victoria.

This report guides planning and the actions we take to deliver safe and secure water supplies to urban and rural communities, business and agriculture, and protect the environmental health of our waterways.

The *Victorian Water Accounts 2013–2014* show the total available volume of Victoria's surface water, groundwater and recycled water in 2013–14 was around 21,300,000 ML similar to the volume available in 2012–13.

Water availability during 2013–14 was below-average in most parts of Victoria, but remained well above the low volumes available in the very dry years of the mid-2000s.

There was a small reduction in the total volume of water held in Victoria's major reservoirs, which started the year at 72 per cent of capacity and ended at 68 per cent - similar to 2012–13. Looking back, this is a much healthier result than 2008–09, when storage levels were at just 17 per cent.

Annual rainfall in 2013–14 was generally average and above-average, compared with widespread below-average rainfall in 2012–13. However, the dry catchment conditions reduced annual streamflow volumes to most rivers.

Around 21 per cent of available water was taken for consumptive purposes - slightly less than in 2012-13. This is likely to be a result of higher rainfall, resulting in less demand for irrigation water.

All data collected for the Victorian Water Accounts is recorded in the Victorian Water Register (www.waterregister.vic.gov.au), which tracks water from where it is extracted in a waterway or aquifer through to its end use.

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Minister for Environment, Climate Change and Water

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Introduction

Overview of the *Victorian Water Accounts 2013-2014*

The *Victorian Water Accounts 2013–2014* is the eleventh in a series that presents annual information about the state's water resources. It covers surface water, groundwater and recycled water systems, reporting on volumes of water available and used during the year.

This report demonstrates the government's commitment to transparency and accountability in the management of our water resources. Victoria has obligations under state and federal legislation to collect and publish information on the state's water resources, and the Victorian Water Accounts makes an important contribution to meeting our reporting requirements.

The *Victorian Water Accounts 2013–2014* consolidates information from the Victorian Water Register, rural and urban water corporations, the Department of Environment, Land, Water and Planning, the Essential Services Commission, the Murray–Darling Basin Authority, the Victorian Alpine Resorts Commission, power generators and other major users of water.

The *Victorian Water Accounts 2013–2014* consists of two parts.

- Part 1 provides a statewide overview of water resources during the year. It includes information on rainfall, streamflow and storage levels, water taken for consumptive purposes, water trading and management of water for the environment.
- Part 2 contains water accounts for each of Victoria's 29 surface water basins and 20 groundwater catchments. It also presents distribution system accounts for Victoria's 19 water corporations. The accounts track each system's inflows, outflows and storage volume changes during the year.

2013–14: the year in water

Annual rainfall in 2013–14 was average or above-average across most of Victoria compared with widespread below-average rainfall in 2012–13. Despite the higher rainfall, the dry catchment conditions resulted in reduced annual streamflow volumes in approximately half the state's basins. The effect of the dry catchments was most pronounced in the Wimmera and Avoca basins, where streamflows were just above average in 2012–13 and were only 29% and 18% of the long-term average flows in 2013–14. Conversely, in the Gippsland area most basins had higher streamflows in 2013–14 than in 2012–13.

There was a small reduction in the total volume of water held in Victoria's major reservoirs during the year, which started at 72% of capacity and ended at 68% of capacity. The storages remained well above the low levels experienced during the driest years of the past decade (only 17% of the total capacity was full at the end of the 2008–09 year).

Groundwater levels in June 2014 were generally stable or rising, with declining levels observed in four Groundwater Management Areas (Moe and Stratford near Gippsland, and Gellibrand and Jan Juc near the Otway Coast). The trends are fairly similar to those of 12 months earlier.

Recycled water availability was higher in 2013–14 with a total volume of 458,058 ML produced compared with 450,355 ML in 2012–13. The higher volume available is likely to be partially due to the higher rainfall, and subsequently higher volumes of water entering the wastewater treatment systems.

Restrictions on taking and using water during 2013–14 applied to three towns and 120 unregulated streams (i.e. streams without any upstream storages). Seasonal allocations reached 100% for high reliability entitlements in most regulated surface water systems and in some systems low reliability allocations were also made. Allocations in most groundwater systems were 100%. The restrictions and allocations in 2013–14 were generally fairly similar to those that occurred in 2012–13.

Approximately 21% of the total water available in 2013–14 was taken for consumptive purposes. This proportion is comparable with 2012–13, although the total volume taken was slightly less this year. The reduction in volume taken is likely a result of higher rainfall this year, resulting in less demand for irrigation water.

In 2013–14, the Victorian Environmental Water Holder oversaw the delivery of more than 809,000 ML of water to 66 river reaches and 79 wetlands, providing significant benefit to a wide range of water-dependent plants and animals. Of the 222 potential priority watering actions identified in the Seasonal Watering Plan for 2013–14, some 181 (82%) were fully or partially achieved through natural river flows, river operations, or as a direct result of managed environmental releases.

Part 1: Overview of Victorian water resources 2013–14

Part 1 of the *Victorian Water Accounts 2013–2014* provides a statewide overview of Victorian water resources during the year. It reports on:

- the quantity of water available in terms of rainfall, streamflow, reservoirs and aquifers
- Victoria's water entitlement and planning framework and the mechanisms it provides for responding to water availability
- the quantity of water allocated for consumptive use from reservoirs, streams and aquifers under entitlements issued by government, as well as quantities used and recycled
- water available to the environment
- Victoria's water trade activity.

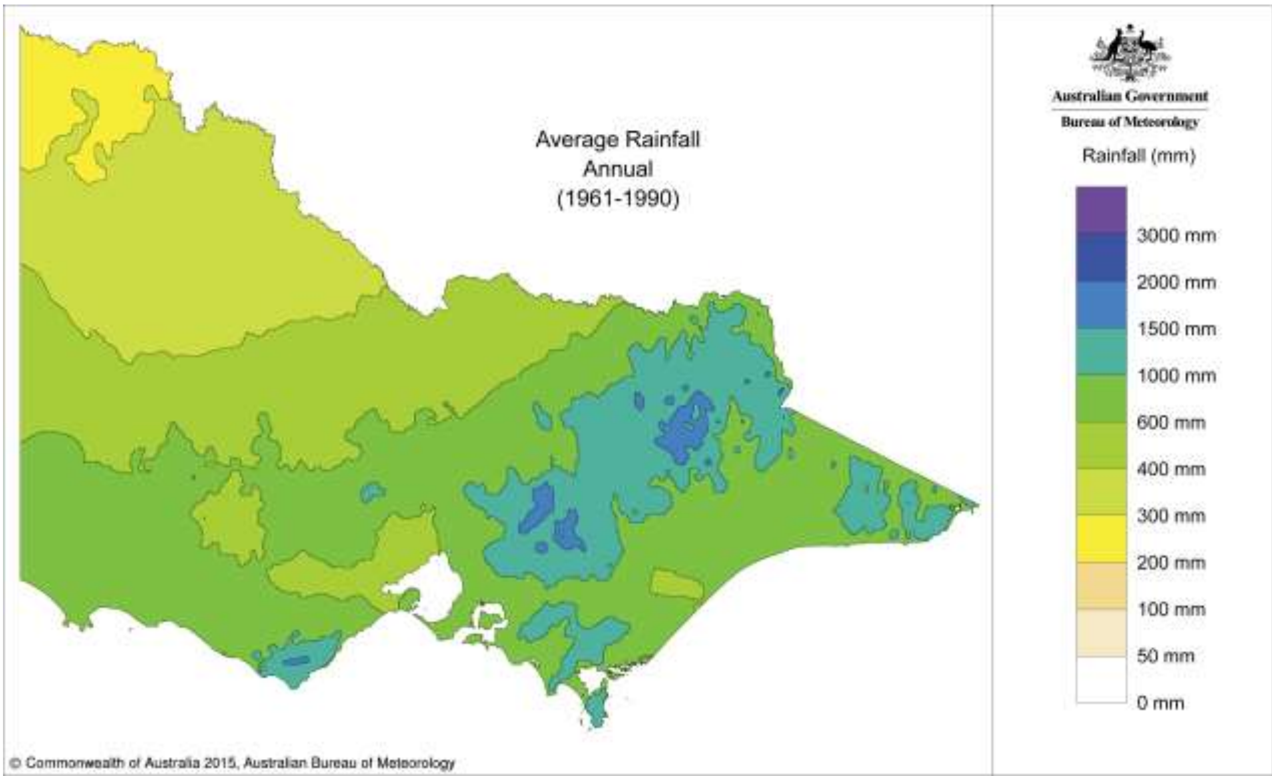
1 Water availability

This chapter presents an overview of surface water and groundwater availability in Victoria in 2013–14. It reports rainfall, streamflow and levels in major reservoirs compared with previous years and the long-term averages. It also reports the annual trend in groundwater levels in Groundwater Management Areas and Water Supply Protection Areas.

1.1 Rainfall

The long-term average rainfall in Victoria varies from less than 300 millimetres a year in the north-west of the state to 2,000 millimetres a year in the alpine area of the north-east (Figure 1-1).

Figure 1-1 Victorian long-term average annual rainfall



Overall, 2013–14 saw near-average rainfall conditions for much of Victoria. Total annual rainfall ranged from 200 to 300 mm in the north-west to 1,800 to 2,400 mm in isolated parts of the alpine region in the north-east and the Otway area in the south-west (Figure 1-2).

Rainfall for 2013–14 was categorised as average or above average across most of Victoria (Figure 1-3), generally ranging between 80% and 125% of the long-term average (Figure 1-4). Rainfall over the south-west coast was categorised as very much above average, with an isolated area near Portland receiving the highest annual rainfall on record (Figure 1-3).

Isolated patches of the state received below-average annual rainfall (Figure 1-3); the lowest rainfall was seen over the Wimmera basin, with between 60% and 80% of the long-term average (Figure 1-4).

These differences in rainfall in Victoria's regions were reflected in evapotranspiration. The statewide average evapotranspiration in 2013–14 was estimated at 532 mm, which is about 3% lower than the long-term average for Victoria. Across the basins in the state's far north-west and south-east, evapotranspiration for 2013–14 was lower than the long-term average, in contrast with other parts of Victoria where evapotranspiration was similar to, or higher than, the long-term average. In general these differences broadly reflect the slightly lower-than-average rainfall in some parts of the north-west and south-east, and slightly higher-than-average rainfall in some other parts of Victoria. The basin with the highest estimated evapotranspiration relative to the long-term average was the Portland basin, reflecting the very much above-average rainfall recorded in this area during 2013–14 (Appendix C).

Figure 1-2 Victorian rainfall in 2013–14 (mm)

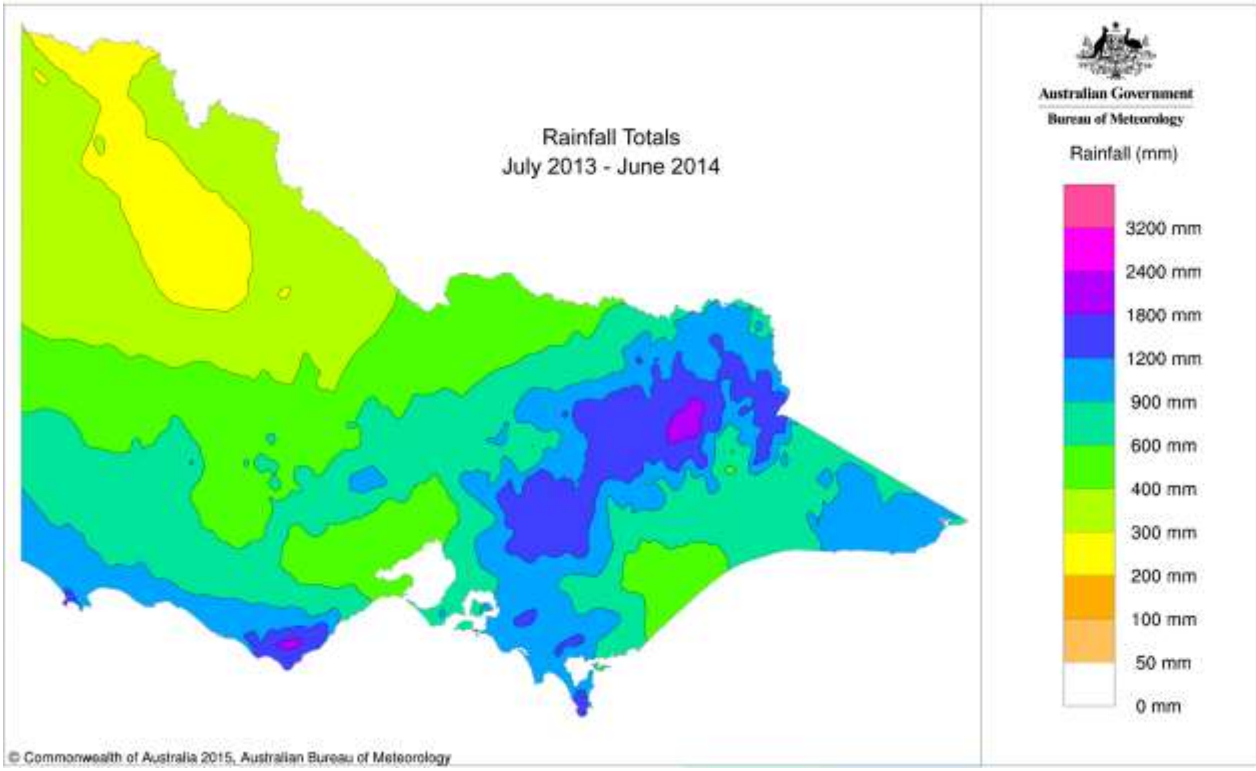


Figure 1-3 Victorian rainfall deciles in 2013–14

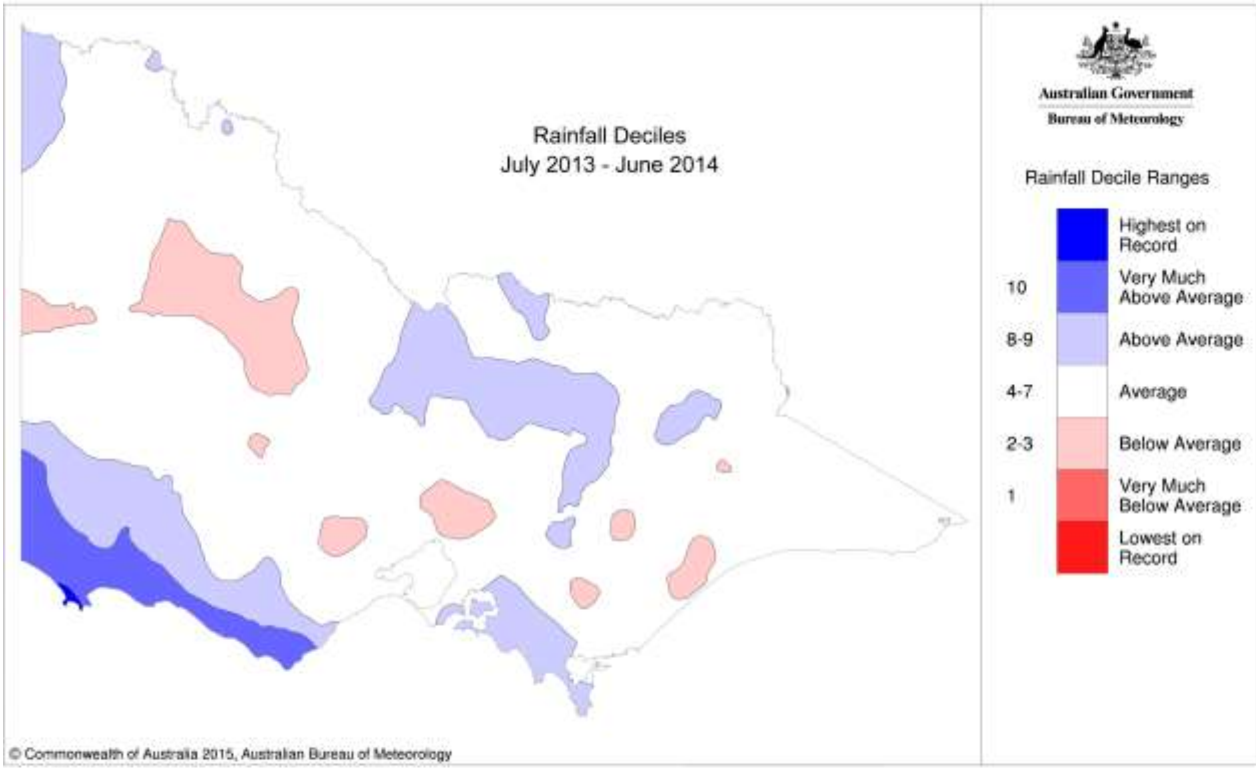
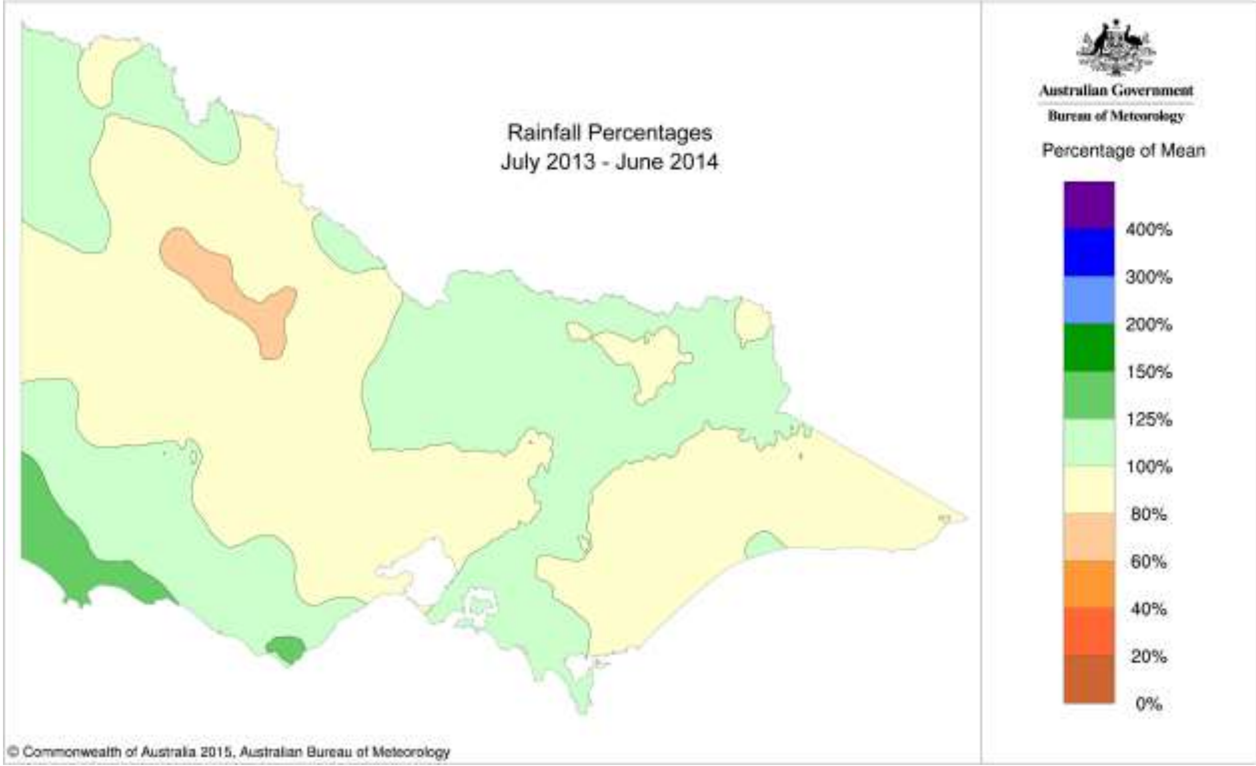


Figure 1-4 Victorian rainfall in 2013–14 as a percentage of long-term average rainfall



While Victoria's total annual rainfall was generally in the average to above-average range, there were variations in seasonal rainfall conditions.

The winter of 2013 (Figure 1-5 A) was particularly wet, with most of the state receiving higher-than-normal winter rainfall. Many southern areas were categorised as very much above average; around 80 sites received the highest winter rainfall on record, largely due to high rainfall events at the end of the previous water year. The Bureau of Meteorology reported that the area-averaged winter rainfall in 2013 was the highest recorded for Victoria since 1995.

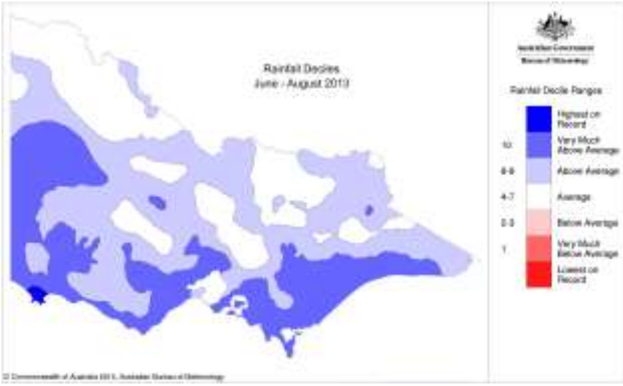
Spring rainfall (Figure 1-5 B) showed some variation across the state, with wetter-than-normal conditions along the coastal areas and drier conditions in parts of the north, particularly in the north-east where conditions were very much below average. However, rainfall throughout the central belt of Victoria was categorised as average.

Summer rainfall (Figure 1-5 C) across most of the state was below average to very much below average with 29 sites, predominantly in the Wimmera region, recording their lowest total summer rainfall on record. Summer rainfall conditions in north-east Victoria were categorised as average, with the Mallee being the only area to receive above-average total summer rainfall.

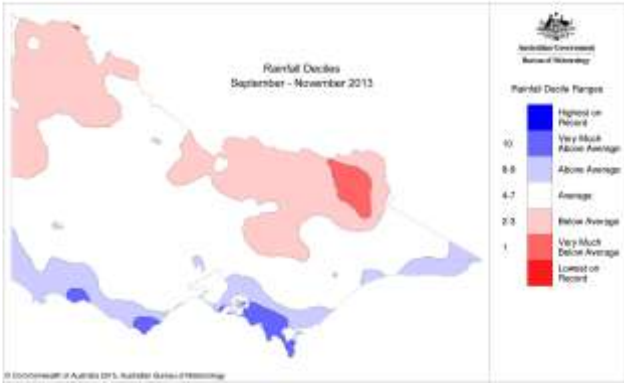
Conditions for the autumn of 2014 (Figure 1-5 D) were wetter than normal in the northern parts of the state, whereas the south received near-average autumn rainfall totals with some pockets of below-average rainfall, predominantly over South Gippsland.

Figure 1-5 Victorian seasonal rainfall deciles in 2013–14

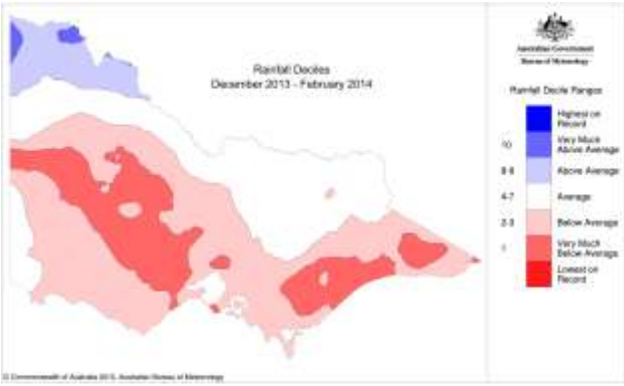
A. Rainfall deciles for winter 2013



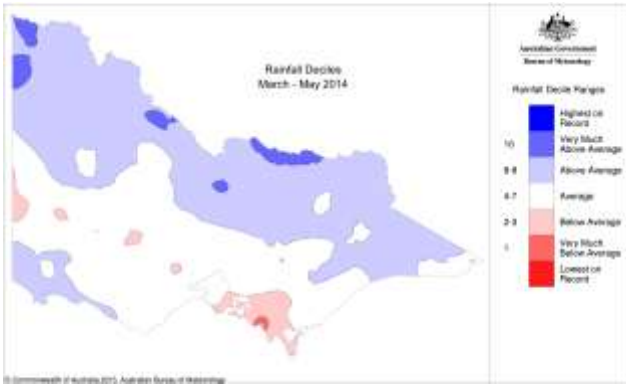
B. Rainfall deciles for spring 2013



C. Rainfall deciles for summer 2013–14



D. Rainfall deciles for autumn 2014

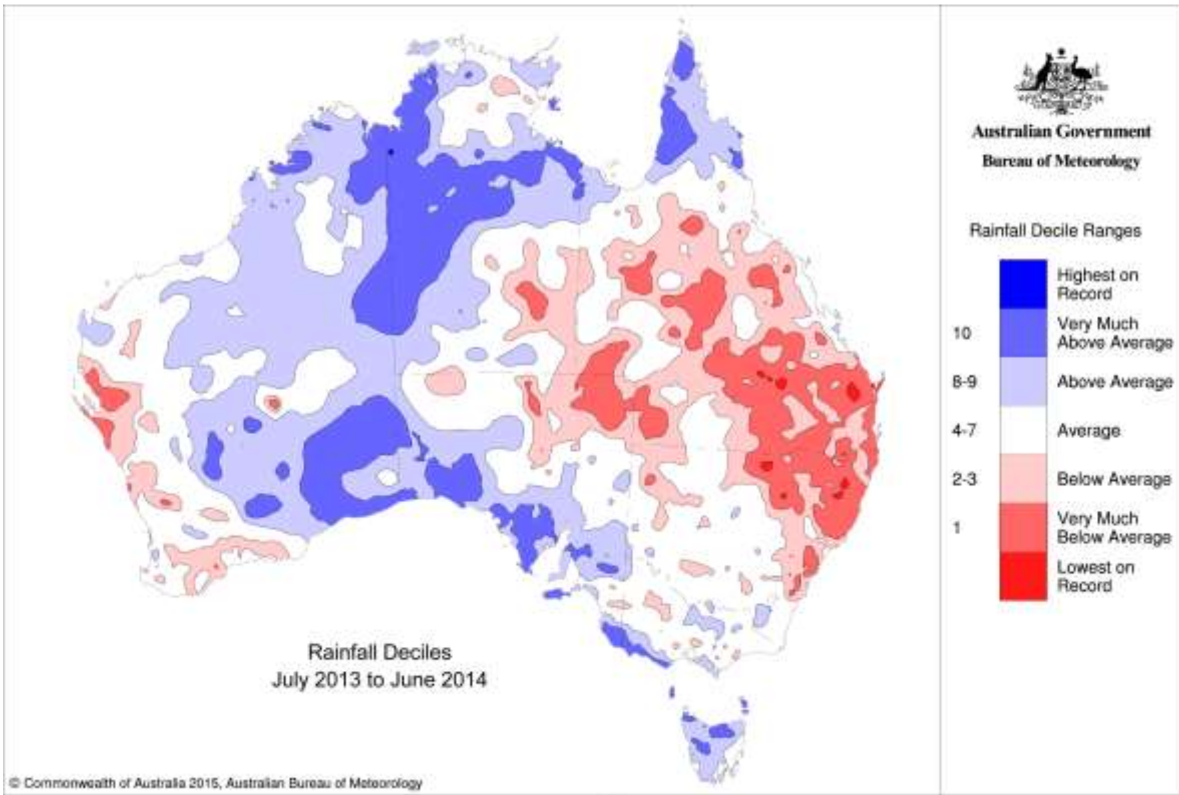


While Victoria generally received average to above-average rainfall in 2013–14, the Bureau of Meteorology classified the area-averaged rainfall conditions across Australia as near average in 2013 and 2014, although there were marked differences between the states (Figure 1-6). Generally, the eastern half of Australia experienced drier-than-normal conditions in 2013–14.

The El Niño–Southern Oscillation (ENSO) was neutral during 2013–14, with neither El Niño nor La Niña influencing Victorian rainfall. During early autumn 2014 the Pacific Ocean showed signs of a developing El Niño, however the atmospheric circulation failed to respond in a manner which progresses the climate system into a full El Niño.

The Southern Annular Mode (SAM) was in a strongly negative phase in late winter and spring 2013, with the August October value of the SAM index being the lowest since 1988. The negative phase of the SAM contributed to above-average rainfall in coastal areas during late winter and spring 2013.

Figure 1-6 Australian rainfall deciles, 1 July 2013 to 30 June 2014



1.2 Streamflow

Local factors influence how much rainfall becomes streamflow and these factors vary between river basins. Local influences include subsurface geology, soil permeability and moisture levels, vegetation cover and the pattern of individual rainfall events. Streamflows within a basin can vary between months, and this is captured in Victoria's Monthly Water Report, published online at <www.delwp.vic.gov.au>.

In 2013–14, local factors resulted in streamflows that were below average in 22 basins and greater than average in five basins (Table 1-1). Some of the basins that had streamflows higher than average in 2012–13 – such as the East Gippsland, Tambo and Latrobe basins – had streamflows below average in 2013–14 (Table 1-3). Overall, the total streamflow volume for Victoria was 76% of the long-term average (Table 1-2). This is a significant drop from the 81% of long-term average reported for 2012–13.

The highest-yielding river basins in 2013–14 relative to their long-term averages were the South Gippsland, Bunyip and Portland Coast basins. These basins had streamflows between 149% and 158% of the long-term average, which is significantly more than the previous year, when they had streamflows of between 94% and 119% of the long-term average.

The Campaspe, Loddon, Tambo, Maribyrnong, Werribee, Hopkins, Wimmera and Avoca basins were the driest in 2013–14. These basins recorded inflows of 18% to 49% of the long-term average.

Table 1-1 Basin streamflow compared with long-term average

Basin	Average annual streamflow (ML)	2013–14 streamflow(1)		2012–13 streamflow(1)	
		(ML)	(% of average)	(ML)	(% of average)
Murray	7,618,000	4,562,480	60%	6,143,993	81%
Kiewa	689,000	605,828	88%	612,663	89%
Ovens	1,758,000	1,450,612	83%	1,234,059	70%
Broken	308,000	210,402	68%	201,296	65%
Goulburn(2)	3,363,000	2,399,347	71%	2,530,962	75%
Campaspe	352,000	161,438	46%	165,079	47%
Loddon	373,000	157,132	42%	194,784	52%
East Gippsland	714,000	666,465	93%	953,355	134%
Snowy(3)	1,022,000	1,110,316	109%	1,441,377	141%
Tambo	297,800	144,683	49%	309,242	104%
Mitchell	884,500	782,716	88%	722,170	82%
Thomson	1,101,760	718,366	65%	876,174	80%
Latrobe	847,400	789,922	93%	900,762	106%
South Gippsland	911,500	1,361,864	149%	1,017,893	112%
Bunyip	541,000	854,730	158%	645,007	119%
Yarra	1,054,000	699,325	66%	914,537	87%
Maribyrnong	113,000	43,563	39%	81,471	72%
Werribee	102,000	41,588	41%	79,770	78%
Moorabool	97,000	51,988	54%	94,386	97%
Barwon	360,000	198,475	55%	155,726	43%
Corangamite	316,000	307,353	97%	145,591	46%
Otway Coast	884,000	962,890	109%	668,930	76%
Hopkins	635,000	280,650	44%	235,182	37%
Portland Coast	361,000	571,317	158%	338,902	94%
Glenelg	964,000	599,750	62%	426,508	44%
Millicent Coast(4)	0	4	-	4	-
Wimmera	316,400	92,907	29%	71,509	23%
Mallee(4)	0	0	-	0	-
Avoca	136,200	24,253	18%	23,942	18%
Total	**26,119,560**	**19,850,362**	**76%**	**21,185,276**	**81%**

Notes:

(1) 'Streamflow' is equivalent to 'catchment inflow' in the water balances presented in Chapter 6.

(2) Includes inflows from Broken River.

(3) Volumes shown for the Snowy basin exclude catchment inflows from New South Wales (upstream of Burnt Hut Crossing).

(4) Surface water resources within the Mallee and Millicent Coast basins are limited and there are currently no streamflow gauges in these basins. Streamflow in the Millicent basin is estimated be equal to the volume of licensed diversion from unregulated streams within the basin. There are no licensed diversions in the Mallee basin and it is assumed it has no streamflow.

Table 1-2 Total Victorian streamflow compared with the long-term average

Year	Streamflow (ML)	Percentage of long-term average
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	8,239,800	32%
2009–10	13,132,100	50%
2010–11	45,714,200	175%
2011–12(1)	32,501,756	124%
2012–13	21,185,276	81%
2013–14	**19,850,362**	**76%**

Note:

(1) The total 2011–12 streamflow differs from the value of 32,182,195 ML reported in the 2011–12 Victorian Water Accounts due to updated data for the Murray, Broken and Goulburn basins.

Continuous records of streamflows for nine selected locations show a range from average to well below-average flows in 2013–14 (Figure 1-7 to Figure 1-15), with none of the selected gauging sites recording above-average annual flows.

Water availability

The Goulburn River at Dohertys (Figure 1-7), Snowy Creek at Granite Flat (Figure 1-11), Mitchell River at Glenaladale (Figure 1-12) and Deep Creek at Bulla (Figure 1-13) all experienced near-to-average flow conditions in 2013–14.

Below-average annual streamflows were recorded at three of the selected sites (Figure 1-8, Figure 1-14 and Figure 1-15), ranging from about 10% to 50% of the respective long-term averages.

Two sites had very much below-average total streamflow for 2013–14, with the Avoca River at Coonooer and Wimmera River at Glynwylln recording flows that were even well below the average of the Millennium Drought (Figure 1-9 and Figure 1-10).

Streamflows influence Victoria's water storages (Section 1.3). In line with the below-average annual streamflows presented in Table 1-1, Table 1-2 and Figure 1-7 to Figure 1-15, the annual inflows to Melbourne's harvesting reservoirs in the Yarra and Thomson basins in 2013–14 were also below the long-term average of the available period of record (Figure 1-16).

Figure 1-7 Annual streamflow – Goulburn River at Dohertys (Station no. 405219)

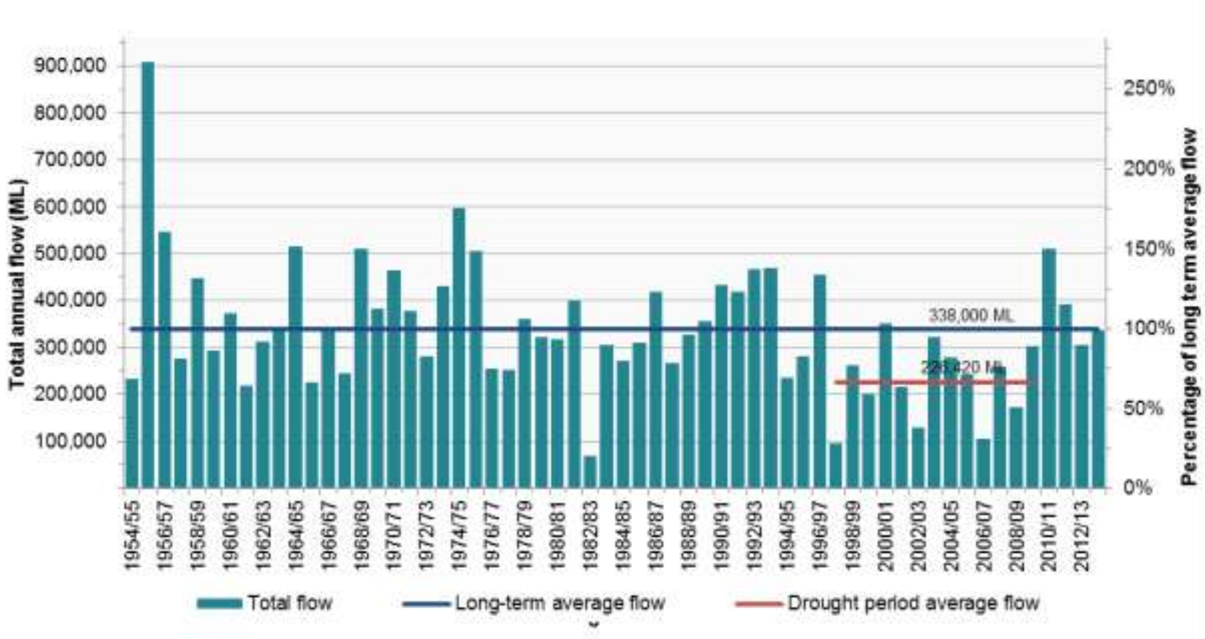


Figure 1-8 Annual streamflow – Loddon River at Vaughan (Station no. 407217)

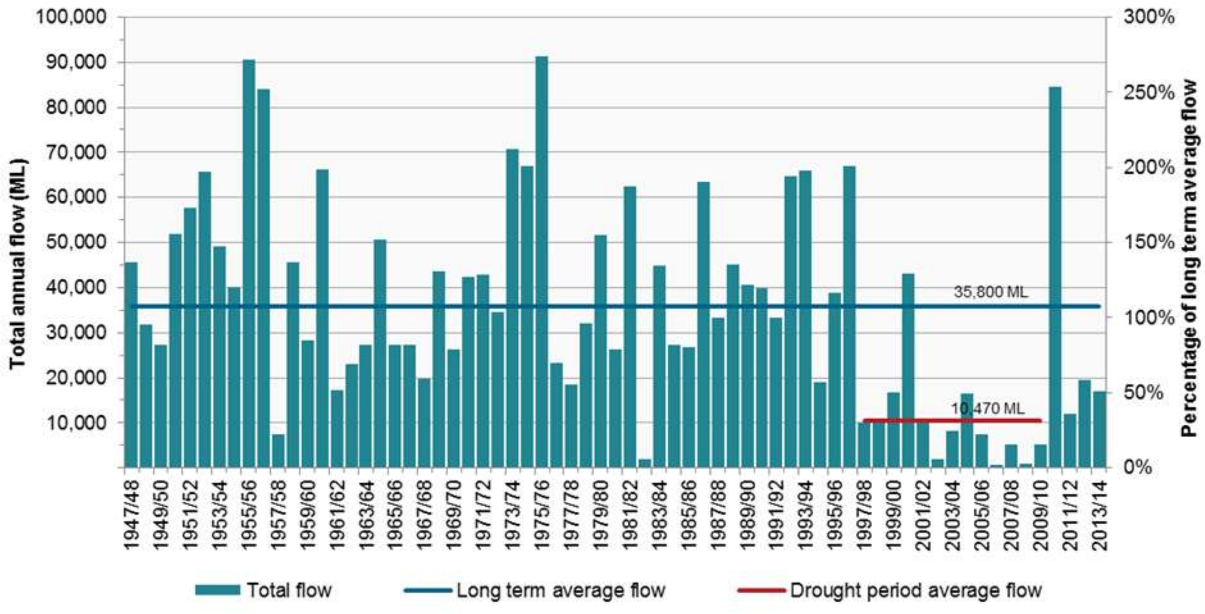


Figure 1-9 Annual streamflow – Avoca River at Coonooer (Station no. 408200)

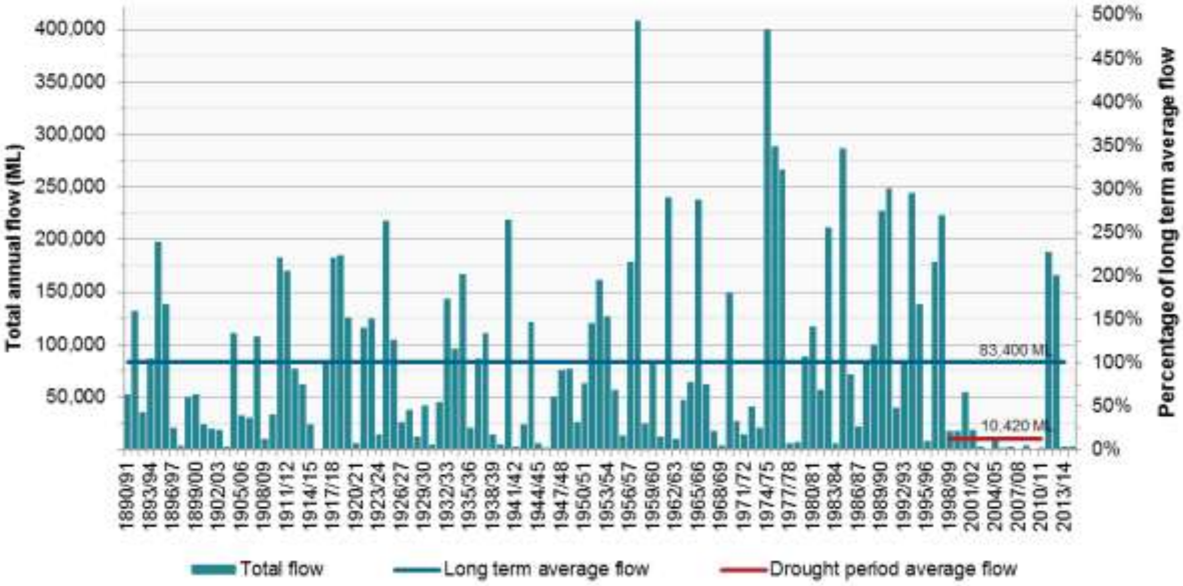


Figure 1-10 Annual streamflow – Wimmera River at Glynwylln (Station no. 415206)

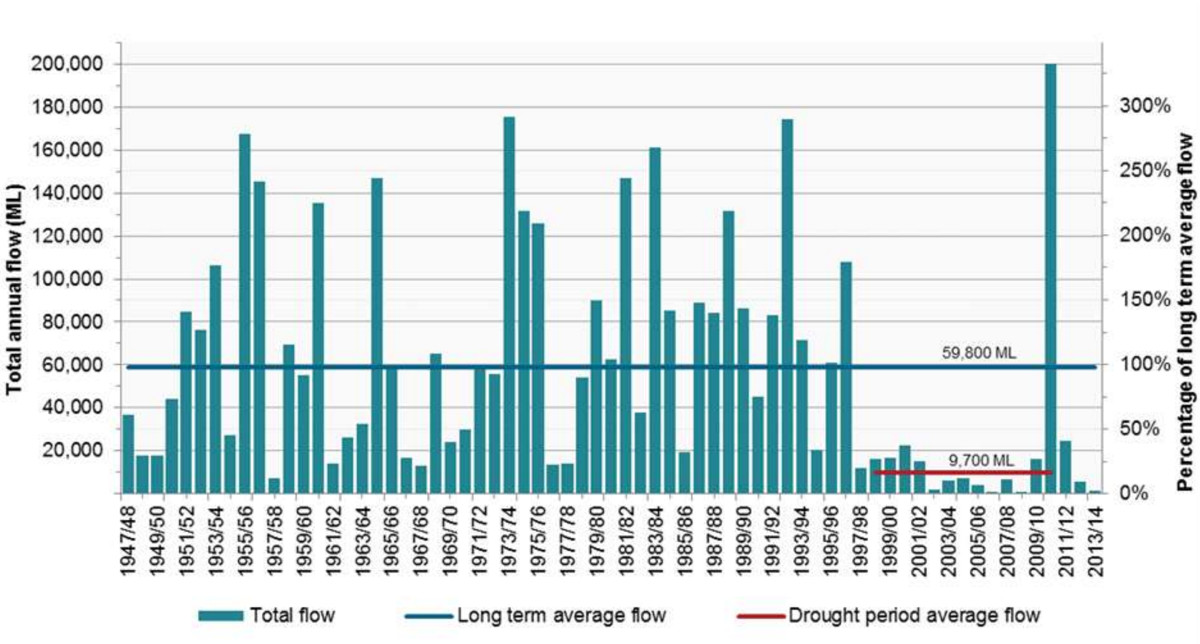


Figure 1-11 Annual streamflow – Snowy Creek at Granite Flat (Station no. 401210)

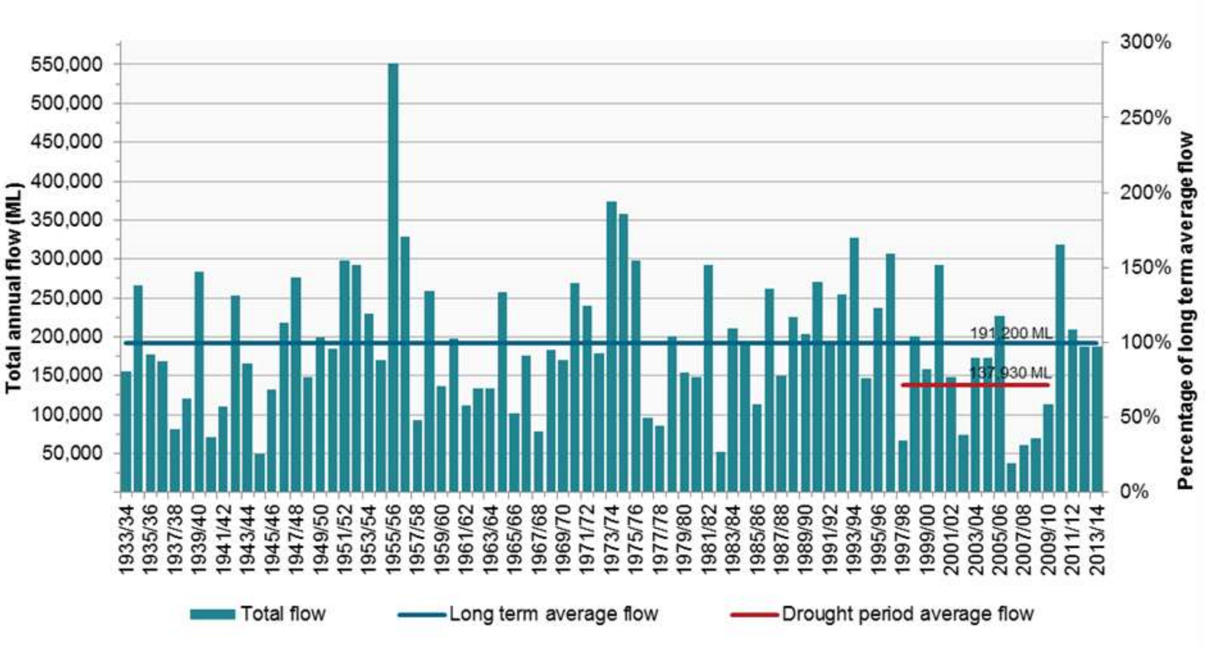


Figure 1-12 Annual streamflow – Mitchell River at Glenaladale (Station no. 224203)

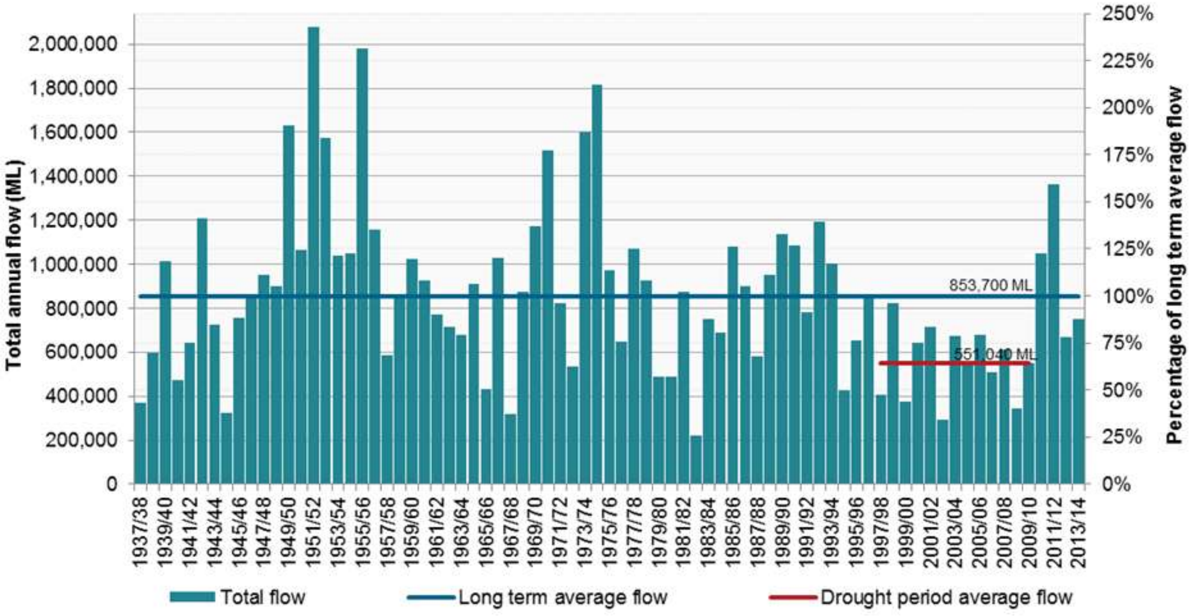


Figure 1-13 Annual streamflow – Deep Creek at Bulla (Station no. 230205)

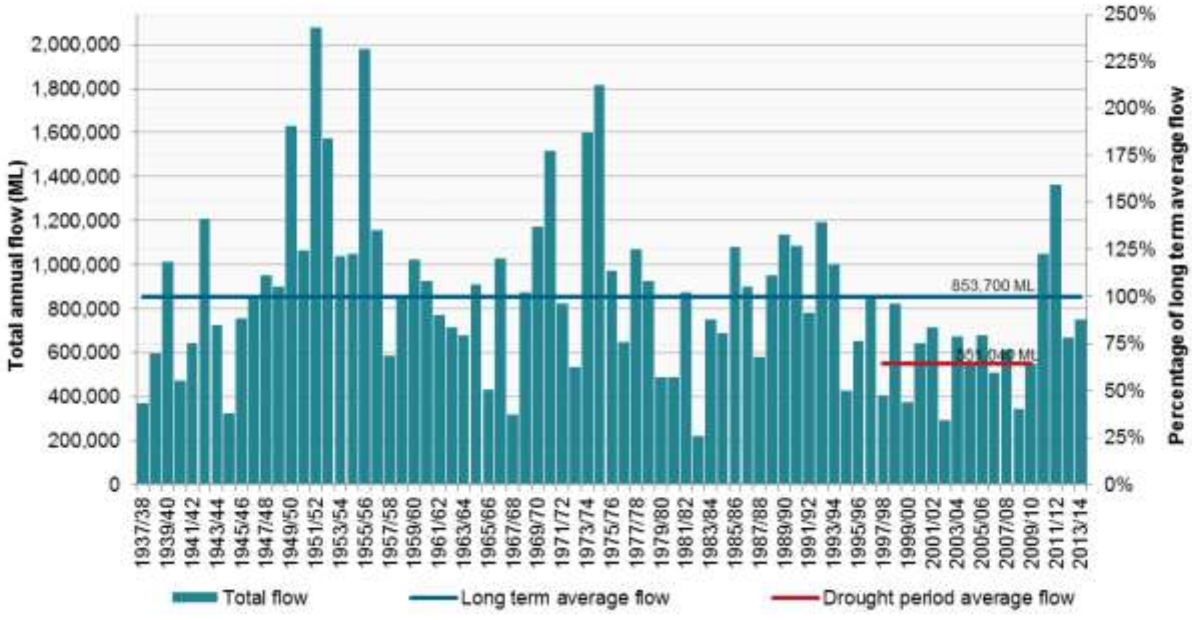
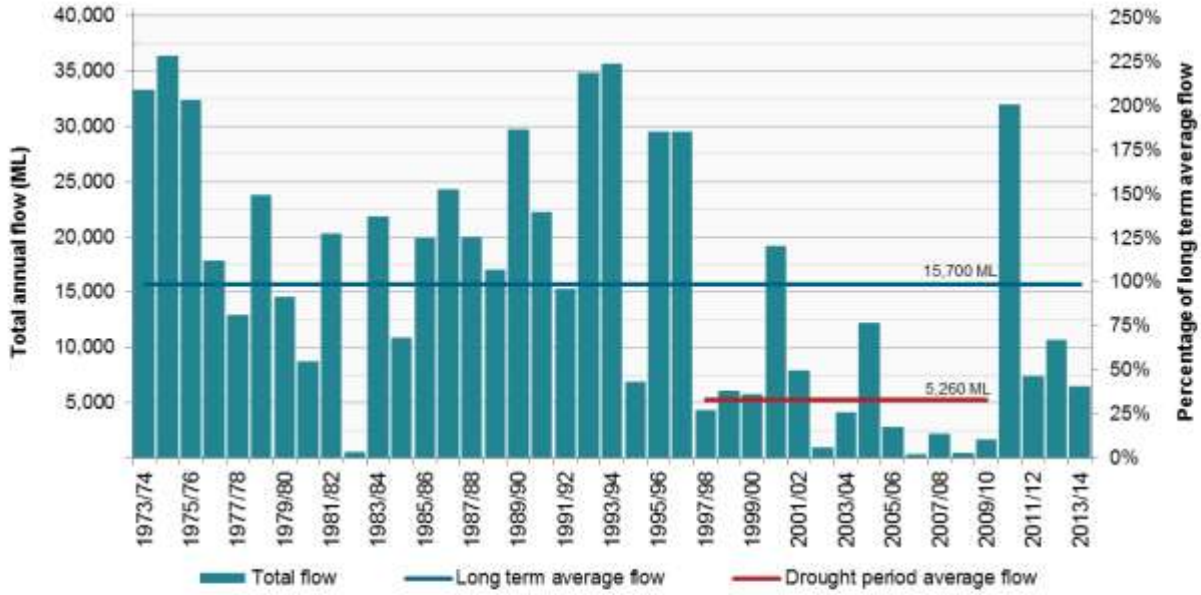


Figure 1-14 Annual streamflow – Werribee River at Ballan (Station no. 231225)



Water availability

Figure 1-15 Annual streamflow – Moorabool River at Batesford (Station no. 232202)

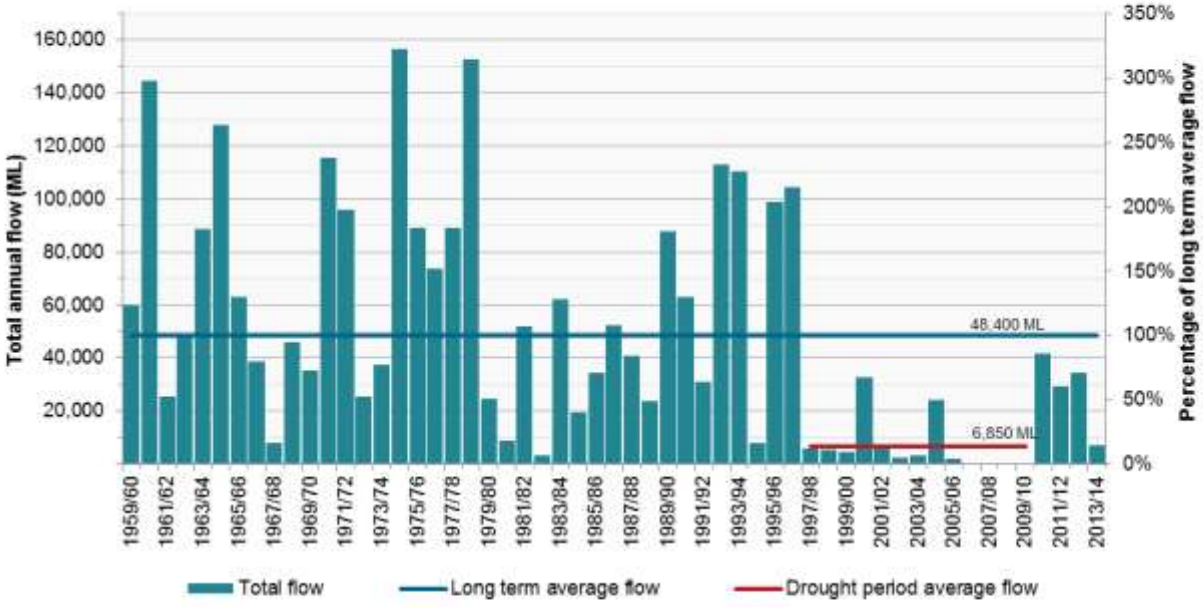
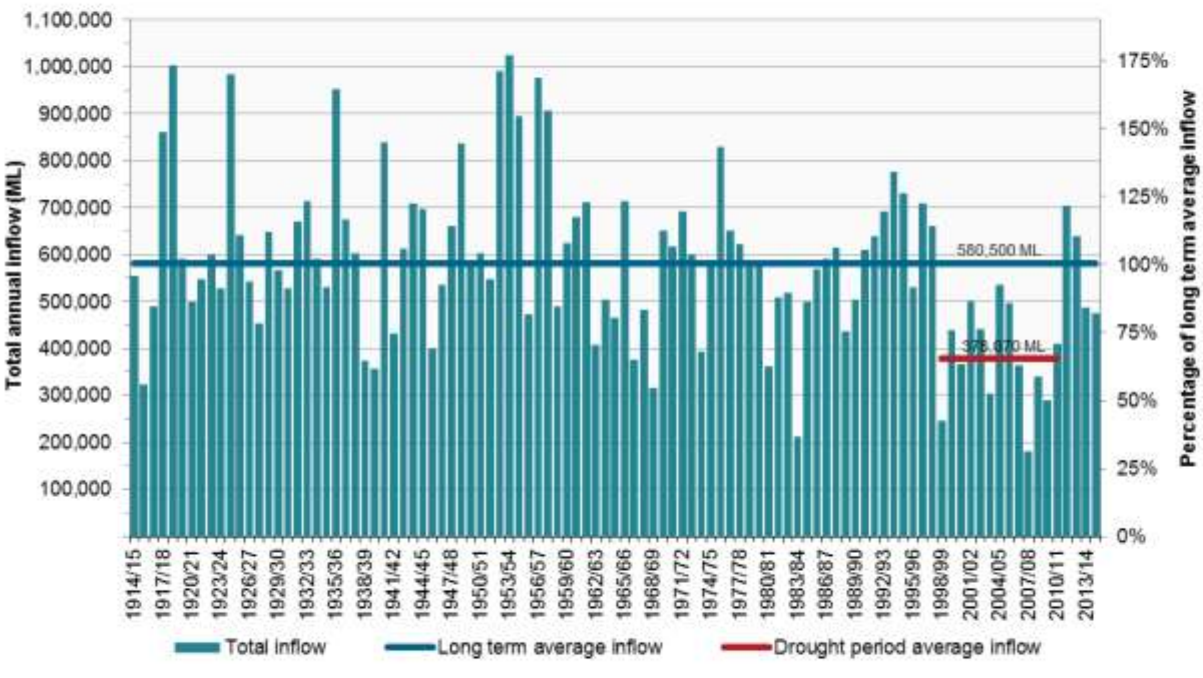


Figure 1-16 Annual inflows to Melbourne's main harvesting reservoirs(1)



(1) Maroondah, O'Shannassy, Upper Yarra and Thomson reservoirs.

1.2.1 Other factors affecting water availability across Victoria

In 2013–14 cyanobacteria blooms, also referred to as blue-green algal blooms or BGA, affected water availability in some parts of Victoria.

Cyanobacteria are a natural component of most aquatic systems and are found in streams, lakes, estuaries and the sea. The presence of significant numbers of cyanobacteria in water bodies can produce toxins that can have serious health implications for humans, animals, birds and livestock, as well as significant environmental impacts.

Many factors can trigger cyanobacteria blooms including nutrient loads, low inflows, low storage volumes and higher-than-normal temperatures. Cyanobacteria outbreaks generally occur in the summer months.

Cyanobacteria blooms are monitored regularly by water corporations and local waterway managers. In cases where the concentration of cyanobacteria exceeds the thresholds for safe water use, the bloom should be reported to the Department of Environment, Land, Water and Planning (DELWP) and, in cases affecting drinking water supplies, the

Department of Health. Local waterway managers should also activate their risk management plans, which may include erecting signage at the site and issuing a media release to the public. More information on the management of cyanobacteria blooms can be found in the Blue-Green Algae Circular, published online at <www.delwp.vic.gov.au>.

In 2013–14, a total of 31 cyanobacteria alerts were issued in Victoria, predominantly affecting recreational water use (Table 1-3). Drinking water supplies affected by cyanobacteria alerts were largely confined to water bodies in the Central and Northern regions. Compared with 2012–13, there was a significant reduction in the number of alerts, with 40% fewer alerts issued for drinking water supplies and more than 50% fewer alerts for recreational water use.

Table 1-3 Cyanobacteria bloom alerts issued in 2013-14

Region	Alerts issued for drinking water supplies in 2013–14	Alerts issued for recreational water use in 2013–14	Total cyanobacteria alerts issued in 2013–14
Central region	5	10	**15**
Gippsland region	1	1	**2**
Northern region	3	6	**9**
Western region	-	5	**5**
Total	**9**	**22**	**31**

1.3 Storages

Victoria's major water storages are capable of holding around 12,363,261 ML. Of this, Melbourne's storage capacity is 1,812,175 ML and the combined capacity of the state's major regional storages is 10,551,086 ML.

In 2013–14 Victoria's total storage levels started the year at 8,867,272 ML (72% of capacity) and ended at 8,438,874 ML (68% of capacity). The combined volume of water stored in Victoria's reservoirs varies both within a given year and between years (Figure 1-17 and Figure 1-18).

Storage levels in Victoria's regional reservoirs started the year at 7,584,358 ML (72% of capacity) and ended at 7,122,890 ML (68% of capacity). Storage levels increased during spring, reaching a peak of 89% of capacity in September, and declined through the summer to a minimum of 63% of capacity by April 2014 (Figure 1-17).

Melbourne's water storages started the year at 1,282,914 ML (71% of total capacity) and ended at a similar level of 1,315,984 ML (73% of total capacity), after reaching a peak of 81% in November 2013 (Figure 1-18). In the previous four years, Melbourne's storage levels were higher at the end of the year than they were at the start. This is in contrast to the latter years of the Millennium Drought when, between 2006 and 2009, storages consistently ended each year at lower levels than they had begun (Figure 1-18).

A subset of about 60 major storages was used to provide the summary information in Figure 1-17 and Figure 1-18. Information on levels held in all major storages across Victoria's surface water basins is set out in Appendix A and in the water balances presented in Chapter 6.

Figure 1-17 Volume in major regional water storages, 1 July 2004 to 30 June 2014

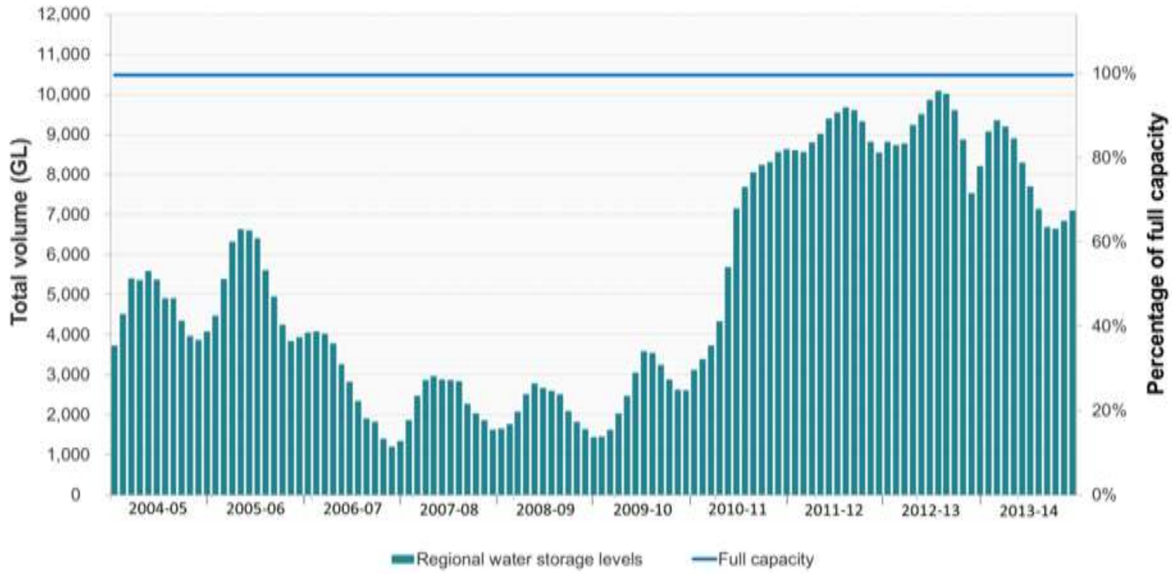
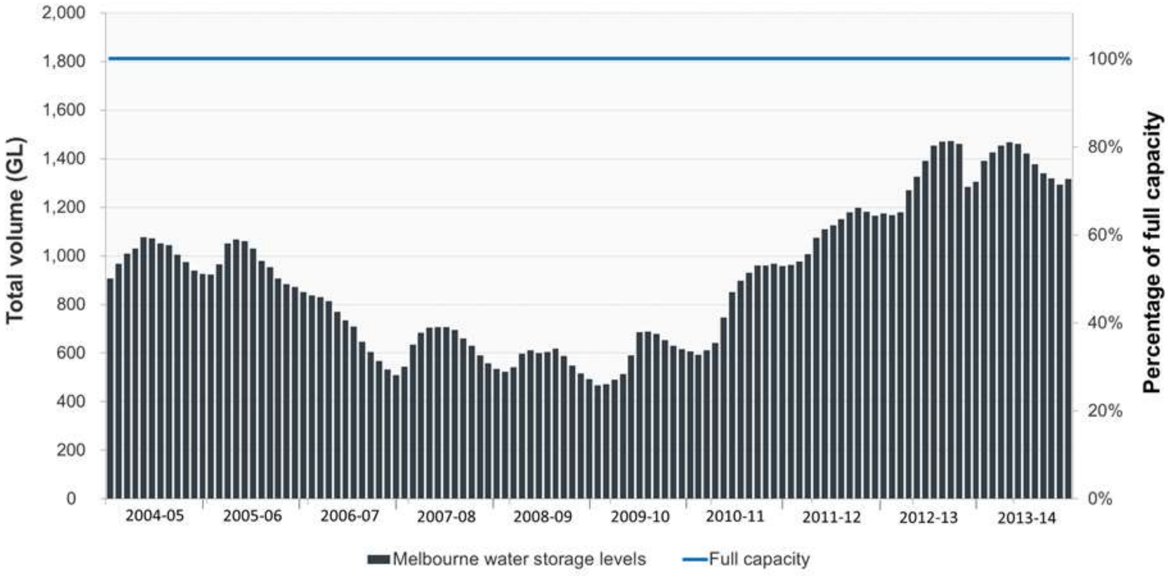


Figure 1-18 Volume in Melbourne Water Corporation storages, 1 July 2004 to 30 June 2014

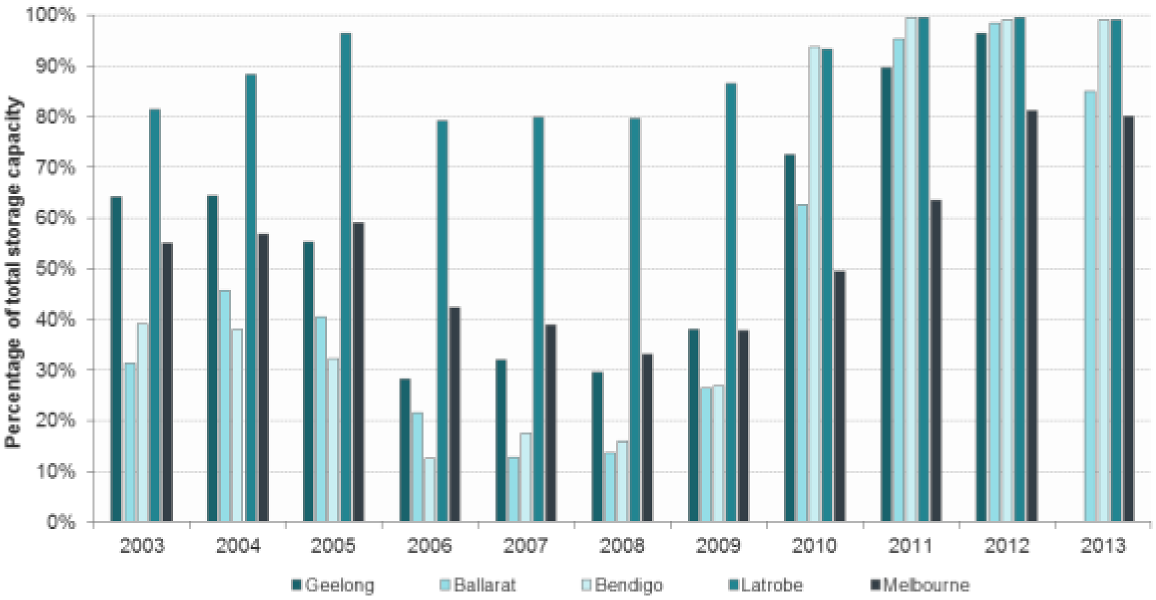


The total volume of water stored in Victoria's major reservoirs has historically been at its highest following winter and spring inflows, hence storage levels at the end of October are traditionally considered to be a good indication of water availability for the remainder of that year.

Figure 1-19 presents October storage levels as a percentage of storage capacity for Melbourne and selected major regional centres from October 2003 to October 2013.

During the drought, October storage levels generally declined from 2003 to 2007 (Figure 1-19) as inflows were not sufficient for systems to recover. A significant drop in levels occurred between 2005–06 and 2006–07, when winter and spring rainfall was extremely low across the state (Figure 1-19). By October 2010, storage levels had recovered significantly, with further recovery during 2011–12 across all major centres (Figure 1-19). At the end of October 2013, storage levels for all the selected urban centres were between 80% and 99% of capacity. Storages for all four regional centres were more than 85% of capacity, while Melbourne storages increased to 80% in October 2013 compared with 81% at the same time in the previous year (Figure 1-19).

Figure 1-19 Water in reservoirs for major urban centres at the end of October in each year between 2003 and 2013, percentage of total storage capacity



1.4 Groundwater

Groundwater exists in the spaces and fractures in rock and sediment beneath the ground's surface. It originates as rainfall or snow, and then seeps from the surface into the groundwater system, where it eventually makes its way back to surface rivers and streams, lakes and wetlands and the ocean. Groundwater supports groundwater-dependent ecosystems, human consumption and agricultural, commercial and industrial uses and contributes to environmental flows in streams.

Trends in groundwater levels reflect changes in aquifer storage resulting from differences between the amount of water flowing into (recharge) and out of (discharge) an aquifer. Groundwater level trends in shallow aquifers are more likely to reflect changes in recharge, from either rainfall or irrigation, whereas deeper aquifer trends may show a greater influence from pumping.

Groundwater in Victoria is managed through Groundwater Management Units (GMUs). A GMU may be classified as either as a Water Supply Protection Area (WSPA) or a Groundwater Management Area (GMA).

The State Observation Bore Network (SOBN) is the collection of bores used for monitoring the movement, availability and quality of Victorian groundwater, as well as the linkages between groundwater and surface water systems throughout the state. The SOBN comprises approximately 2,500 bores that are monitored on a routine basis. Short-term groundwater level trends for GMUs have been determined based on five years of consistent monitoring data from key bores in the SOBN. Trend determinations are made quarterly, when each reading is compared with previous readings in the same season (i.e. a summer record is compared with previous summer records to account for seasonality). The bores for each GMU are selected on the basis of a number of factors, including the length and quality of records available, the geographic distribution of bores and the maximum possible distance from irrigation bores (to minimise the influence of pumping on the groundwater levels recorded).

During 2013–14, groundwater level trends in Victoria's WSPAs remained similar to those observed in 2012–13 (Table 1-4 and Figure 1-20). In the state's GMAs 10 areas were categorised as increasing compared with four areas in 2012–13 (Table 1-5 and Figure 1-21).

The number of WSPAs in Victoria has reduced from 19 to 17, following abolition of the Denison WSPA and Shepparton Irrigation WSPA.

Table 1-4 Groundwater level trends in Water Supply Protection Areas

Water Supply Protection Area	Groundwater level trend 2013–14				Groundwater level trend June 2013
	September 2013	December 2013	March 2014	June 2014	
Bungaree	Rising	Rising	Rising	**Rising**	Rising
Condah	Stable	Rising	Rising	**Stable**	Stable
Denison(1)	Stable	Stable	-	**-**	Stable
Deutgam	Rising	Rising	Rising	**Rising**	Rising
Glenelg	Stable	Stable	Stable	**Stable**	Stable
Katunga	Rising	Rising	Rising	**Rising**	Rising
Koo Wee Rup	Rising	Rising	Rising	**Rising**	Rising
Loddon Highlands	Rising	Rising	Rising	**Rising**	Rising
Lower Campaspe Valley	Rising	Rising	Rising	**Rising**	Rising
Murrayville	Stable	Stable	Stable	**Stable**	Stable
Nullaware	Rising	Rising	Rising	**Rising**	Rising
Sale	Stable	Stable	Stable	**Stable**	Stable
Shepparton Irrigation Region(1)	Stable	Stable	-	**-**	Stable
Upper Ovens	Rising	Rising	Stable	**Stable**	Stable
Wandin Yallock	Rising	Rising	Rising	**Rising**	Rising
Warrion	Rising	Rising	Rising	**Rising**	Rising
Wy Yung	Rising	Rising	Rising	**Rising**	Rising
Yangery	Rising	Rising	Rising	**Rising**	Rising
Yarram	Declining	Stable	Stable	**Stable**	Declining

Note:

(1) Denison and Shepparton Irrigation Region were undeclared during the March and June reporting periods.

Figure 1-20 Groundwater trends in Water Supply Protection Areas

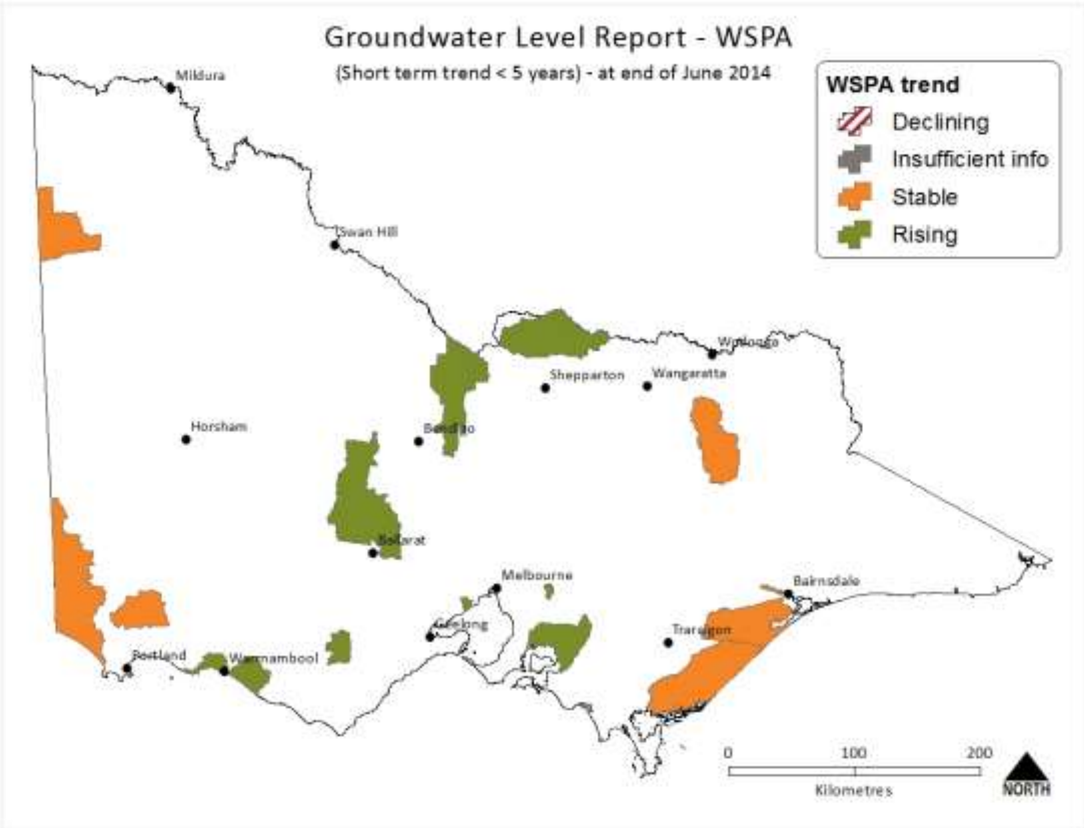


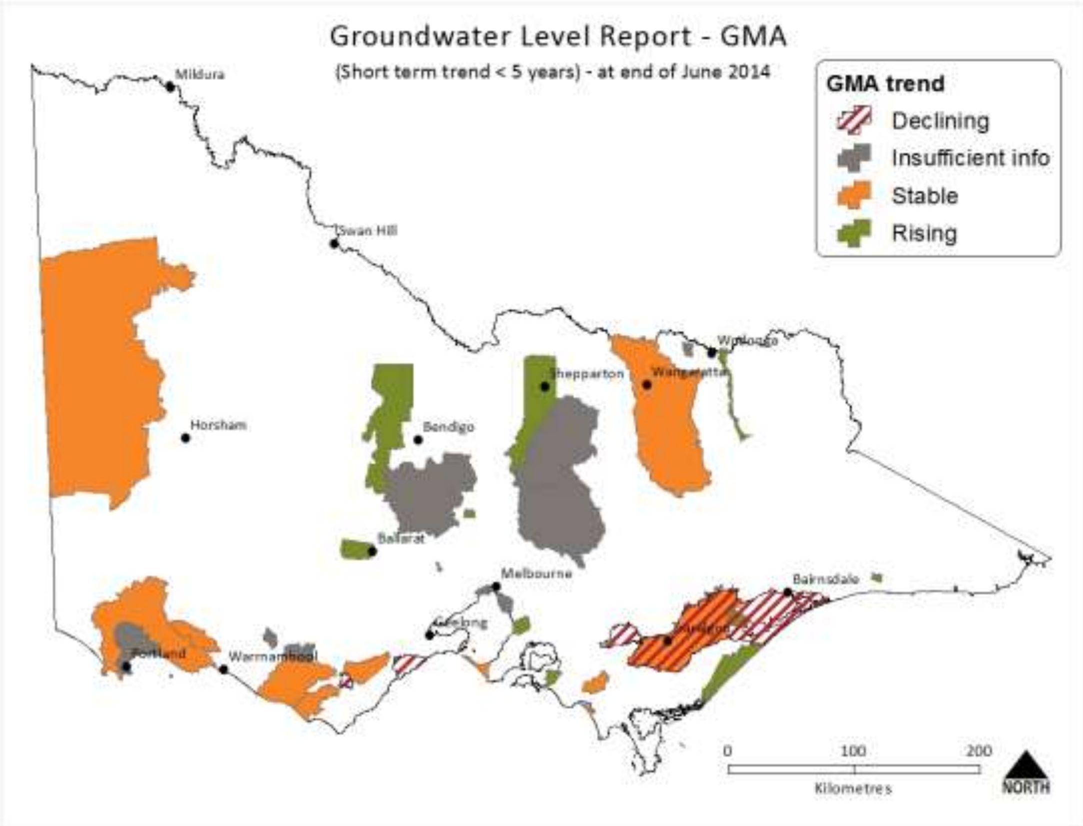
Table 1-5 Groundwater level trends in Groundwater Management Areas

Groundwater Management Area[1]	Groundwater level trend 2013–14				Groundwater level trend June 2013
	September 2013	December 2013	March 2014	June 2014	
Cardigan	Increasing	Increasing	Increasing	**Increasing**	Rising
Corinella	Increasing	Increasing	Increasing	**Increasing**	Rising
Frankston	Stable	Increasing	Increasing	**Increasing**	Stable
Gellibrand	Stable	Declining	Declining	**Declining**	Stable
Gerangamete	Stable	Declining	Declining	**Stable**	Declining
Giffard	Stable	Increasing	Increasing	**Increasing**	Stable
Hawksdale	Stable	Stable	Stable	**Stable**	Stable
Jan Juc	Declining	Declining	Declining	**Declining**	Declining
Lancefield	Increasing	Stable	Stable	**Increasing**	Stable
Leongatha	Stable	Stable	Stable	**Stable**	Stable
Lower Ovens	Increasing	Increasing	Increasing	**Stable**	Rising
Merrimu	Declining	Declining	Declining	**Stable**	Declining
Mid Goulburn	Stable	Stable	Increasing	**Increasing**	Stable
Mid Loddon	Rising	Increasing	Increasing	**Increasing**	Rising
Moe	Declining	Declining	Declining	**Declining**	Declining
Mullindolingong	Rising	Increasing	Increasing	**Increasing**	Rising
Nepean	Stable	Stable	Stable	**Stable**	Stable
Newlingrook	Stable	Stable	Stable	**Stable**	Stable
Orbost	Increasing	Increasing	Stable	**Increasing**	Stable
Paaratte	Stable	Stable	Stable	**Stable**	Stable
Portland	Stable	Stable	Stable	**Stable**	Stable
Rosedale	Stable	Declining	Declining	**Stable**	Stable
Stratford	Declining	Stable	Declining	**Declining**	Declining
Tarwin	Stable	Stable	Stable	**Stable**	Stable
Wa De Lock	Stable	Stable	Stable	**Increasing**	Stable
West Wimmera	Stable	Stable	Stable	**Stable**	Stable

Note:

(1) The following GMAs have been omitted from this table due to insufficient state observation bores to adequately define the groundwater resource or changes to the resource over time: Alexandra, Barnawartha, Colongulac, Cut Paw Paw, Glenormiston, Heywood, Kinglake and Moorabbin.

Figure 1-21 Groundwater trends in Groundwater Management Areas



2 Management of Victoria’s water resources

Victoria’s *Water Act 1989* provides the basis for managing the state’s water resources. Under the Act, the Crown holds the rights to all of Victoria’s water and may issue it to consumptive users and the environment via a range of mechanisms (Figure 2-1).

Given the considerable variation in water availability from year to year (Chapter 1), Victoria’s ability to deal with a range of conditions is built on providing certainty and flexibility in how water is shared and managed through its water entitlement and planning frameworks.

Under the water entitlement framework, entitlement holders are responsible for managing their own water supplies, including risks to these supplies due to drought or climate variability. Entitlements to water are transferable and transfers are facilitated through water markets wherever possible.

The entitlement framework contains tools to actively manage consumptive and environmental water entitlements and is supported by a planning framework that spans the short, medium and long terms.

In exceptional circumstances, such as unprecedented droughts, the Minister for Water may intervene to alter water-sharing arrangements to ensure that critical human needs can be supplied when there are no other practical alternatives.

2.1 Victoria’s water entitlement and planning framework

Establishment of the water entitlement framework in the Act was a major reform in Victoria’s water management. The framework takes a whole-of-system water management approach and considers all water resources for both consumptive and environmental purposes.

The following are established by the framework:

Secure entitlements (Figure 2-1): These entitlements are recognised in the Act and can be considered equivalent to property rights, with legal tenure that is certain and protected, and known arrangements for sharing available water during dry and drought years.

- **Limits on water entitlements:** It is important that water taken under an entitlement does not reduce reliability of supply to other entitlement holders or impact on important environmental values. A range of tools such as caps and diversion limits confine water entitlements.
- **Clear consultative processes for changing entitlements:** To protect the integrity of entitlements, the Act sets out clear processes to be followed before an entitlement can be changed.

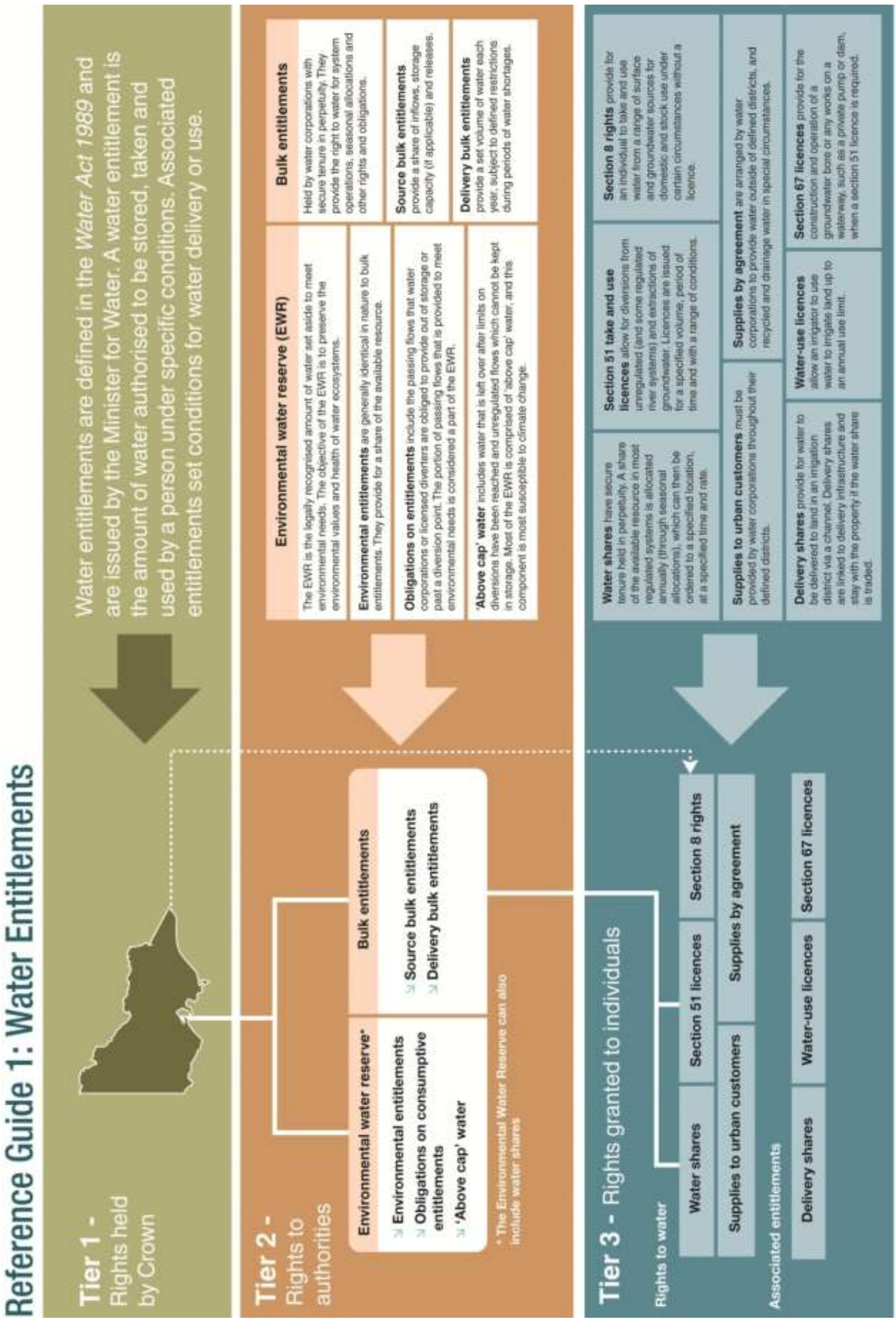
Annual processes to allocate water to entitlements: The framework provides the ability to restrict annual water use in response to seasonal variability. Annual use can be restricted through seasonal allocations, urban water restrictions and rosters, and restrictions or bans on licence holders in unregulated river or groundwater systems (Chapter 2.2).

Ability to trade: Markets can be used to facilitate the efficient use of water resources, giving water users the flexibility to buy and sell their water and water entitlements (see Chapter 5 for information on trade in 2013–14).

To support and guide management of water allocated under the entitlement framework, Victoria has an integrated water planning framework, supported in legislation and with specified timeframes for review. This planning framework incorporates:

- year-to-year or short-term planning through measures such as seasonal resource determinations on rural regulated systems and drought response plans in urban systems
- local planning to balance the demand for water and available supply in the medium to long term
- local planning to maintain and improve the health of rivers and wetlands through the development of regional waterway management strategies
- strategic planning through the development of regional sustainable water strategies
- long-term assessments of the resource base and river health every 15 years.

Figure 2-1 Victoria's entitlement framework



2.2 Responding to water availability

The amount of water available for consumptive use and environmental purposes will vary from year to year. The entitlement and planning framework includes mechanisms to conserve and share water between users in response to seasonal variability and water shortage. These mechanisms include urban water restrictions, seasonal allocations in regulated systems, and restrictions on licence holders in groundwater systems and unregulated surface water catchments.

When these mechanisms for managing variability in water availability are not sufficient, water corporations also undertake other measures such as water carting to augment local supplies.

In exceptional circumstances, the Minister for Water has emergency powers under section 33AAA of the Water Act to declare that a water shortage exists and to qualify rights to water. The Minister for Water did not qualify any rights to water in 2013–14.

Water markets are also an important mechanism for individual entitlement holders in regulated systems to manage seasonal variation in water availability and facilitate the sharing of available resources. Information on trade in 2013–14 is presented in Chapter 5.

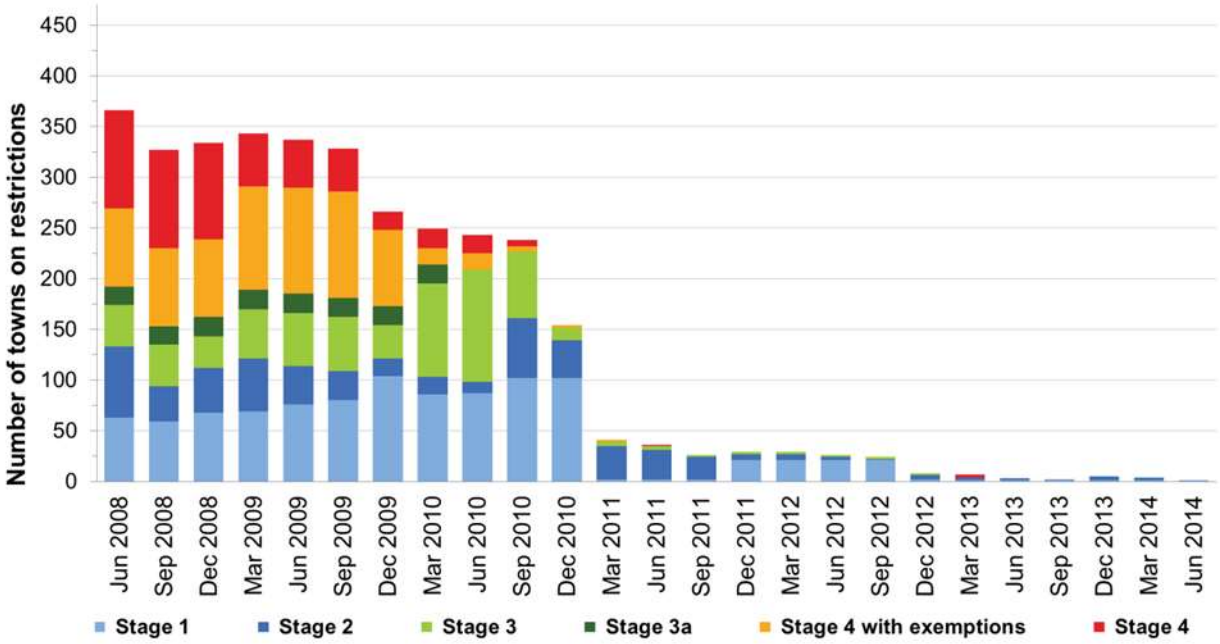
2.2.1 Urban water restrictions

All Victorian towns are subject to a uniform scale of water restrictions under the Victorian Uniform Drought Water Restriction Guidelines. The scale has four key stages of restrictions, 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.

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.

In 2013–14, the number of Victorian towns on water restrictions continued to decline relative to the widespread restrictions during the Millennium Drought. By the end of June 2014, only one township was subject to water restrictions, compared with more than 450 towns at the peak of the drought in 2007 (Figure 2-2).

Figure 2-2 Number of Victorian towns on restrictions, June 2007 to June 2014



2.2.1.1 Central region and Melbourne metropolitan area

In central Victoria, the long-standing water restrictions for Redbank were removed. Stage 2 restrictions were lifted and permanent water saving rules came into effect in mid-March.

As with previous years, Barwon Water implemented mandatory summer restrictions for the coastal townships of Apollo Bay, Marengo and Skenes Creek from November through to May. Mandatory restrictions are applied to ensure the limited storage capacity of the Marengo basin copes with the tourist influx through summer and autumn. The towns returned to permanent water saving rules in May 2013.

Metropolitan Melbourne and all other townships in the Central region remained on permanent water saving rules.

2.2.1.2 Northern region

On 30 June 2013 Goulburn Valley Water removed Stage 1 restrictions for Pyalong which had been in place since February that year due to low flows in Mollisons Creek. Pyalong reverted to permanent water saving rules along with all other townships in the Northern region.

2.2.1.3 Western region

Long-standing restrictions remained in place at Harrow in the Wimmera region. GWMWater maintained Stage 2 restrictions in the township for the duration of 2013–14.

All other townships remained on permanent water saving rules.

2.2.1.4 Gippsland region

In the Gippsland region all townships were subject to permanent water saving rules throughout 2013–14.

Table 2-1 Urban water restrictions in 2013–14

Water corporation	Water system and towns	Level and duration of restrictions in 2013–14
Central region		
Barwon Water	Marengo system (Apollo Bay, Skenes Creek, Marengo)	PWSR applied 1 July to 2 November 2013 Stage 2 restrictions applied 3 November 2013 to 4 May 2014 PWSR applied 5 May to 30 June 2014
	All other towns	PWSR applied all year
Central Highlands Water	Redbank	Stage 2 restrictions applied 1 September 2006 to 13 March 2014 PWSR applied 14 March to 30 June 2014
	All other towns	PWSR applied all year
Melbourne metropolitan retailers (Yarra Valley Water, South East Water, City West Water)	Metropolitan Melbourne	PWSR applied all year
Southern Rural Water (Werribee and Bacchus Marsh systems)	All towns	PWSR applied all year
Westernport Water	All towns	PWSR applied all year
Western Water	All towns	PWSR applied all year
Northern region		
Coliban Water	All towns	PWSR applied all year
Goulburn-Murray Water	All towns	PWSR applied all year
Goulburn Valley Water	All towns	PWSR applied all year
Lower Murray Water	All towns	PWSR applied all year
North East Water	All towns	PWSR applied all year
Western region		
GWMWater	Harrow	Stage 1 restrictions applied all year
	All other towns	PWSR applied all year
Wannon Water	All towns	PWSR applied all year
Gippsland region		
East Gippsland	All towns	PWSR applied all year
Gippsland Water	All towns	PWSR applied all year
South Gippsland Water	All towns	PWSR applied all year
Southern Rural Water (Macalister system)	All towns	PWSR applied all year

Note:
PWSR: permanent water saving rules

2.2.2 Seasonal allocation of water in declared systems

In declared water systems, water rights and licences have been unbundled from land. Water entitlements in the regulated systems of northern Victoria were converted to high reliability and low reliability water shares when unbundled on 1 July 2007. Unbundling extended to the Werribee and Bacchus Marsh and Thomson–Macalister water systems on 1 July 2008.

Restrictions on water use in declared water systems are determined by the seasonal water allocation. The seasonal allocation differs from urban restrictions in that each water share entitlement is allocated a share of the available resource proportional to the volume of the entitlement. Seasonal allocations are expressed as a percentage of entitlement (either high reliability or low reliability water shares).

Initial allocations are made early in the water year 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.

All irrigation districts in northern Victoria reached 100% allocation for high reliability entitlements in 2013–14 (Table 2-2). Low reliability allocations reached 100% in the Broken and Bullarook systems and 46% in the Campaspe, but remained at 0% in the Murray, Goulburn and Loddon systems.

In southern Victoria, high reliability entitlements reached 100% in both the Thomson–Macalister and Werribee and Bacchus Marsh systems in 2013–14. Low reliability allocations reached 5% in the Thomson–Macalister system and 15% in the Werribee and Bacchus Marsh system.

Table 2-2 Seasonal water allocations in declared water systems

Water system	Water shares	2013–14			2012–13
		Initial allocation(1) (% of entitlement)	Mid-season allocation(2) (% of entitlement)	Final allocation(3) (% of entitlement)	Final allocation (% of entitlement)
Northern Systems					
Murray	High reliability	42	100	**100**	100
	Low reliability	0	0	**0**	0
Goulburn	High reliability	95	100	**100**	100
	Low reliability	0	0	**0**	0
Broken	High reliability	33	100	**100**	100
	Low reliability	0	100	**100**	100
Campaspe	High reliability	100	100	**100**	100
	Low reliability	0	46	**46**	100
Loddon	High reliability	95	100	**100**	100
	Low reliability	0	0	**0**	0
Bullarook	High reliability	0	100	**100**	100
	Low reliability	100	100	**100**	100
Southern Systems					
Thomson–Macalister	High reliability	90	95	**100**	100
	Low reliability	0	0	**5**	20
Werribee and Bacchus Marsh	High reliability	80	100	**100**	100
	Low reliability	0	15	**15**	40

Notes:

(1) Allocations in August are provided as an indication of the initial allocation for the season.

(2) Allocations in February are provided as an indication of mid-season allocations.

(3) The Northern announces final allocations in April while Southern Rural Water announces final allocations in June.

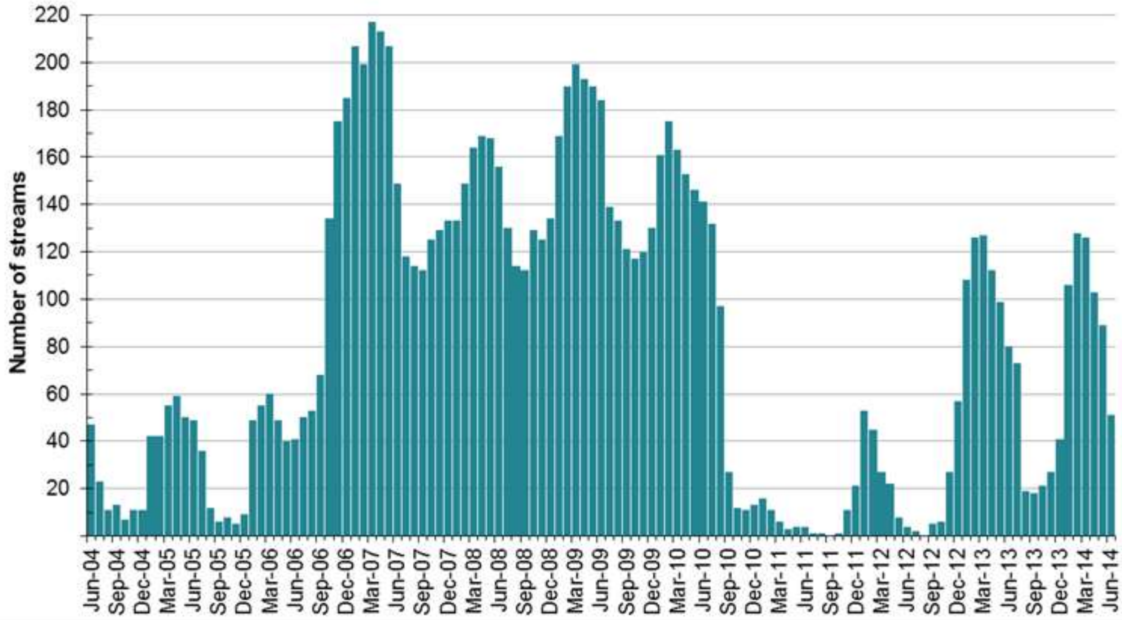
2.2.3 Restrictions on diversions from unregulated streams

Streamflow management plans and local management plans determine how water in unregulated streams will be shared between consumptive uses and the environment in times of water shortage. Under these plans, water corporations impose rosters, restrictions and bans on the water taken from streams by licensed diverters when streamflows drop below specified thresholds. Rosters and restrictions set out the order in which licence holders are allowed to take water and the quantity allowed to be taken (e.g. 75% of licensed volume). When water is particularly scarce, bans on diversions from waterways are imposed.

The need to implement restrictions on diversions from unregulated streams fluctuates during 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 eased over the winter and spring seasons.

As shown in Figure 2-3, restrictions on diversions in 2013–14 followed this general trend, however the total number of unregulated streams subject to diversion restrictions in winter and early spring were higher than the previous year after a particularly dry summer in 2012-13. By October 2013 diversion restrictions were at a similar number to the previous year and this trend continued through to May 2014. By June there were significantly fewer diversion restrictions than the previous year.

Figure 2-3 Number of Victorian unregulated streams on restrictions, 2004–05 to 2013–14



2.2.4 Seasonal allocations of groundwater in Groundwater Management Units

Seasonal allocations are announced in accordance with the groundwater management plans developed for Water Supply Protection Areas (WSPAs) and Groundwater Management Areas (GMAs). 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.

In 2013–14, two Groundwater Management Units were subject to restrictions on groundwater use. As per the previous year, Katunga WSPA received a seasonal allocation of 70% in all zones for the 2013–14 season, while Neuarpur sub-zone 1 (part of the West Wimmera GMA) received an 88% seasonal allocation for 2013–14, compared with 92% in 2012–13.

2.2.5 Water carting

Water carting is another option used by water corporations to augment supplies when local sources cannot meet demand. Doing so, however, is a time-consuming and expensive exercise and usually only a last resort to supply smaller towns. In recent years water carting has been required to address water scarcity, particularly during drought periods. For the first time in the reporting of the Victorian Water Accounts, no water carting was recorded in 2013–14.

3 Water for consumptive use

Water for consumptive use in Victoria is taken from reservoirs, streams and aquifers under entitlements issued by the Victorian Government and authorised under the *Water Act 1989*. Victoria's water entitlement framework is discussed in Chapter 2.

Generally, water for consumptive use is allocated to either water corporations, which are granted bulk entitlements, or to individuals, who are issued a water share or a licence. In addition to the entitlements that are formally issued, the Act enables individuals to take water for domestic and stock purposes from a range of surface water and groundwater sources without a licence (e.g. from a farm dam). These domestic and stock rights are defined in the Act and are not formally issued.

As well as consumptive uses, the Act provides for water to be used for environmental purposes – see Chapter 4 for details.

Table 3-1 shows the volume of water defined in entitlements for consumptive use in Victoria in 2013–14 and 2012–13. 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 thus only a minor change in the total number of entitlements will occur 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 entitlements in a capped catchment.

Table 3-1 Consumptive water entitlements in Victoria in 2013–14 and 2012–13

Entitlement type	Volume 2013–14 (ML)	Volume 2012–13 (ML)
Surface water		
Bulk entitlements(1)	5,585,394	5,617,655
Licences(2)	280,579	282,412
Small catchment dams(3)	522,949	522,949
Total surface water entitlements	**6,389,422**	**6,423,016**
Groundwater		
Licences	953,159	957,695
Bulk entitlements	10,000	10,000
Total groundwater entitlements	**963,159**	**967,695**
Total entitlements	**7,352,581**	**7,390,710**

Notes:

(1) Bulk entitlement volumes are represented as the volume that can be taken in a one-year period. They are not adjusted to reflect trade, caps that are climatically adjusted, or caps that are long-term rolling averages. Bulk entitlements and environmental entitlements held by the Victorian Environmental Water Holder are not included as water taken under these entitlements is not considered to be for 'consumptive' purposes.

(2) Includes licences issued for unregulated rivers only. The volume of licences within regulated water supply systems is not included as these licences are included under rural water businesses' bulk entitlements.

(3) Not all small catchment dams are required to be licensed or registered under the *Water Act 1989* (i.e. farm dams for domestic and stock use). The total entitlement volume is assumed to be equal to the estimate of total water taken by small catchment dams for the year.

The availability and use of Victoria's water resources for 2013–14 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, but rather the bulk volume of water extracted from a stream or groundwater bore.

The total available volume of Victoria's surface water, groundwater and recycled water in 2013–14 was approximately 21,310,000 ML. Of this, approximately 4,400,000 ML (or 21%) was taken for consumptive purposes in 2013–14.

Surface water availability in 2013–14 was far greater than the total volume of water granted in surface water entitlements. The volume of surface water taken in 2013–14 was 62% of the total entitlement volume.

Table 3-2 Victoria's water availability and water taken for consumptive use in 2013–14

Water source	Available resource (ML)	Total entitlements (ML)	Total taken (ML)
Surface water(1)	19,850,362	6,389,422	3,961,489
Groundwater(2)	1,020,416	963,163	329,360
Recycled water	458,058	n/a	90,612

Notes:

(1) The volume of available surface water resources is assumed to be the volume of catchment inflow for all Victorian basins, as determined in the surface water balance for each basin presented in Chapter 6.

(2) The actual groundwater resource (that is, the volume of water in aquifers) is unknown. The total resource has been assumed to be the sum of the allocation limit ofeach GMU.

n/a: not applicable

3.1 Surface water entitlements and use

This section provides an overview of surface water taken under consumptive entitlements across Victoria.

The information on water taken from Victoria's rivers is summarised according to river basins as defined by the former 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 the AWRC and areas in Victoria supplied from the Murray River downstream of Lake Hume. The extent of each of Victoria's river basins is shown in Figure 3-1.

Figure 3-1 Surface water river basins in Victoria

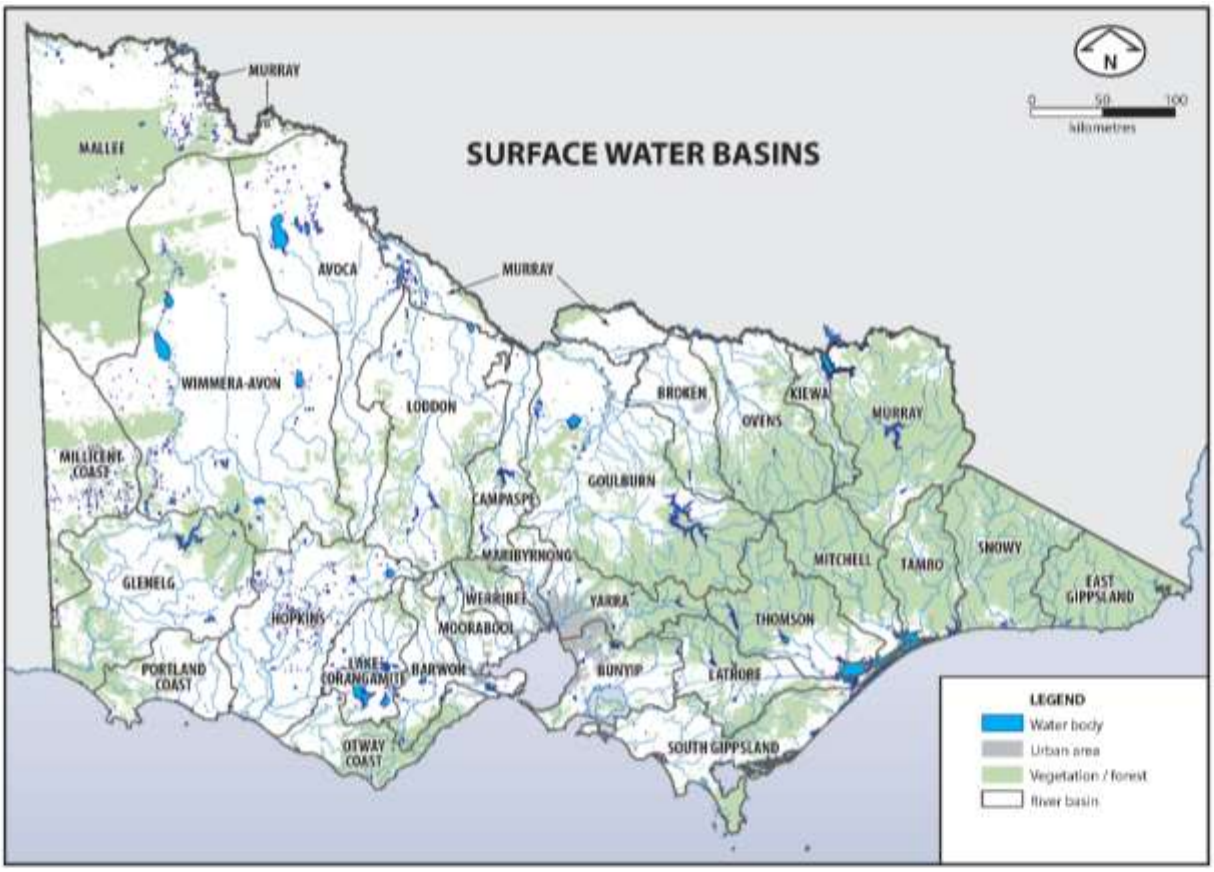


Table 3-3 summarises the volume of water taken under bulk entitlements, licences and small catchment dams in each basin in 2013–14. More detail on diversions under surface water entitlements in each basin can be found in Part 2.

The bulk entitlement volumes for some basins have changed compared with the values reported in the 2012–13 accounts.

The volume of water taken under bulk entitlements in 2013–14 was 60% of the total volume of bulk entitlements, and the volume of water taken under licences was 25% of the total volume of licences.

Not all small catchment dams are required to be licensed or registered under the Act (i.e. farm dams for domestic and stock use). The total entitlement volume is assumed to be equal to the estimate of total water taken by small catchment dams for the year.

Table 3-3 Volume allocated and taken under surface water entitlements in 2013–14

Basin	Bulk entitlements[1]			Licences[2]			Small catchment dams
	Entitlement volume (ML)	Volume taken (ML)	Proportion of entitlement volume taken (%)	Entitlement volume (ML)	Volume taken (ML)	Proportion of entitlement taken (%)	Volume taken (ML)
Murray	1,914,897	1,255,244	66%	17,056	2,159	13%	6,445
Kiewa	1,106	585	53%	15,794	2,034	13%	3,927
Ovens	50,499	11,487	23%	18,097	7,170	40%	15,888
Broken	25,279	10,206	40%	2,990	1,613	54%	15,738
Goulburn	1,909,610	1,188,711	62%	25,729	6,354	25%	47,513
Campaspe	105,648	35,278	33%	3,309	1,201	36%	28,776
Loddon	125,799	23,108	18%	22,707	7,263	32%	50,037
East Gippsland	622	149	24%	660	90	14%	1,100
Snowy	2,201	687	31%	3,992	564	14%	3,356
Tambo	342	48	14%	4,167	358	9%	3,971
Mitchell	9,208	4,655	51%	16,385	8,718	53%	4,558
Thomson	392,124	342,142	87%	17,244	3,965	23%	6,984
Latrobe	216,842	114,069	53%	18,817	6,145	33%	20,547
South Gippsland	168,815	7,429	4%	12,843	2,708	21%	24,256
Bunyip	36,595	10,454	29%	18,985	4,485	24%	15,525
Yarra	400,000	250,804	63%	42,889	8,624	20%	15,824
Maribyrnong	10,711	3,739	35%	2,093	329	16%	7,782
Werribee	37,617	23,491	62%	1,021	48	5%	9,347
Moorabool	40,600	13,195	32%	3,571	1,190	33%	22,197
Barwon	55,734	38,767	70%	5,581	1,173	21%	30,898
Corangamite	0	0	n/a	1,177	108	9%	12,366
Otway Coast	19,667	12,681	64%	6,701	751	11%	12,728
Hopkins	629	155	25%	11,417	1,924	17%	64,538
Portland Coast	0	0	n/a	1,079	2	0%	16,135
Glenelg	4,554	2,246	49%	1,066	215	20%	55,483
Millicent Coast	0	0	n/a	4	4	100%	0
Wimmera	56,516	19,723	35%	2,177	186	9%	14,337
Mallee	0	0	n/a	0	0	n/a	0
Avoca	278	94	34%	3,029	18	1%	12,693
Total	**5,585,894**	**3,369,143**	**60%**	**280,579**	**69,397**	**25%**	**522,949**

Notes:

(1) Bulk entitlement volumes are represented as the volume that can be taken in a one-year period. They are not adjusted to reflect trade, caps that are climatically adjusted, or caps that are long-term rolling averages. Bulk entitlements and environmental entitlements held by the Victorian Environmental Water Holder are not included as water taken under these entitlements as they are not considered to be for consumptive purposes.

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

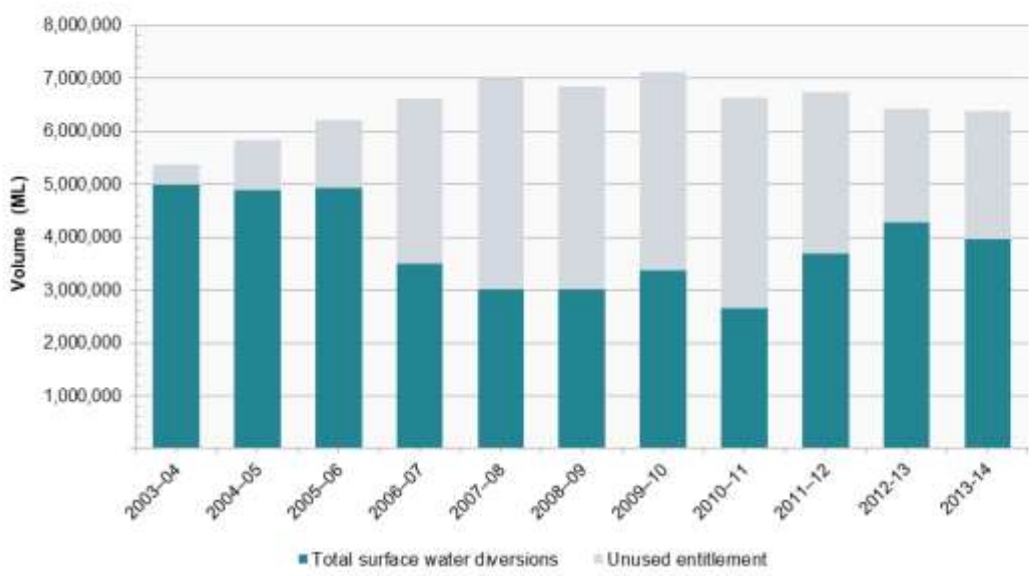
n/a: information not available

Figure 3-2 shows the volume of water taken under surface water entitlements during the past 10 years.

The low water use from 2006–07 to 2009–10 is a reflection of the low water availability during the recent drought. During this period, restrictions on water use by urban customers, low seasonal allocations in the irrigation districts and rosters and restrictions on licensed diversions from streams were widespread. In contrast, the low use seen in 2010–11 and 2011–12 is a reflection of supressed demand for water due to the wet conditions experienced during these years. The proportion of water taken to volume of entitlements was 60% in 2013–14, a decrease from 65% in 2012–13.

The total volume of surface water entitlements generally increased from 2003–04 to 2009–10 due to continued conversion of water corporations' historic rights into bulk entitlements and the granting of new bulk entitlements and licences.

Figure 3-2 Surface water entitlements and associated diversions



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

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

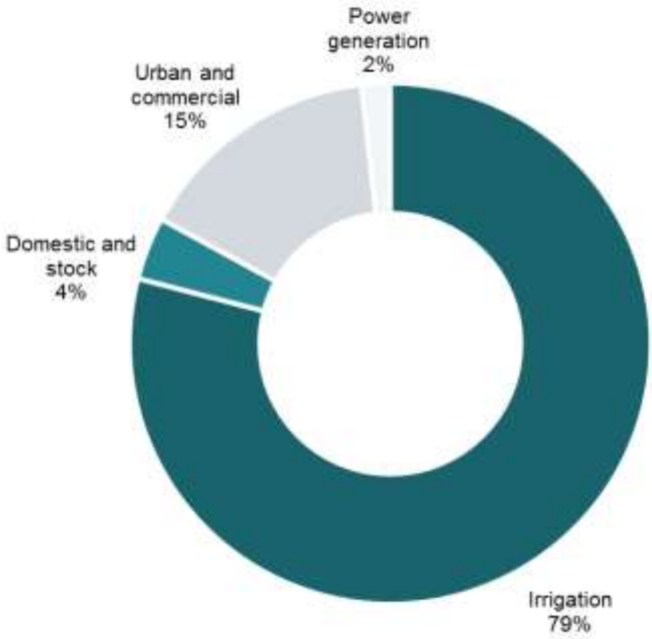
As shown in Table 3-4, the volume of water taken under consumptive entitlements in 2013–14 decreased compared with 2012–13. The volume of water diverted for irrigation purposes in 2013–14 was around 107,000 ML less than the amount diverted in 2012–13. In contrast, the volume of water diverted for urban and commercial purposes was slightly more than in 2012–13. The volume diverted for power generation purposes was similar in 2013–14 and 2012–13.

Irrigation continues to be the highest category of surface water use in the state, comprising 79% of all diversions. This portion decreased in 2013–14 compared with 2012–13.

Table 3-4 End use of surface water diverted under consumptive entitlements

Consumptive end use	2013–14		2012–13	
	Volume diverted (ML)	Proportion of total consumptive diversions (%)	Volume diverted (ML)	Proportion of total consumptive diversions (%)
Irrigation	3,360,433	79%	3,467,102	80%
Domestic and stock	166,347	4%	166,836	4%
Urban and commercial	650,557	15%	586,316	14%
Power generation	74,881	2%	75,422	2%
Total	**4,252,217**	**100%**	**4,295,676**	**100%**

Figure 3-3 Total surface water diversions for consumptive purposes in Victoria, 2013–14



3.2 Groundwater entitlements and use

Groundwater in Victoria is managed through Groundwater Management Units (GMUs). A GMU may be classified as either as a Water Supply Protection Area (WSPA) or a Groundwater Management Area (GMA). Areas that do not fall into these units are referred to as unincorporated areas (UAs).

- **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.
- **WSPA**: an area declared under the *Water Act 1989* to protect groundwater or surface water resources through the development of a management plan.
- **UA**: an area where limited development or use of groundwater has occurred. This is usually because the resource is low-yielding, 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.

Full details of water entitlements and use from each GMA and WSPA in 2013–14 are presented in Appendix B.

In 2013–14, total groundwater licensed entitlement was approximately 963,159 ML across the state. The total groundwater use across the state, including domestic and stock use, was approximately 329,348 ML, which was less than the volume used in 2012–13 (369,569 ML).

In 2013–14, the total volume of licensed groundwater extracted from GMAs and WSPAs (not UAs) was approximately 256,606 ML, a decrease of 13% compared with 2012–13 (293,538 ML).

Domestic and stock use (52,573 ML) was estimated to account for approximately 16% of total groundwater use (329,348 ML).

In Victoria's GMAs, licensed groundwater entitlements totalled 510,794 ML, with total use of 159,081 ML consisting of 136,006 ML of metered extractions and 23,075 ML of estimated domestic and stock use.

Licensed groundwater entitlements in WSPAs totalled 341,075 ML, with total use of 133,411 ML consisting of 120,600 ML of metered extractions and 12,811 ML of estimated domestic and stock use.

Estimated groundwater entitlements in the UAs were approximately 111,291 ML, with 36,856 ML extracted. This was lower than 2012–13 when entitlement was approximately 120,422 ML and 43,098 ML was extracted.

The total volume of groundwater extracted for urban use in 2013–14 was 8,736 ML, which was approximately 3% of the total groundwater extracted.

Approximately 72 towns have a groundwater entitlement as either a supplementary or primary water supply. In 2013–14, only 54 of these towns recorded any extraction. The largest of these was Sale with extraction of 1,910 ML.

Figure 3-4 shows the location of towns where groundwater is used for urban water supply.

Figure 3-4 Location of towns where groundwater is extracted for urban supply

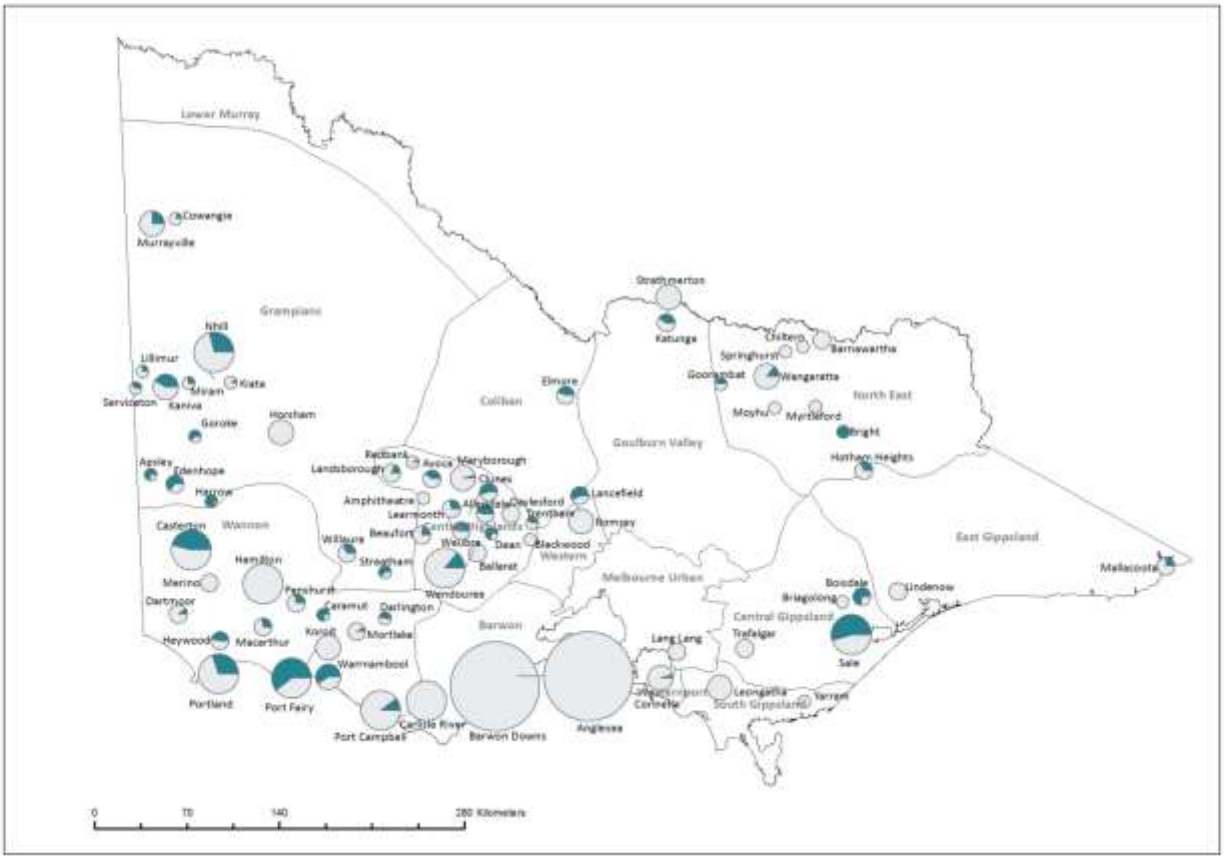
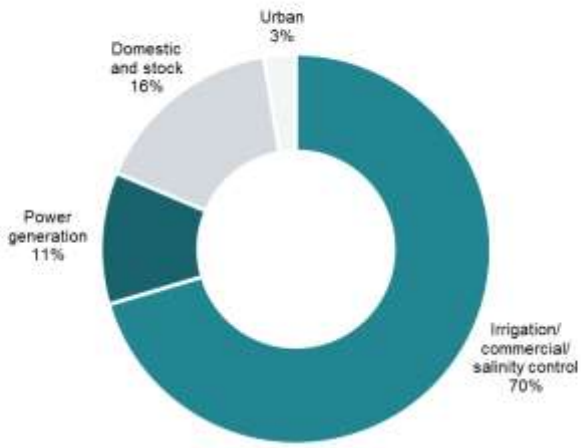


Table 3-5 and Figure 3-5 show the groundwater extraction by type of use in GMUs in 2013–14.

Table 3-5 Groundwater extraction by use in Groundwater Management Units

Consumptive end use	Volume diverted (ML)	Proportion of total consumptive diversions (%)
Irrigation/commercial/salinity control	231,927	70%
Domestic and stock	52,573	16%
Urban	8,736	3%
Power generation	36,113	11%
Total consumptive diversions 2013–14	**329,349**	**100%**
Total consumptive diversions 2012–13	369,570	100%

Figure 3-5 Groundwater extraction by use in Groundwater Management Units



3.3 Recycled water production

The total volume of 458,058 ML of wastewater produced in 2013–14 was higher than the 450,355 ML produced in 2012–13 (Table 3-6). The volume of water recycled by Victoria's water businesses for use external to treatment plants in 2013–14 increased compared with 2012–13. The recycled volume was 72,194 ML, which represents an increase of 1,498 ML compared with 2012–13. The volume recycled represents 16% of the total volume available for reuse at the end of the wastewater treatment process. An additional 18,418 ML was recycled for use within the wastewater treatment process which, when subtracted from the total, increases the proportion to 20% of wastewater available for reuse. The volumes and percentages used in the following paragraphs only refer to recycled water supplied for use external to the treatment plants.

A significant portion of recycled water production occurs at two treatment plants: the Eastern Treatment Plant in the Bunyip basin and the Western Treatment Plant in the Werribee basin. In 2013–14, the volume of water recycled by the Eastern Treatment Plant was 17,886 ML, which was a decrease on the 21,352 ML recycled in 2012–13. 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 increased from 26,865 ML in 2012–13 to 31,837 ML in 2013–14. This increased recycled water volume was used for agriculture (8,438 ML in 2012–13 to 9,401 ML in 2013–14), as well as conservation use in the Ramsar-listed wetlands (15,784 ML in 2012–13 to 19,835 ML in 2013–14).

The volume of water recycled in Melbourne, including at treatment plants operated by the Melbourne metropolitan retailers, was 40,774 ML. The percentage of water recycled was higher outside of Melbourne where weather conditions, the availability of land and access to potential purchasers (i.e. agricultural producers) are more favourable. Excluding the wastewater recycled in Melbourne, the remainder of the state recycled 27%, or 31,420 ML, of the wastewater available for reuse. This was slightly lower than in 2012–13, when it was 33,206 ML.

Table 3-6 Volume of wastewater recycled in 2013–14

Basin	Wastewater produced (ML)	Volume of wastewater recycled (ML)	Percentage of wastewater recycled (%)	End uses of recycled water (ML)					Volume discharged to the environment (ML)	Release to ocean/ Other[3] (ML)
				To retailers	Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Murray	10,337	4,777	46%	0	315	4,462	0	0	3,586	1,974
Kiewa	298	128	43%	0	3	125	0	0	196	(26)
Ovens	2,494	634	25%	0	89	545	0	0	1,860	0
Broken	232	232	100%	0	0	232	0	0	0	0
Goulburn	6,419	6,012	94%	0	263	5,749	0	0	362	45
Campaspe	1,909	1,244	65%	0	243	1,001	0	0	752	(87)
Loddon	7,889	2,159	27%	0	830	1,329	0	0	5,204	526
East Gippsland	148	101	68%	0	0	101	0	0	0	47
Snowy	295	257	87%	0	0	257	0	0	0	38
Tambo	783	798	102%	0	0	798	0	0	0	(15)
Mitchell	1,724	1,653	96%	0	0	231	1,422	0	0	71
Thomson	377	347	92%	0	8	339	0	0	30	0
Latrobe	21,021	678	3%	0	10	60	608	0	3,686	16,657
South Gippsland	5,656	389	7%	0	62	317	0	10	5,267	0
Bunyip	156,486	20,924	5%	5,636	1,547	754	0	12,987	9,631	125,931
Yarra	10,989	3,134	10%	0	459	612	0	2,063	0	7,855
Maribyrnong	3,071	1,965	35%	0	417	645	0	903	1,732	(626)
Werribee	177,704	35,721	20%	2,601	374	12,417	19,835	494	4,878	137,105
Moorabool	1,242	1,242	100%	0	1,242	0	0	0	0	0
Barwon	32,714	4,438	8%	0	807	1,354	432	1,845	28,090	186
Corangamite	2,350	464	18%	0	8	424	0	32	1,836	50
Otway Coast	1,482	272	13%	0	0	195	0	77	1,129	81
Hopkins	6,178	598	10%	0	188	403	0	7	25	5,555
Portland Coast	2,779	101	4%	0	0	101	0	0	239	2,439
Glenelg	1,145	328	29%	0	50	278	0	0	271	546
Millicent Coast	88	57	65%	0	57	0	0	0	0	31
Wimmera	2,054	1,800	88%	0	476	1,324	0	0	0	254
Mallee	0	0	0%	0	0	0	0	0	0	0
Avoca	194	159	82%	0	43	116	0	0	0	35
Total 2013–14	**458,058**	**90,612**	**16%**	**8,237**	**7,491**	**34,169**	**22,297**	**18,418**	**68,774**	**298,672**
Total 2012–13	**450,355**	**91,327**	**16%**	**9,616**	**8,839**	**34,137**	**18,104**	**20,631**	**66,316**	**292,712**

Notes:

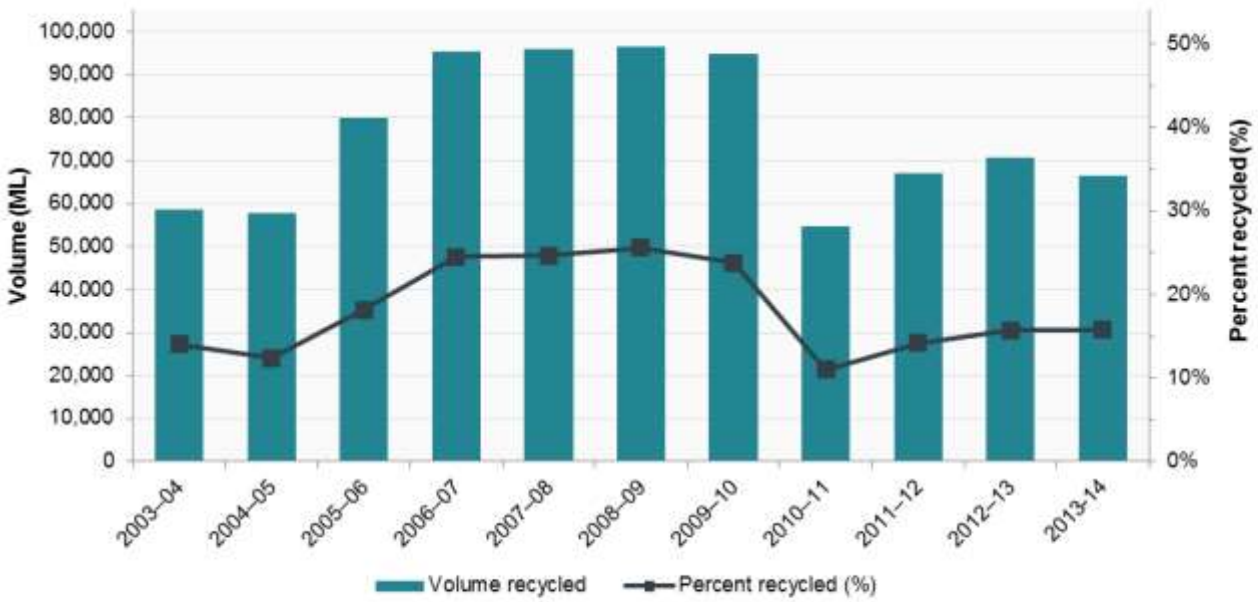
(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled.

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

Figure 3-6 shows the trend in recycled water in the 10 years to 2013–14. In 2004–05, the volume recycled was slightly less than 60,000 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. The volume and percentage recycled in 2012–13 and 2013–14 were less than in recent years, due to reduced demand for recycled water as a result of higher rainfall.

Figure 3-6 Recycled water volume and percentage, 2004–05 to 2013–14(1)



Note:
(1) This figure excludes recycled water used 'within process'.

3.4 Urban and commercial consumptive use

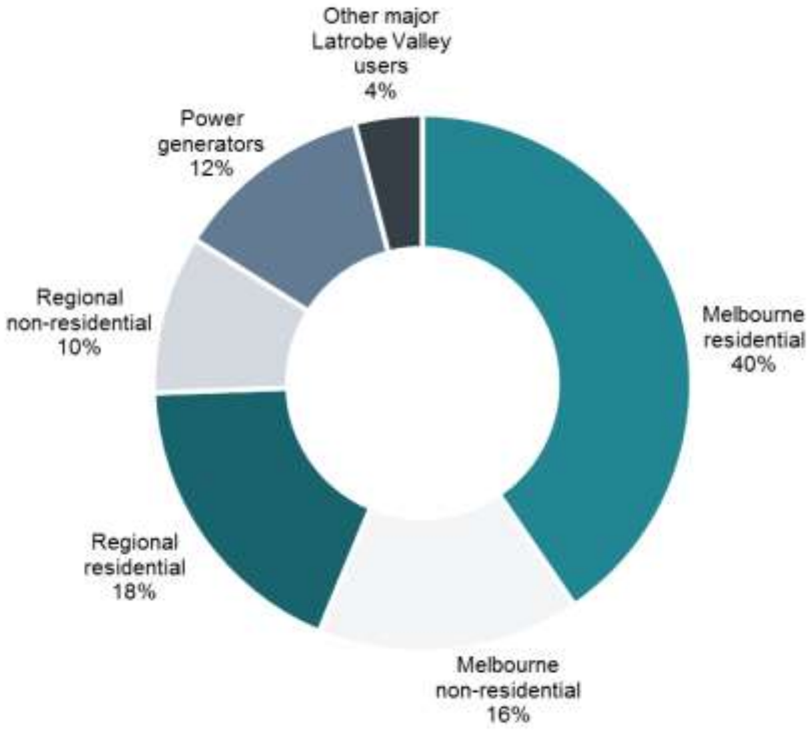
Consumption in urban areas is often measured by the metered volume of water delivered to customers. This figure differs from the bulk water diversion figures presented in Table 3-4 because water is lost in the distribution network through evaporation and leakage between the points of diversion and delivery. Therefore the metered consumption volumes discussed below are less than the urban diversion volumes in Table 3-4 and Figure 3-3. Detailed information about urban distribution systems can be found in Chapter 8.

Metered urban water consumption in Victoria decreased in 2013–14 compared with 2012–13. Total urban water consumption by residential users increased by 1% compared with 2013–14, and non-residential use decreased by 1% in 2013–14 compared with 2012–13. The largest decreases were in regional Victoria, with regional residential and non-customers decreasing their water consumption by 2% and 3% respectively. The 2013–14 data in Table 3-7 is represented as a pie chart in Figure 3-7.

Table 3-7 Urban metered water consumption in Victoria

Urban consumption category	2013–14 (ML)	2012–13 (ML)	Change (%)
Melbourne – residential	252,943	251,517	1%
Melbourne – non-residential	98,995	99,566	-1%
Regional – residential	113,492	115,757	-2%
Regional – non-residential	59,695	61,474	-3%
Power generators	74,881	75,422	-1%
Other major Latrobe Valley industrial users	25,381	25,375	0%
Total urban consumption	**625,387**	**629,111**	**-1%**

Figure 3-7 Consumptive uses of urban and commercial metered water in Victoria, 2013–14



4 Water for the environment

The Environmental Water Reserve (EWR) is water set aside through Victoria's water allocation framework to provide environmental benefits. The EWR is managed to preserve the environmental values and health of water ecosystems, including their biodiversity, ecological function and quality of water. Water in the EWR is provided in three ways:

- **Environmental water entitlements**: volumes of water held by the environmental water holders in perpetuity. In general, they are a share of the available resource in storages that can be released to meet specific environmental needs. They are the component of the EWR that can be actively managed.
- **Obligations on consumptive entitlements**: the volumes of water which water corporations or licensed diverters are obliged to provide out of storages or past diversion points (as passing flows) before water can be taken for consumptive use.
- **'Above cap' water**: the water available above the total volume allocated for consumptive use.

In regulated systems, where the flow of a river is regulated through the operation of dams or weirs, water for the environment is provided through environmental entitlements to water held in storages and by requiring water corporations to pass flows at dams, weirs and other extraction points under conditions placed on their bulk entitlements. More information on environmental water in regulated systems is provided in Section 4.2.

In unregulated rivers, the EWR is provided primarily through management of licensed diversions, including licence conditions, rostering and restriction rules, and caps on licensed volume. In groundwater systems, the EWR is provided by limiting the volume of groundwater that can be extracted for consumptive use. More information on environmental water in unregulated rivers and groundwater systems is provided in Section 4.3.

4.1 Overview of environmental water and seasonal conditions

The Victorian Environmental Water Holder (VEWH) is the independent statutory body responsible for deciding the most efficient and effective use of environmental water entitlements across the state. Information on the VEWH's planning processes for use of the environmental water holdings and the outcomes of environmental watering undertaken in 2013–14 is available in the VEWH's annual report and annual watering booklet, available at <www.vewh.vic.gov.au>.

At the national level, the Commonwealth Environmental Water Holder (CEWH) was established under the Commonwealth *Water Act 2007* to recover water for the environment through water purchase and infrastructure investment throughout the Murray–Darling Basin. Delivery of Commonwealth environmental water in Victoria is managed by the VEWH in partnership with the CEWH and catchment management authorities. To facilitate the use of Commonwealth water in Victorian rivers and wetlands, water is traded into Victorian environmental entitlements.

In 2013–14, many systems across Victoria experienced average to wet conditions early in the water year, followed by drier conditions towards the end of the year. Priority environmental watering actions were managed to meet these changing conditions and some significant environmental outcomes were achieved. The drier conditions also enabled many wetlands and floodplains to undergo a drying phase, which is a critical component of environmental water management in these systems.

In 2013–14, a significantly greater number of priority watering actions were able to be achieved than in previous years. More water was delivered to more sites across the state. Both the volume of environmental water delivered and number of river reaches or wetlands that received water were close to twice the achievement of 2012–13. Due to drier seasonal conditions, environmental water entitlements also played a greater part, with an increased reliance on managed environmental water to restore the flow.

Of the 222 potential priority watering actions identified in the *Seasonal Watering Plan 2013–14*, 181 actions or 82% were fully or partially achieved. Of these, 147 or 81% relied on some contribution of managed environmental water. The remaining 19% of actions were achieved with unregulated flows, consumptive water *en route* or with water being delivered for other purposes, or were events that did not require water such as a wetland that was in a drying phase.

The VEWH oversaw the delivery of 809,678 ML of environmental water to 145 priority environmental flow river reaches (66) or wetlands (79) across Victoria. A greater number of sites were able to be watered in 2013–14 compared with previous years, because the total volume held in environmental entitlements had risen, in addition to the increased availability of Commonwealth environmental water. Water delivery to new wetland sites also became possible with improved or increased infrastructure and landholder support.

In 2013–14, there was no change to the formal water management plans in effect in Victoria. Eight streamflow management plans were in place in the Yarra basin, and an integrated water management plan was in place in the Ovens basin. Local management plans have been recommended across most other basins (see Section 4.3).

The lower river flows experienced across much of the state in 2013–14 meant the total volume of water leaving Victoria's river basins was lower than the previous year (14,984 GL, compared with 17,028 GL in 2012–13). However, as a percentage of total inflow volume, the water reaching the basin outlets was lower, with 76% reaching the basin outlets in 2013–14 compared with 80% in 2012–13 (see Section 4.5).

4.2 Environmental water in regulated systems

During 2013–14, water held by the VEWH increased from a long-term average of 590,000 ML to 650,000 ML. This increase was due to the creation of one new environmental entitlement (bringing the total to 22) and amendments to three more entitlements. The creation of the *Blue Rock Environmental Entitlement 2013* provided a share of inflows equating to a long-term average of 18,737 ML per year in Blue Rock Reservoir. Further increases in long-term average water availability for entitlements in the Loddon, Goulburn and Murray systems were driven by water recovered for the environment through irrigation modernisation projects, including water savings under the Goulburn–Murray Water Connections Project Stage 1 for the Murray and Goulburn entitlements. In total, 1,105,541 ML of water was available to the VEWH in 2013–14, including water made available by the CEWH and the Living Murray program.

4.2.1 Environmental water holdings held by VEWH in southern Victoria

There are currently nine environmental entitlements within southern Victoria (Table 4-1).

Under the environmental entitlements for the Werribee, Moorabool, Yarra, Thomson, Latrobe (Blue Rock), Tarago and Bunyip rivers, a share of inflows to major storages on these rivers is available for environmental watering.

Creation of the *Blue Rock Environmental Entitlement 2013* provided a share of inflows equating to a long-term average of 18,737 ML per year in Blue Rock Reservoir, plus passing flows for the Latrobe River. The Macalister River entitlement is specified as being equivalent to the high reliability and low reliability water shares in the Macalister system; water is allocated to the entitlement under the seasonal determination process for entitlements and water shares.

The *Barwon River Environmental Entitlement 2011* and *Lower Latrobe River Wetlands Environmental Entitlement 2010* provide for unregulated flows to be diverted to floodplain wetlands. Use of these entitlements depends on suitable river heights, as specified in the entitlements. Use of water under unregulated flow entitlements is difficult to quantify due to infrastructure and metering limitations. Substantial inflows into these wetlands also occur via overbank flows and catchment runoff. As such, no volumes have been reported for these entitlements in Table 4-1 below.

Table 4-1 Environmental entitlements in southern Victoria 2013–14 (ML)

Basin	Entitlement/ Reliability	Entitlement volume (ML) at 1 July 2013	Opening carryover (ML)	Allocation (ML)	Share of inflows (ML)	Net trade (ML)	Net spills [1] (ML)	Return flows (ML)	Total available / accrued (ML)	Use (ML)	Closing Balance[2] [3] (ML)
Latrobe	***Lower Latrobe River Wetlands Environmental Entitlement 2010***[4][7]										
	Unregulated	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Blue Rock Environmental Entitlement 2013[5]										
	Share of inflows	9% inflows	-	18,737	1,369	-	2,379		22,485	3748	18,737
Thomson	***Bulk Entitlement (Thomson River – Environment) Order 2005***[6]										
	High reliability	10,000	(187)	10,000	-	1,054	-		10,867	10,754	113
	Macalister River Environmental Entitlement 2010[1]										
	High reliability	12,461	2,896	12,461	-	-	(2,142)		13,215	11,388	1,827
	Low reliability	6,230	1,246	311	-	-	-		1,557	1,461	96
Yarra	***Yarra River Environmental Entitlement 2006***[2]										
	High reliability	17,000	34,965	17,000	-	(1,054)	-		50,911	16,835	34,076
Bunyip	***Tarago and Bunyip Rivers Environmental Entitlement 2009***										
	Share of inflows	10.3% inflows	1,808	-	2,449	-	527		4,784	1,784	3,000
Werribee	***Werribee River Environmental Entitlement 2011***										
	Share of inflows	10% inflows	869	-	298	-	-	43	1,210	461	865
	Melbourne Water water shares										
	n/a	n/a	-	788	-	-	-	-	788	-	788
Maribyrnong	**Purchased allocation**										
	n/a	n/a	-	731	-	-	-	-	731	200	531
Barwon	***Barwon River Environmental Entitlement 2011***[4]										
	Unregulated	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Moorabool	***Moorabool River Environmental Entitlement 2010***										
	Share of inflows	11.9% inflows	4,423	-	285	-	-	-	4,708	2,500	2,208
Total			**46,020**	**60,029**	**4,401**	**0**	**764**	**43**	**111,256**	**49,131**	**62,241**

Notes:

(1) Net spills are calculated by the addition of :i) physical spills from storages; ii) credits to the VEWH account from other accounts in the same storage when those accounts are full; iii) debits from the VEWH account to other accounts in the same storage when the VEWH account is full.
(2) The water detailed in the closing balance column is available to carry over, subject to the carryover rules of the relevant entitlements.
(3) The use of the closing balance calculation column depends on the allocation method in that system.
(4) Use of these entitlements depends on suitable river heights, as specified in the entitlement.
(5) This entitlement became a part of the VEWH Water Holdings during the 2013–14 water year.
(6) Overuse at the end of 2012–13, the volume of opening carryover resulted in the Thomson account being overdrawn.
(7) This entitlement was originally named the *Latrobe River Environmental Entitlement 2010* and was renamed on 4 July 2013 to avoid confusion with the new environmental entitlement for the Latrobe system (*Blue Rock Environmental Entitlement 2013*).

n/a: information not available

4.2.2 Environmental water holdings held by VEWH in western Victoria

Within western Victoria, one environmental entitlement supplies both the Wimmera and Glenelg rivers and wetlands connected to the Wimmera–Mallee pipeline. The entitlement is for water held in the Grampians headworks system, a highly connected system that harvests water from both the Glenelg and Wimmera basins.

Table 4-2 Environmental entitlements in western Victoria 2013–14 (ML)

Basin	Entitlement/ Reliability	Entitlement volume at 1 July 2013 (ML)	Opening carryover (ML)	Allocation (ML)	Total available (ML)	Use (ML)	Closing balance[1] (ML)
Wimmera and Glenelg	***Wimmera Glenelg Rivers Environmental Entitlement 2010***						
	Wimmera Mallee pipeline product – high reliability	40,560	25,795	32,935	58,730	29,739	28,991
	Wimmera Mallee wetlands – high reliability[2]	1,000	1,421	250	1,671	265	1,406
Total			**27,216**	**33,185**	**60.401**	**30,004**	**30,397**

Notes:

(1) The water detailed in the closing balance column is available to carry over, subject to the carryover rules of the relevant entitlements.
(2) The reliability of the Wimmera Mallee wetlands entitlement is lower than the Wimmera Mallee Pipeline product, but is still 'high reliability' compared with other entitlements in the Wimmera.

4.2.3 Environmental water holdings held by VEWH in northern Victoria

In northern victoria the VEWH hold environment entitlements in the Murray, Goulburn, Campaspe and Loddon basins as detailed Table 4-3. In addition the CEWH holds approximately 600,000 ML of water shares in northern Victoria.

During 2013–14, allocations of savings and mitigation water associated with Stage 1 of the Goulburn-Murray Water Connections Project were made to the River Murray and Goulburn River entitlements. Water savings were also added to the Loddon River entitlement.

The VEWH holds environmental entitlements and water shares in the Murray, Goulburn and Loddon rivers in trust to provide improved environmental flows for the Snowy River. The water available and used for this purpose is detailed in Table 4-3; more information on Snowy River increased flows is provided in Section 6.10.

Table 4-3 Environmental entitlements in northern Victoria 2013–14 (ML)

Basin	Entitlement/ Reliability	Entitlement at 1 July 2013 (ML)	Allocation carried over from 2012–13 (ML)	Carryover lost to spill [1] (ML)	Allocation (ML)	Return flow re-credit [2] (ML)	Net transfers [3] (ML)	Net allocation trade VEWH[4] (ML)	Total available (ML)	Use (ML)	Closing balance [5] (ML)
Murray	***Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999***										
	High reliability	28,750	25,966	23,917	28,750	355,444	(312,225)	0	74,017	73,915	102
	Unregulated	40,000	0	0	2,448	0	0	0	2,448	2,448	0
	Environmental Entitlement (River Murray – NVIRP Stage 1) 2012 [6][7]										
	-	13,560	27,284	13,282	15,040	0	133,923	0	162,965	145,864	17,102
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999 – Barmah–Millewa Environmental Water Allocation										
	High reliability	50,000	105,750	0	50,000	0	0	0	178,500	64,200	114,300
	Low reliability	25,000			25,000						

	***Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999* – Living Murray**										
	High reliability	9,589	5,710	5,260	9,589	0	19,671	0	29,711	25,153	4,558
	Low reliability	101,850	0	0	0	81,849	(11,543)	0	70,306	67,465	2,841
	Unregulated	34,300	0	0	3,586	0	0	0	3,586	3,586	0
	Bulk Entitlement (River Murray – Snowy Environmental Reserve) Conversion Order 2004										
	High reliability	29,794	0	0	29,794	0	(29,794)	0	0	n/a	0
	Water shares – Snowy River Environmental Reserve										
	High reliability	11,392	1	0	14,671	0	(14,672)	0	0	n/a	0
	Low reliability	6,415	0	0	0	0	0	0	0	n/a	0
Broken	**Water shares – Broken System (Goulburn-Murray Water)**										
	-	0	0	0	0	0	121	0	121	121	0
Goulburn	***Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012***										
	-	28,449	25,937	0	25,213	0	229,222	0	280,408	257,788	22,620
	Goulburn River Environmental Entitlement 2010										
	High reliability	1,432	0	0	1,432	0	0	0	1,432	1,432	0
	Environmental Entitlement (Goulburn System – Living Murray) 2007										
	High reliability	39,625	30,058	0	39,625	0	(1,510)	0	68,173	49,009	19,164
	Low reliability	156,980	14,991	0	0	0	1,510	0	16,501	14,991	1,510
	Bulk Entitlement (Snowy – Environment) Order 2005										
	High reliability	30,252	0	0	30,252	0	(30,252)	0	0	n/a	0
	Low reliability	8,156	0	0	0	0	0	0	0	n/a	0
	Water shares – Snowy River Environmental Reserve										
	High reliability	6,401	0	0	8,321	0	(8,321)	0	0	n/a	0
	Low reliability	17,852	0	0	0	0	0	0	0	n/a	0
Campaspe	***Campaspe River Environmental Entitlement 2013***										
	High reliability	20,652	0	0	20,652	0	1,517	0	22,169	11,676	10,493
	Low reliability	2,966	0	0	1,364	0	0	0	1,364	0	1,364
	Campaspe passing flow account										
	Passing flows	0	0	0	1,121	0	0	0	1,121	1,121	0
	Environmental Entitlement (Campaspe River – Living Murray Initiative) 2005										
	High reliability	126	126	0	126	0	0	0	252	126	126
	Low reliability	5,048	1,642	0	2,322	0	0	0	3,964	1,642	2,322
Loddon	***Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005*** (8)										
	High reliability	2,000	2,000	0	2,000	0	0	0	4,000	2,000	2,000
	High reliability	1,480	0	0	1,480	0	0	0	1,480	785	695
	Trigger based	7,490	0	0	7,490	0	0	0	7,490	3,376	4,114
	Low reliability	2,024	0	0	0	0	3,475	300	3,775	3,775	0
	Water shares – Snowy River Environmental Reserve										
	High reliability	470	0	0	470	0	(470)	0	0	n/a	0
	Environmental Entitlement (Birch Creek – Bullarook System) 2009										
	High reliability	100	100	0	0	0	0	0	100	0	100
Total		**682,153**	**239,564**	**42,459**	**320,747**	**437,293**	**(19,348)**	**300**	**933,883**	**730,472**	**203,411**

Notes:

(1) When spare capacity is available in certain systems in northern Victoria, entitlement holders are able to carry over unused water above their entitlement volume. If system storages spill, some or all of that carryover may be deemed to be 'lost' through that spill.

(2) Return flows provisions in entitlements allow environmental water to be delivered to achieve outcomes in multiple systems. For example, these rules allow water to be delivered through the Goulburn or Campaspe systems and then be re-credited for delivery in the Murray system (minus losses) to meet the environmental objectives in downstream sites such as the Lower Lakes in South Australia.

(3) Administrative transfers between allocation bank accounts are required to facilitate the use of water across river and wetland systems, and to enable the use of water made available by the CEWH and the Living Murray program in Victoria. A positive transfer value indicates there has been a net transfer of allocation into the specified entitlement. A negative value indicates a net transfer of allocation out of the specified entitlement. Net transfers by the VEWH represent transfers of water to the Snowy River entitlements and transfers of water to South Australia to facilitate delivery to the Murray River.

(4) Negative net trades indicate net sale of water allocation, while positive net trades indicate net purchase of water allocation.

(5) The water detailed in the closing balance column is available to carry over, subject to the carryover rules of the relevant entitlements.

(6) Total entitlement volume and allocation includes mitigation water allocated for the purposes of water-specific environmental sites that have been identified through Goulburn-Murray Water Connections Project environmental approvals processes.

(7) Volume of allocation carried over from 2012–13 includes 14,753 of Living Murray carried over in a VEWH account.

(8) High reliability entitlement volume of 1,480 ML is the volume of water savings allocated to the VEWH Water Holdings during the 2013–14 water year through an amendment to the Loddon bulk entitlement.
n/a: not applicable

4.2.4 Snowy River increased flows

Victoria continues to meet its obligations to provide improved environmental flows in the Snowy River. Allocation to water entitlements held in trust for the Snowy River is traded out of VEWH environmental accounts to supply consumptive users who would otherwise have been supplied through water diverted from the Snowy system. By reducing the demand to supply consumptive users from the Snowy system, this water can be used to maximise environmental flows in both the Snowy and Murray rivers.

Under the Snowy Water Inquiry Outcomes Implementation Deed, increased flows to the rivers 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 system on the basis of one-third to the Murray River and two-thirds to the Snowy River (until the Murray River reaches a maximum of 70,000 ML, after which all remaining water is apportioned to the Snowy River).

The information on the Snowy River entitlements in Table 4-4 was sourced from the New South Wales Office of Water.

Table 4-4 Snowy River entitlements 2013–14 (ML)

Entitlement source	Entitlement at 1 March 2014 (ML)	Volume available for release in 2013–14 (ML)
Victoria(1)	115,939	82,366
New South Wales(2)	168,406	169,237
Total	**284,344**	**251,603**
Volume apportioned to Snowy River increased flows		*181,603*
Volume apportioned to River Murray increased flows		*70,000*

Notes:
(1) Primarily high reliability entitlements.
(2) Primarily high security entitlements.

4.3 Environmental water in unregulated systems

Management plans are developed in unregulated river systems and are used to set out arrangements for sustainably managing available water resources to balance the needs of all users, including the environment. The types of management plans are:

- **statutory management plans** – which are **streamflow management plans** (for unregulated surface water systems) and **integrated water management plans** (for highly connected groundwater and surface water systems). Statutory plans are developed for managing water resources of priority unregulated waterways, and highly connected groundwater and surface water systems, that are under flow stress, or where there is a demand for more development.
- **local management plans** – developed by water corporations to capture and formalise existing rules in unregulated systems where there are no statutory management plans.

A precursor to the establishment of a statutory water management plan is the declaration by the Minister for Water of a Water Supply Protection Area (WSPA) under section 27 of the *Water Act 1989*. A WSPA protects the area's water resources through the development of a statutory management plan that aims for equitable management and long-term sustainability of the resource. No surface water WSPAs were declared in 2013–14. WSPAs for the Avon River and Tarra River catchments were abolished during 2013–14 as these catchments will be managed by local management plans rather than statutory water management plans (see Table 4-5).

Streamflow management plans (SFMPs) determine how river water will be shared between consumptive users and the environment in declared surface water WSPAs in unregulated systems.

In 2013–14, eight SFMPs were in effect in Victoria, all within the Yarra basin. In addition, one integrated management plan is in effect in the Upper Ovens River where there is a high degree of connectivity between groundwater and surface water. Table 4-5 lists each basin where SFMPs are in place and gives the status of each plan as reported by rural water corporations. No additional SFMPs are planned. Twenty-one priority systems were initially identified in 2004 for development of SFMPs. Since then, technical studies and resource appraisals have been completed, resulting in a reassessment of priorities throughout Victoria. These reassessments have occurred through the development of sustainable water strategies. Where SFMPs would have been developed, local management plans will be used instead. Local management plans 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.

Sustainable water strategies have recommended that local management plans are more appropriate than SFMPs for a number of the 21 priority streams initially identified in 2004, as reported in Table 4-5.

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 eight SFMPs that are in effect, hence information about its compliance with the SFMPs is available from its 2013–14 annual report. In addition, annual reports for each of the SFMPs are posted on the Melbourne Water website.

Goulburn-Murray Water is responsible for the management and implementation of the integrated Upper Ovens River Water Management Plan (WMP). Information about compliance with the plan is reported in the Upper Ovens River WMP annual report, which is available on the Goulburn-Murray Water website.

Table 4-5 Status of streamflow management plans and integrated water management plans

Basin	Stream(s)	Work undertaken in 2013–14
Kiewa	Kiewa River	Local management plan in place as recommended under the Northern Region Sustainable Water Strategy
Ovens	Ovens River above Myrtleford	Integrated WMP approved and operational
Goulburn	King Parrot Creek, Yea River, Seven Creeks	Local management plans in place as recommended under the Northern Region Sustainable Water Strategy
Thomson	Avon River	Local management plan in place as recommended under the Gippsland Region Sustainable Water Strategy: proposed for review
Latrobe	Latrobe River (upper)	Local management plan in place as recommended under the Gippsland Region Sustainable Water Strategy
South Gippsland	Tarra River	Local management plan in place as recommended under the Gippsland Region Sustainable Water Strategy
Yarra	Diamond Creek, Hoddles Creek, Plenty River, Pauls / Steels / Dixons creeks, Olinda Creek, Stringybark Creek, Woori Yallock Creek and Little Yarra and Don Rivers	All streamflow management plans approved and operational
Maribyrnong	Upper Maribyrnong River (Deep Creek)	Need for streamflow management plan to be reviewed
Barwon	Barwon River main stem and tributaries to the south including Leigh River	Need for streamflow management plan to be reviewed
Otway Coast	Gellibrand River	Local management plan in place as recommended under the Western Region Sustainable Water Strategy
Hopkins	Merri River	Reviewed under the Western Region Sustainable Water Strategy: a local management plan was recommended
Wimmera	Upper Wimmera River	Reviewed under the Western Region Sustainable Water Strategy: a local management plan was recommended

4.4 Compliance with passing flow requirements

Each water corporation 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 and environmental entitlements.

No major breach of passing flow compliance was reported in 2013–14, however six minor failures to meet passing flow requirements occurred:

- Coliban Water at the request of the North Central Catchment Management Authority has varied the minimum passing flow in the Coliban River to four megalitres per day. The rationale is to accumulate environmental reserves to provide larger ‘fresher’ flows during dry periods.
- Goulburn–Murray Water was unable to meet the minimum required passing flow in:
  - Birch Creek for 10 days in July 2013 and August 2013, and one day in November 2013 and May 2014 due to fluctuating natural flow requirements. The release in Birch Creek was less than required for one day in September 2013 due to timing in changes to the release.
  - Broken Creek, downstream of Gowangardie Weir, for one day due to higher-than-anticipated irrigation demand. This also occurred at the Broken Weir site on 29 December 2013 and 1 January 2014. The flow downstream of Broken Weir was less than the required flow for an additional two days in April 2014 and five days in May 2014 due to fluctuating natural flow requirements caused by climatic conditions. These fluctuating conditions also contributed to flows in the Broken River in the reach between Lake Nillahcootie and Broken Weir being 1 ML per day below the required flow for five days in July 2013.

- Campaspe River below Lake Eppalock on a number of days between May and June 2014 while maintenance work was undertaken. On 18 September 2013, there was an operational issue with the outlet valve and the flow downstream was less than the required flow. On all occasions the volume of flow that was not able to be provided was recorded in the Eppalock Passing Flow Account for later release for the environment on the advice of North Central Catchment Management Authority.

- Western Water was unable to meet the minimum passing flow requirements in:
  - Willimigongon Creek due to manual operation requirements. A shortfall totalling 46 ML was not released as instantaneous passing flows. This was compensated for by ensuring average passing flows over the year exceeded the shortfall. To improve the manual operation process, Western Water is planning to install an extra flow meter at Orde Hill offtake.
  - Main Creek due to manual operation requirements. A shortfall totalling 17 ML was not released as instantaneous passing flows. This was compensated for by ensuring average passing flows over the year exceeded the shortfall. The creek's diversion station will be investigated to determine if telemetry can be used to monitor the diversion. If telemetry is a viable option, it will not eliminate the manual process but it will provide greater monitoring capability to allow for daily changes in creek flow. Historically (including in 2013–14), a greater passing flow that what is required by the bulk entitlement has been allowed to pass over the financial year in recognition of this non-compliance. If telemetry is not viable, Western Water will continue to allow the greater total annual passing flow. Western Water installed new infrastructure to conduct environmental releases from Campaspe Reservoir in 2013–14.

4.5 Proportion of total streamflow that reaches basin outlets

Figure 4-1 compares the total flows throughout the state with the total volume leaving the state's basins since 2003–04. Table 4-6 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 diversions.

Given the highly variable and seasonal nature of flows in Victorian rivers and the complex demands made of them by water diversions for consumption, the proportion of annual flow of water leaving a basin (i.e. the proportion of annual flow not diverted for consumption) is not in itself a reliable indicator of river health or other environmental benefits. While this water is likely to 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 2013–14, the proportion of total flow leaving the basin decreased in most basins when compared with the previous year (Table 4-6). The basins that experienced the lowest proportions of water leaving the basin as a percentage of total flow in 2013–14 were the Campaspe (40%), Goulburn (39%), Loddon (22%), Moorabool (21%), Werribee (18%), Wimmera (18%) and Avoca (0%) basins. The proportion of annual flow leaving the basin was above 90% in 11 basins, predominantly in the south of the state, similar to 2012–13. The Snowy and East Gippsland basins recorded the highest proportion of total flow leaving the basin in 2013–14; consumptive use in these basins is generally very low compared with water availability, and almost all inflows are passed to Bass Strait.

Across Victoria as a whole, the total volume of water leaving the river basins in 2013–14 was 14,984 GL compared with 17,028 GL in 2012–13 (Figure 4-1), which reflected the substantially lower basin inflows. However, as a percentage of total flow, the proportion of water that reached the basin outlets was lower to the previous year, with 75% in 2013–14 compared with 80% in 2012–13 (Table 4-6).

Figure 4-1 Volume leaving Victorian surface water basins, as proportion of total flow, 2003–04 to 2013-14

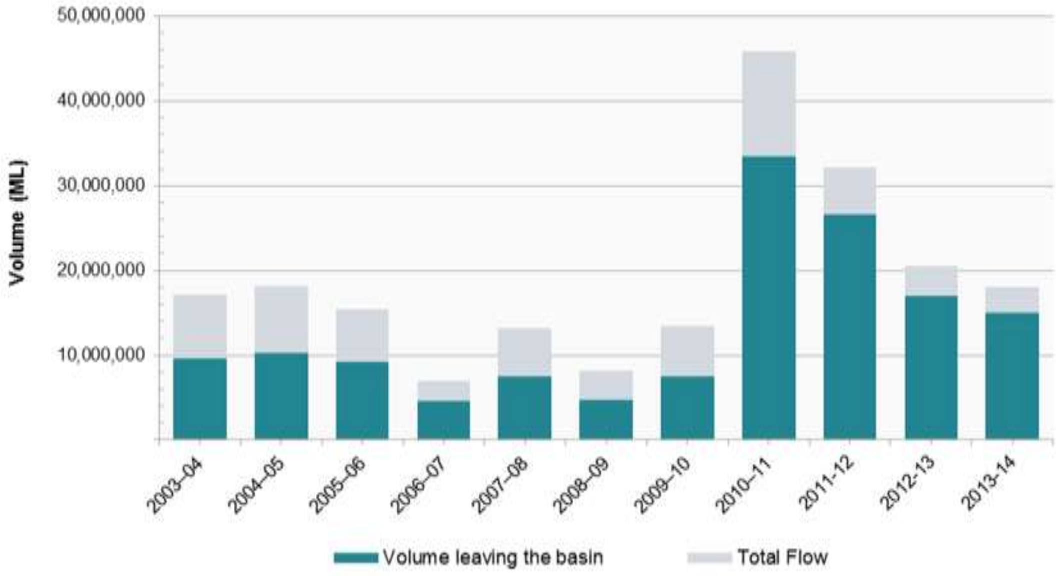


Table 4-6 Volume leaving Victorian surface water basins 2013–14

Basin	Outflow to	2013–14			2012–13		
		Total flow if no diversions (ML)	Volume leaving the basin (ML)	Proportion of total flow leaving the basin (%)	Total flow if no diversions (ML)	Volume leaving the basin (ML)	Proportion of total flow leaving the basin (%)
Murray[1]	South Australia	4,562,480	2,437,400	53%	6,143,993	4,015,600	65%
Kiewa[2]	Murray River	605,828	569,621	94%	612,663	560,841	92%
Ovens	Murray River	1,450,612	1,395,536	96%	1,234,059	1,181,616	96%
Broken	Murray River	210,402	156,008	74%	201,296	171,518	85%
Goulburn	Murray River	2,399,347	939,676	39%	2,530,962	1,723,620	68%
Campaspe	Murray River	161,438	64,280	40%	165,079	81,278	49%
Loddon	Murray River	157,132	35,129	22%	194,784	59,020	30%
East Gippsland	Bass Strait	666,465	665,059	100%	953,355	951,942	100%
Snowy (Vic. only)[3]	Bass Strait	1,110,316	1,485,553	134%	1,441,377	1,820,329	126%
Tambo	Gippsland Lakes	144,683	138,321	96%	309,242	302,443	98%
Mitchell	Gippsland Lakes	782,716	762,965	97%	722,170	699,601	97%
Thomson	Gippsland Lakes	718,366	490,207	68%	876,174	562,825	64%
Latrobe	Gippsland Lakes	789,922	687,467	87%	900,762	801,824	89%
South Gippsland	Bass Strait, Western Port	1,361,864	1,326,435	97%	1,017,893	983,554	97%
Bunyip	Bass Strait, Western Port, Port Phillip Bay	854,730	826,921	97%	645,007	612,847	95%
Yarra[4]	Port Phillip Bay	699,325	410,630	59%	914,537	650,795	71%
Maribyrnong	Port Phillip Bay	43,563	29,131	67%	81,471	63,658	78%
Werribee	Port Phillip Bay	41,588	7,359	18%	79,770	49,963	63%
Moorabool	Port Phillip Bay	51,988	10,814	21%	94,386	50,779	54%
Barwon	Port Phillip Bay, Bass Strait	198,475	141,873	71%	155,726	142,120	91%
Corangamite[5]	Corangamite lakes	307,353	290,180	94%	145,591	128,241	88%
Otway Coast	Bass Strait	962,890	934,417	97%	668,930	639,420	96%

Hopkins	Bass Strait	280,650	183,891	66%	235,182	136,907	58%
Portland Coast	Bass Strait	571,317	550,934	96%	338,902	318,387	94%
Glenelg	Bass Strait	599,750	427,820	71%	426,508	290,509	68%
Millicent Coast(6)	South Australia	4	n/a	n/a	4	n/a	n/a
Wimmera(5)	Lakes Hindmarsh and Albacutya	92,907	17,212	19%	71,509	28,834	40%
Mallee(6)	Murray River	n/a	n/a	n/a	n/a	n/a	n/a
Avoca(5)	Lake Bael Bael and the Marshes	24,253	22	0%	23,942	28	0%
Total		**19,850,362**	**14,984,862**	**75%**	**21,185,276(7)**	**17,028,499**	**80%**

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 New South Wales share of Kiewa River flows under the Murray–Darling Basin Agreement.

(3) The total flow volume relates to the flows from the Victorian tributaries of the Snowy River only. Volume leaving the basin relates to all water flowing from the Snowy River into Bass Strait, which includes water originating from the New South Wales portion of the Snowy River.

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

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

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

(7) This volume differs from the volume reported in 2012-13 Victorian Water Accounts due to updated data for the Bunyip and Avoca basins.

n/a: not applicable

5 Water trade

Water trade has long been used as a tool in Victoria to facilitate efficient use of water resources. While unofficial trade was likely occurring as early as the 1940s, official temporary trades first occurred in 1987 and official permanent trades first occurred in 1991–92. The ability to report on trade allows the examination of how availability and demand for water influences its movement and efficient use in Victoria. This chapter reports on trade activity during the 2013–14 water year, taking into consideration the volume of water traded and the geographical movements of water in those trades.

5.1 Victoria's water trade framework

There are four main avenues for trading water in Victoria. For declared systems there is trade of allocation and trade (or transfer) of water shares; in non-declared systems there is entitlement volume trade and change of ownership. Trade of water in Victoria is governed by trading rules and policies set by the Minister for Water. The rules and policies aim to facilitate trade wherever possible, while minimising negative impacts on other users and the environment. Basin Plan trading rules come into effect in the 2014–15 water year regulating restrictions on water trading within the Murray-Darling Basin. During 2013–14 Victoria made considerable efforts to amend legislation, trading rules, systems and procedures to ensure compliance with these rules starting 1 July 2014.

5.1.1 Allocation trade

Allocation trade involves transferring a volume of water allocation from a seller to a buyer. Water allocation is water allocated each season against water entitlements, for example water shares. Water is allocated based on the available resource in any given year. (Discussion about seasonal allocations in 2013–14 can be found in Section 2.2.2). The allocation made against a water entitlement may be traded separately from the entitlement and from land according to trading rules for declared water systems, which are governed by the Minister. Allocation trade can either occur within a trading zone or between trading zones in line with the trading rules.

Allocation trade only occurs in declared water systems. In northern Victoria these are the Broken, Bullarook, Campaspe, Goulburn, Loddon, Murray and Ovens systems; and in southern Victoria, the Thomson–Macalister and Werribee systems.

5.1.2 Trade of water shares

Trade of water shares can mean a transfer of ownership, a change of location, or both. In this report trade is taken to mean a change in location, as the purpose of including trade here is to show the movement of water into or out of different water delivery areas in Victoria.

A transfer of ownership occurs when a water share is sold from one person to another. A change of location may occur during a transfer of ownership or following an application to vary or associate a water share. A water share can be associated with a new water use licence without a transfer of ownership; in this situation a change of location occurs without a change of owner. The source of water for a water share cannot change during this transaction, however the point of use can change. For instance, when a water user located in the Murray system purchases a Goulburn water share, the water share source remains in the Goulburn, but it is tagged for use in the Murray. In order to analyse the movement of water shares, the direction of trade must be assessed by considering the point of use rather than the source of the water share as this never changes. In summary, 'movement' can either be considered to occur with:

- a change of ownership (the new owner wishes the water share to be used at a new location), or
- an association or variation of the water share (an existing owner wishes to shift the water share to another location).

In this report, a change of location is presented as the movement of water shares between delivery systems.

5.1.3 Trade of take and use licences

Outside declared water systems, take and use licences can be traded in Victoria. A take and use licence can either be sourced from unregulated surface water systems or from groundwater. Trade of take and use licences can either be an entitlement volume trade or a change of ownership. Transfer of entitlement volume for a take and use licence can be either a 'permanent volume transfer' or a 'temporary volume transfer' to transfer part or all of the volume from one licence to another. These generally include a change in location. The other type of transfer is 'change of ownership', which changes the ownership of a licence without affecting its volume and location. Approval of bundled entitlement trades are subject to the constraints of the Act, the ministerial policies for managing take and use licences and any approved local management rules or plans.

For the purposes of this chapter, trades of bundled entitlements are presented as either unregulated surface water trades or groundwater trades.

5.2 Overview of trade in 2013–14

In this chapter, northern Victoria is defined as the area north of the Great Dividing Range falling under the management of Goulburn–Murray Water, Lower Murray Water and Coliban Water. Southern Victoria includes areas south of the divide under Southern Rural Water and Melbourne Water. Western Victoria is the area under Grampians Wimmera Mallee Water.

Total allocation trade in northern Victoria amounted to 2,080 GL in 2013–14, down from 2,342 GL in the previous year. In southern Victoria, allocation trade fell to around 17 GL in 2013–14 from about 24 GL in the previous year.

There was a decrease in water share movement (i.e. transfers of ownership and variations) in northern Victoria, falling from 603 GL in 2012–13 to 368 GL in 2013–14. In southern Victoria, the level of water share movement increased from about 30 GL in 2012–13 to 39 GL in 2013–14.

In northern Victoria, the Commonwealth purchased about 10 GL of high reliability water shares in 2013–14, down from 31 GL in 2012–13.

For take and use licences in northern Victoria, there was 37.4 GL of groundwater trade and 7.6 GL of surface water trade. Southern Victoria had 17.8 GL of take and use licence groundwater trade and 7.4 GL of take and use licence surface water trade. Western Victoria had 5.7 GL of take and use licence groundwater trade and less than 0.1 GL of surface water trade in various unregulated entitlement types (take and use licences, water allowances, bulk entitlements).

Further information about water trading in Victoria is provided in the *Victorian Water Trading 2013–14 Annual Report*, available at <http://waterregister.vic.gov.au>.

5.3 Northern Victoria

5.3.1 Allocation trade

Total trade of allocation in northern Victoria was 2,080 GL in 2013–14 (Table 5-2), slightly less than the 2,342 GL traded in 2012–13. The number of trades increased from 11,330 in 2012–13 to 11,729 in 2013–14. The continued high level of trade resulted from a combination of high allocations and the activity of environmental and institutional water owners transferring water allocation between their accounts. These levels of allocation trade also reflect the fact that a number of irrigators are now relying on the allocation trade market after selling their water shares to the Commonwealth in previous years. Like 2012–13, environmental trades made up a significant portion of the volume traded in 2013–14; 877 GL was traded by environmental parties which equates to 42% of the total volume traded. Given the large influence of environmental trades on the total volume traded, the volume of water traded by non-environmental parties is separated (Table 5-3) from the amount traded by environmental parties (Table 5-4). For a discussion about the assumptions made to distinguish between environmental and non-environmental trading, see the *2013–14 Victorian Water Trading Report*. Table 5-1 summarises the volume traded and number of trades by type in 2013–14.

Table 5-1 Summary of trade of allocation in northern Victoria (ML)

Trade type	Number of trades	Volume (ML)
Environmental allocation trade	86	876,651
Non-environmental allocation trade	11,643	1,203,391

Victoria continued to be an exporter of water in 2013–14, exporting a net volume of 134 GL in 2013–14, a decrease from the previous year when Victoria exported a net volume of 645 GL. Interstate allocation trade in 2013–14 was again dominated by environmental trades and included 359 GL transferred to South Australia. For non-environmental allocation trade there was actually a net trade into Victoria of about 194 GL.

Table 5-2 shows the volume of allocation traded between each trading zone in northern Victoria in 2013–14. In summary:

- Intrazone trade was again highest in 1A Greater Goulburn with about 467 GL total volume traded, of which 219 GL was non-environmental allocation trade.
- Four Victorian trading zones had a net allocation purchase in 2013–14 compared with just one (1A Greater Goulburn) in 2012–13. These included zone 1A Greater Goulburn (60 GL) and zone 6 Vic Murray – Dartmouth to Barmah (72 GL) [zone 20 Snowy is not included as it is only used as a mechanism for holding Snowy savings].
- Victoria purchased a net 150 GL of allocation from New South Wales this year. This flips the previous year's trend when Victoria sold 108 GL to New South Wales.

- Victoria sold a net 285 GL of allocation to South Australia in 2013–14. This was down from the 537 GL sold in 2012–13, although this was again dominated by environmental allocation trade (359 GL of environmental allocation trades to South Australia in 2013–14; 532 GL traded to South Australia in 2012–13).

Table 5-2 Trade of allocation in northern Victoria (ML)

Trading zone		Buyer																			
		Victoria															NSW	SA			
	Seller	1A Greater Goulburn	1B Boort	2A Broken – Nillacootie to Caseys Weir	2B Broken – Caseys Weir to Goulburn River	3 Lower Goulburn	4A Campaspe	4C Lower Campaspe	5A Loddon	5B Bullarook	6 Vic Murray – Dartmouth to Barmah	6B Lower Broken Creek	7 Vic Murray – Barmah to SA	9A Ovens	9B King	20 Snowy	NSW	12 South Australian Murray	**Total sold**	**Number of trades**	**Net sold**
Victoria	1A Greater Goulburn	466,992	26,521			4,298	1,303	2	1,133		20,117	2,320	68,620			33,696	2,160	3,158	**630,321**	**4,669**	**(59,993)**
Victoria	1B Boort	34,050	10,807				300		80		460	120	29,108			1,852	210	100	**77,087**	**242**	**(4,803)**
Victoria	2A Broken – Nillacootie to Caseys Weir				24														**24**	**1**	**22**
Victoria	2B Broken – Caseys Weir to Goulburn River			2	408														**410**	**6**	**(22)**
Victoria	3 Lower Goulburn	12,536	186			189					495		1,672			3,025	2,000	878	**20,981**	**136**	**13,951**
Victoria	4A Campaspe	21,355	2,519			400	9,008	70			1,059	65	4,024				40	406	**38,945**	**222**	**25,985**
Victoria	4C Lower Campaspe	448					632	9											**1,088**	**10**	**958**
Victoria	5A Loddon	3,445	147						4,784		145	4	1,324			470		282	**10,600**	**120**	**3,746**
Victoria	5B Bullarook									269									**269**	**10**	**0**
Victoria	6 Vic Murray – Dartmouth to Barmah	27,605	4,878			158			56		77,608	1,684	37,602			33,189	1,074	9,268	**193,122**	**1,274**	**(72,265)**
Victoria	6B Lower Broken Creek	3,392	100						12		5,336	1,337	2,223			81	242	3,549	**16,272**	**188**	**9,653**
Victoria	7 Vic Murray – Barmah to SA	72,210	22,693			575	717		440		122,365	1,091	214,913			11,196	13,811	363,771	**823,781**	**3,941**	**300,539**
Victoria	9A Ovens													182					**182**	**5**	**0**
Victoria	9B King														272				**272**	**5**	**0**
Victoria	20 Snowy																		**0**	**0**	**(83,509)**
NSW	NSW	26,425	11,926			1,410		50	349		31,948		98,149						**170,257**	**577**	**150,720**
SA	12 South Australian Murray	21,856	2,114				1,000				5,855		65,606						**96,430**	**323**	**(284,982)**
Total purchased		**690,313**	**81,890**	**2**	**432**	**7,030**	**12,961**	**131**	**6,854**	**269**	**265,387**	**6,620**	**523,242**	**182**	**272**	**83,509**	**19,537**	**381,412**	**2,080,042**		
Number of trades		**5,101**	**362**	**1**	**6**	**57**	**43**	**4**	**61**	**10**	**1,430**	**117**	**4,318**	**5**	**5**	**14**	**74**	**121**		**11,729**	

Table 5-3 Non-environmental trade of allocation in northern Victoria (ML)

Trading zone		Buyer																		
		Victoria														NSW	SA			
Seller		1A Greater Goulburn	1B Boort	2A Broken – Nillacootie to Caseys Weir	2B Broken – Caseys Weir to Goulburn River	3 Lower Goulburn	4A Campaspe	4C Lower Campaspe	5A Loddon	5B Bullarook	6 Vic Murray – Dartmouth to Barmah	6B Lower Broken Creek	7 Vic Murray – Barmah to SA	9A Ovens	9B King	NSW	12 South Australian Murray	**Total sold**	**Number of trades**	**Net sold**
Victoria	1A Greater Goulburn	247,578	26,521			4,298	1,303	2	433		20,117	2,320	68,248			2,160	3,158	**376,138**	**4,655**	**-64,748**
	1B Boort	18,836	10,807				300		80		460	120	26,108			210	100	**57,020**	**236**	**-24,870**
	2A Broken – Nillacootie to Caseys Weir																	**0**	**0**	**-2**
	2B Broken – Caseys Weir to Goulburn River			2	311													**313**	**5**	**2**
	3 Lower Goulburn	9,834	186			189					495		1,672			2,000	878	**15,254**	**134**	**8,224**
	4A Campaspe	16,355	2,519			400	3,123	70			1,059	65	4,024			40	406	**28,060**	**220**	**21,617**
	4C Lower Campaspe	448						9										**456**	**9**	**326**
	5A Loddon	3,445	147						2,009		145	4	1,324				282	**7,355**	**117**	**3,976**
	5B Bullarook									269								**269**	**10**	**0**
	6 Vic Murray – Dartmouth to Barmah	21,109	4,878			158			56		44,926	1,684	30,469			1,074	2,093	**106,447**	**1,262**	**-8,721**
	6B Lower Broken Creek	3,392	100						12		5,336	1,337	2,223			242	564	**13,206**	**186**	**6,586**
	7 Vic Murray – Barmah to SA	71,610	22,693			575	717		440		25,828	1,091	211,023			13,811	14,941	**362,730**	**3,910**	**-136,117**
	9A Ovens													182				**182**	**5**	**0**
	9B King														272			**272**	**5**	**0**
NSW	NSW	26,425	11,926			1,410		50	349		10,948		88,149					**139,257**	**566**	**119,720**
SA	12 South Australian Murray	21,856	2,114				1,000				5,855		65,606					**96,430**	**323**	**74,008**
Total purchased		**440,887**	**81,890**	**2**	**311**	**7,030**	**6,443**	**131**	**3,379**	**269**	**115,169**	**6,620**	**498,847**	**182**	**272**	**19,537**	**22,422**	**1,203,391**		
Number of trades		**5,086**	**362**	**1**	**4**	**57**	**41**	**4**	**58**	**10**	**1,406**	**117**	**4,306**	**5**	**5**	**74**	**107**		**11,643**	

Table 5-4 Environmental trade of allocation in northern Victoria (ML)

Trading zone		Buyer											
		Victoria							NSW	SA			
Seller		1A Greater Goulburn	2B Broken - Casey's to Goulb	4A Campaspe - Eppalock to WWC	5A Loddon	6 Vic Murray – Dartmouth to Barmah	7 Vic Murray – Barmah to SA	20 Snowy	New South Wales	South Australia	**Total sold**	**Number of trades**	**Net sold**
Victoria	1A Greater Goulburn	219,414			700		372	33,696			**254,182**	**14**	**4,756**
	1B Boort	15,215					3,000	1,852			**20,067**	**6**	**20,067**
	2A Broken – Nillacootie to Caseys Weir		24								**24**	**1**	**24**
	2B Broken – Caseys Weir to Goulburn River		97								**97**	**1**	**-24**
	3 Lower Goulburn	2,702						3,025			**5,727**	**2**	**5,727**
	4A Campaspe	5,000		5,885							**10,885**	**2**	**4,368**
	4C Lower Campaspe			632							**632**	**1**	**632**
	5A Loddon				2,775			470			**3,245**	**3**	**-230**
	6 Vic Murray – Dartmouth to Barmah	6,496				32,682	7,133	33,189		7,175	**86,675**	**12**	**(63,544)**
	6B Lower Broken Creek							81		2,985	**3,066**	**2**	**3,066**
	7 Vic Murray – Barmah to SA	600				96,536	3,889	11,196		348,830	**461,051**	**31**	**436,656**
	20 Snowy										**0**	**0**	**(83,509)**
NSW	New South Wales					21,000	10,000				**31,000**	**11**	**31,000**
SA	South Australia										**0**	**0**	**(358,990)**
Total purchased		**249,427**	**121**	**6,517**	**3,475**	**150,218**	**24,395**	**83,509**	**0**	**358,990**	**876,651**		
Number of trades		**15**	**2**	**2**	**3**	**24**	**12**	**14**	**0**	**14**		**86**	

5.3.2 Water share transfers

Table 5-5 and Table 5-6 summarise the transfer and variations of high reliability and low reliability water shares in northern Victoria during 2013–14 by grouped delivery system. While not all transfers involved a change in location (i.e. water share purchases within a delivery system), the movement of water shares between delivery systems can be observed in these tables. In summary:

- Approximately 368 GL of high reliability and low reliability water shares were transferred or varied.
- 3,485 transfers or variations of high reliability water shares occurred, totalling around 259 GL.
- 1,461 transfers or variations of low reliability water shares occurred, totalling around 109 GL.
- Most transfers and variations occurred within delivery system groups.
- About 79 GL of high reliability water shares moved between delivery system groups. This included 41 GL of water share disassociation from land to the non-water-user group and 28 GL of non-water-user group water shares being reconnected to land.
- About 20 GL of low reliability water shares moved between delivery system groups. This included 5 GL of water share disassociation from land to the non-water-users group and 8 GL of non-water-user group water shares being reconnected to land.

Table 5-5 Transfer and variation of high reliability water shares in northern Victoria (ML)

	Destination																			
Delivery system	Broken River	Bullarook	Campaspe Irrigation Area	Campaspe River	Central Goulburn Irrigation Area	Goulburn River	Loddon River	Loddon Valley Irrigation Area	Murray River	Murray Valley Irrigation Area	Nyah, Tresco and Woorinen	Ovens River	Robinvale, Red Cliffs, Merbein, FMID	Rochester Irrigation Area	Shepparton Irrigation Area	Torrumbarry Irrigation Area	Non-water user	**Total trades (ML)**	**Number of trades**	**Net out / (Net in) (ML)**
Source																				
Broken River	523																	**523**	**9**	**(4)**
Bullarook		6																**6**	**1**	**0**
Campaspe Irrigation Area				654														**654**	**5**	**342**
Campaspe River				1,302													40	**1,342**	**22**	**(615)**
Central Goulburn Irrigation Area					22,603	76		574	337	14	2			177	82	4	7,157	**31,024**	**595**	**3,697**
Goulburn River					12	3,225		150	42					272		77	264	**4,042**	**70**	**708**
Loddon River							1,354	56									107	**1,518**	**31**	**36**
Loddon Valley Irrigation Area					200			11,996	236						55	1,568	3,653	**17,708**	**142**	**3,075**
Murray River									21,711	770			268			105	7,185	**30,038**	**325**	**2,462**
Murray Valley Irrigation Area										28,525					54		9,292	**37,871**	**367**	**7,290**
Nyah, Tresco and Woorinen									187		2,605					150	624	**3,565**	**89**	**890**
Ovens River												1,166						**1,166**	**33**	**(5)**
Robinvale, Red Cliffs, Merbein, FMID									384		50		9,466			145	2,090	**12,135**	**472**	**1,870**
Rochester Irrigation Area					172			185	240	42				14,355	57	131	2,432	**17,614**	**241**	**2,223**
Shepparton Irrigation Area			30		1,114	25		184						62	10,114	80	2,173	**13,781**	**283**	**3,004**
Torrumbarry Irrigation Area									991		8		17			33,416	6,297	**40,729**	**503**	**(11,602)**
Non-water user	4		282		3,227	8	127	1,488	3,449	1,229	10	5	514	525	417	16,657	17,168	**45,110**	**297**	**(13,371)**
Total trades (ML)	**527**	**6**	**312**	**1,956**	**27,328**	**3,334**	**1,481**	**14,633**	**27,576**	**30,580**	**2,676**	**1,171**	**10,265**	**15,391**	**10,778**	**52,331**	**58,481**	**258,826**		
Number of trades	**11**	**1**	**4**	**25**	**542**	**66**	**29**	**131**	**327**	**294**	**72**	**34**	**401**	**208**	**232**	**479**	**629**		**3,485**	

Table 5-6 Transfer and variation of low reliability water shares in northern Victoria (ML)

Delivery system	Destination																			
Source	Broken River	Bullarook	Campaspe Irrigation Area	Campaspe River	Central Goulburn Irrigation Area	Goulburn River	Loddon River	Loddon Valley Irrigation Area	Murray River	Murray Valley Irrigation Area	Nyah, Tresco and Woorinen	Ovens River	Robinvale, Red Cliffs, Merbein, FMID	Rochester Irrigation Area	Shepparton Irrigation Area	Torrumbary Irrigation Area	Non-water user	**Total trades (ML)**	**Number of trades**	**Net out (ML)**
Broken River	136																	**136**	**7**	**0**
Bullarook		3																**3**	**1**	**0**
Campaspe Irrigation Area			13	302														**315**	**2**	**288**
Campaspe River				695	22													**718**	**13**	**(280)**
Central Goulburn Irrigation Area					13,624	17		191	185	121				159	757	870	344	**16,267**	**310**	**1,258**
Goulburn River					4	932										37		**972**	**26**	**11**
Loddon River							566	18										**583**	**20**	**(31)**
Loddon Valley Irrigation Area					344			6,390						289	27	1,060	442	**8,553**	**69**	**1,387**
Murray River									2,495		9					107	402	**3,014**	**51**	**(142)**
Murray Valley Irrigation Area										20,180					24		930	**21,134**	**237**	**(2,975)**
Nyah, Tresco and Woorinen											1,255					32		**1,287**	**26**	**23**
Ovens River												586						**586**	**20**	**0**
Robinvale, Red Cliffs, Merbein, FMID													100					**100**	**2**	**(100)**
Rochester Irrigation Area					424			272	12	221				7,446	378	192	314	**9,258**	**121**	**463**
Shepparton Irrigation Area			14		199	12		218						53	7,881	146	583	**9,106**	**180**	**(402)**
Torrumbary Irrigation Area								54	404	48			100			24,946	1,560	**27,112**	**295**	**(2,590)**
Non-water user					391		49	23	61	3,540				848	441	2,313	2,417	**10,081**	**81**	**3,089**
Total trades (ML)	**136**	**3**	**27**	**998**	**15,008**	**960**	**614**	**7,165**	**3,156**	**24,109**	**1,264**	**586**	**200**	**8,795**	**9,508**	**29,702**	**6,992**	**109,223**		
Number of trades	**7**	**1**	**2**	**13**	**310**	**26**	**20**	**69**	**51**	**237**	**26**	**20**	**2**	**121**	**180**	**295**	**81**		**1,461**	

5.3.3 Unregulated surface water

As shown in Table 5-7, trade in surface water take and use licences is much lower than the trade in groundwater take and use licences (Table 5-8). Trades as part of land transfers (take and use licence change of ownership) are the dominant trade type (by volume) in surface water trades.

Table 5-7 Trade of surface water take and use licences in northern Victoria

River basin	Permanent trade		Temporary trade		Trade as part of land transfer	
	Number	Volume (ML)	Number	Volume (ML)	Number	Volume (ML)
Broken			1	25	9	50
Campaspe	163	1,549	30	253	65	365
Goulburn	5	78	6	158	61	916
Kiewa	3	108	6	379	12	259
Loddon	1	5	3	267	11	440
Murray	1	20	5	211	27	1,333
Ovens	4	59	6	282	36	830
Total	**183**	**1,825**	**57**	**1,575**	**221**	**4,194**

5.3.4 Groundwater

Table 5-8 shows that in 2013–14, trades of groundwater take and use licences were mostly part of land transfers (take and use licence 'change of ownership') with 153 trades amounting to about 30 GL. Temporary and permanent entitlement volume trades had 19 transfers (about 2 GL) and 61 transfers (about 5 GL) respectively.

Table 5-8 Trade of groundwater take and use licences in northern Victorian GMUs

Groundwater Management Unit	Permanent trade		Temporary trade		Trade as part of land transfer	
	Number	Volume (ML)	Number	Volume (ML)	Number	Volume (ML)
Alexandra					1	200
Central Victorian Mineral Springs			1	2	2	25
Katunga	3	654	12	1,095	16	5,951
Kinglake					1	100
Loddon Highlands	2	120	19	1,133	11	1,375
Lower Campaspe Valley	3	471	15	1,861	10	5,207
Lower Ovens	3	29	8	500	12	1,282
Mid Goulburn			2	126	4	1,529
Mid Loddon	4	628	1	292	3	698
Mullindolingong					1	30
Shepparton Irrigation					70	12,641
Strathbogie					2	40
Unincorporated					10	467
Upper Goulburn	1	10			3	169
Upper Ovens	3	19	3	341	7	373
Total	**19**	**1,931**	**61**	**5,350**	**153**	**30,086**

5.4 Southern Victoria

5.4.1 Allocation trade

The total volume of allocation traded within southern Victoria during 2013–14 was about 17 GL, comprising 320 trades. This was a large fall in trade compared with the 24 GL (557 trades) reported in 2012–13. Table 5-9 shows the number and volume of allocation trades by trading zone in southern water systems during 2013–14. In summary:

- 89% of the allocation trade occurred within trading zones, with only about 2 GL of interzone trade.
- There was a 30% reduction in traded volume from 2012–13 when 24 GL was traded. Most of this reduction was in the Thomson–Macalister system where 13.7 GL was traded in 2013–14 compared with 20.1 GL in 2012–13.
- Only 3,020 ML was traded within the Werribee and Bacchus Marsh trading zones. This was only a small reduction from the 3,374 ML traded during 2012–13. Trade within Werribee District continued to be the major contributor to the volume of allocation trade in this area.

There was one 788 ML environmental trade in the Werribee system during 2013–14.

Table 5-9 Trade of allocation in southern Victoria (ML)

	Trading zone	Buyer								
		31AD Bacchus Marsh District	31AR Upper Werribee Diverters	31BD Werribee District	31BR Lower Werribee Diverters	41 Macalister	42B Mid Thomson	Total sold	Number of trades	Net sold
Seller	31AD Bacchus Marsh District	353		75				**428**	**19**	**75**
	31AR Upper Werribee Diverters							**0**	**0**	**0**
	31BD Werribee District			1,568	828			**2,396**	**70**	**557**
	31BR Lower Werribee Diverters			196				**196**	**5**	**(632)**
	41 Macalister					11,897	80	**11,977**	**197**	**(628)**
	42B Mid Thomson					708	1,074	**1,781**	**29**	**628**
	Total purchased	**353**	**0**	**1,839**	**828**	**12,605**	**1,154**	**16,778**		
	Number of trades	**16**		**76**	**2**	**209**	**17**		**320**	

5.4.2 Water share transfers

The transfers and variations of high reliability and low reliability water shares during 2013–14 in southern Victoria are presented in Table 5-10 and Table 5-11. While not all transfers involved a change in location (i.e. water share purchases within a delivery system), the movement of water shares between delivery systems can be observed in these tables. The tables show that:

- 515 transfers and variations of low reliability and high reliability water shares (totalling 38,911 ML) were recorded for southern Victoria. This is an increase from 387 transfers (amounting to 30,272 ML) in 2012–13.
- The largest volume of transfers was within the Macalister Irrigation District (about 28 GL). A much lower volume of transfers occurred within the Werribee and Bacchus Marsh irrigation districts and the Thomson River.
- There was a net movement of high reliability water shares out of the non-water-user category during 2013–14 which was a reversal on the net movement into the non-water-user category in the previous year.

Table 5-10 Transfer and variation of high reliability water shares in southern Victoria (ML)

	Delivery system	Destination: Bacchus Marsh Irrigation District	Werribee Irrigation District	Werribee River	Macalister Irrigation District	Macalister River	Thomson River	Non-water user	Total trades (ML)	Number of trades	Net out / (Net in) (ML)
Source	Bacchus Marsh Irrigation District	157							**157**	**3**	**0**
Source	Werribee Irrigation District		358						**358**	**14**	**0**
Source	Werribee River			15					**15**	**6**	**0**
Source	Macalister Irrigation District				18,901	24	120	125	**19,171**	**182**	**200**
Source	Macalister River				65	1,257			**1,322**	**12**	**41**
Source	Thomson River						5,231		**5,231**	**61**	**(120)**
Source	Non-water user				4				**4**	**2**	**(121)**
Source	**Total trades (ML)**	**157**	**358**	**15**	**18,970**	**1,281**	**5,351**	**125**	**26,258**		
Source	**Number of trades**	**3**	**14**	**6**	**183**	**11**	**62**	**1**		**280**	

Table 5-11 Transfer and variation of low reliability water shares in southern Victoria (ML)

	Delivery system	Destination: Bacchus Marsh Irrigation District	Werribee Irrigation District	Werribee River	Macalister Irrigation District	Macalister River	Thomson River	Non-water user	Total trades (ML)	Number of trades	Net out / (Net in) (ML)
Source	Bacchus Marsh Irrigation District	74							**74**	**3**	**0**
Source	Werribee Irrigation District		167						**167**	**14**	**0**
Source	Werribee River								**0**	**0**	**0**
Source	Macalister Irrigation District				9,044		88	59	**9,190**	**156**	**117**
Source	Macalister River				30	629			**659**	**11**	**30**
Source	Thomson River						2,563		**2,563**	**51**	**(88)**
Source	Non-water user								**0**	**0**	**(59)**
Source	**Total trades (ML)**	**74**	**167**	**0**	**9,074**	**629**	**2,651**	**59**	**12,653**		
Source	**Number of trades**	**3**	**14**	**0**	**156**	**11**	**51**	**0**		**235**	

5.4.3 Unregulated surface water

Trading of permanent and temporary entitlement volume in unregulated systems decreased from about 12 GL in 2012–13 to about 3 GL in 2013–14. There was a similar volume of trade as part of a land transfer in 2013–14 and 2012–13 (Table 5-12).

Table 5-12 Trade of surface water take and use licences in southern Victoria (ML)

River basin	Permanent trade		Temporary trade		Trade as part of land transfer	
	Number	Volume (ML)	Number	Volume (ML)	Number	Volume (ML)
Barwon			5	165	7	182
Bunyip	6	107	10	367	20	284
East Gippsland					1	2
Glenelg	1	2			3	93
Hopkins	1	25	6	420	12	807
Latrobe	4	30	9	361	19	324
Maribyrnong			30	731	8	139
Mitchell			2	75	13	421
Moorabool			3	36	2	37
Otway Coast					5	91
Portland Coast					1	4
Snowy			2	59	2	360
South Gippsland	1	20	1	3	27	393
Tambo	1	21			8	99
Thomson/Macalister			3	172	11	353
Werribee					1	19
Yarra	18	271	22	34	65	928
Total	**32**	**476**	**93**	**2,422**	**205**	**4,535**

5.4.4 Groundwater

Table 5-13 shows that in 2013–14, as in previous years, trades of groundwater take and use licences were dominated by trades as part of land transfers (take and use licence change of ownership) with 136 trades amounting to about 9 GL. About 7 GL of temporary and 2 GL of permanent entitlement volume were transferred.

Water trade

Table 5-13 Trade of groundwater take and use licences in southern Victorian GMUs

Groundwater Management Unit	Permanent trade		Temporary trade		Trade as part of land transfer	
	Number	Volume (ML)	Number	Volume (ML)	Number	Volume (ML)
Bungaree			11	215	6	278
Cardigan					2	8
Colongulac			1	3	1	4
Corinella					2	16
Denison			3	270	5	260
Deutgam	1	39			3	135
Giffard	1	200	1	50	1	10
Glenelg			1	200	1	80
Glenormiston					2	184
Hawkesdale			2	265	2	1,414
Heywood					5	153
Koo Wee Rup	8	194	16	488	13	1,628
Lancefield	1	10			2	235
Merrimu	1	16				
Moe			1	50	2	18
Moorabbin			1	3	1	3
Nepean	3	145	11	545	3	129
Nullawarre	3	64	7	540	7	745
Rosedale	1	40	1	288	4	34
Sale	2	121	6	417	5	373
Stratford	1	90				
Unincorporated	1	20	3	105	46	1,559
Wa De Lock	3	167	3	579	6	872
Wandin Yallock			4	44	5	96
Warrion	3	356	1	150	5	267
Wy Yung	1	40	2	60	1	12
Yangery	3	59	3	71	3	168
Yarram	1	300	3	2,648	3	294
Total	**34**	**1,862**	**81**	**6,990**	**136**	**8,973**

5.5 Western Victoria

5.5.1 Unregulated surface water

In 2013–14 there were no permanent or temporary trades of surface water take and use licences in western Victoria. There were three trades in association with land transfers (totalling 6.6 ML of surface water take and use licence), all within the Wimmera river basin.

In 2013–14 there were 17 trades of Wimmera Mallee Pipeline product between water allowance holders (totalling 5.0 ML).

5.5.2 Groundwater

In 2013–14 the volume of groundwater take and use licences traded was 5.7 GL compared with 7.7 GL in 2012–13.

Table 5-14 Trade of groundwater take and use licences

Groundwater Management Unit	Permanent trade		Temporary trade		Trade as part of land transfer	
	Number	Volume (ML)	Number	Volume (ML)	Number	Volume (ML)
Murrayville			1	141	3	1,890
Unincorporated					1	71
West Wimmera	5	380	16	2,032	6	1,195
Total	**5**	**380**	**17**	**2,172**	**10**	**3,156**

Part 2: Water Accounts 2013–14

Part 2 of the 2013–14 Victorian Water Accounts presents an account of surface water, groundwater and distribution systems in Victoria for 2013–14.

Chapter 6 provides the water accounts for each of Victoria's 29 river basins and includes:

- a map of each river basin
- a basin overview, including summaries of information presented in each basin, management responsibilities in the basin and, where applicable, information about the Environmental Water Reserve (EWR)
- the total water resources in each basin
- detailed information about surface water and recycled water in the basin.

The basin water accounts presented in Chapter 6 track surface water from the time it appears as inflow to a waterway to the time it is diverted from the surface streams of the basin, or flows from them to another basin or to the sea.

Chapter 7 provides the water accounts for each of Victoria's 20 groundwater catchments and includes:

- a map of each groundwater catchment
- an overview of groundwater resources in each catchment
- detailed information about licences and groundwater use in the catchment.

The groundwater catchment accounts presented in Chapter 7 help to describe Victoria's groundwater resource and track groundwater extracted for irrigation, urban and domestic and stock use.

Chapter 8 provides the accounts for distribution systems. These accounts track the water from the time it moves from a waterway, an aquifer or other source to the time it is delivered to a customer, or to another destination. Such accounting is important because distribution systems are part of the water cycle people can control and where delivery efficiency improvements can most readily be made. These accounts have the potential over time to address a number of questions such as:

- How do the many urban systems compare with each other? Urban systems range from large and well-resourced (such as those operated by Melbourne retailers), to very small and possibly less well-resourced systems in small towns throughout the state.
- How do piped urban systems compare with piped irrigation systems and to large gravity irrigation systems that are currently being modernised?
- What potential is there to recover water to meet rising demand by upgrading maintenance standards in the numerous systems apart from the few large irrigation systems?

6 Basin water accounts

6.1 Overview of methodology

6.1.1 Introduction

This section outlines the basis for the information presented in the basin water accounts. It explains some important assumptions and limitations of the data in the accounts, which should be read in conjunction with the information contained in the accounts.

The basin water accounts are compiled from information obtained from:

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

The basin water accounts report information on surface water and recycled water in 2013–14 for the 29 river basins within Victoria. The basin definitions are based on the river basin boundaries designated by the former Australian Water Resources Council (AWRC). The exception is the Murray basin which, for the purposes of the Victorian Water Accounts, includes the Upper Murray basin as defined by the AWRC and areas in Victoria supplied from the Murray River downstream of Lake Hume. Until 2012–13, groundwater data was presented together with surface water in the Victorian Water Accounts, according to river basin boundaries. The Victorian Water Accounts now presents groundwater information in its own section, reported by groundwater catchment according to changes to Victoria's groundwater management framework. Chapter 7 presents an introduction, methodology and catchment accounts for Victoria's groundwater resources.

6.1.2 Surface water data

Surface water data generally aligns well with river basin boundaries. The only instances where this does not occur is where water is diverted from a waterway in one river basin and then used in another. For the purposes of the basin water accounts, water is accounted for at the point of diversion from the waterway and not the point of use. For example, information on diversions to supply the Rochester Irrigation Area, located at the downstream end of the Campaspe basin, is accounted for in the Goulburn basin where its source of supply is located.

6.1.3 Recycled water

Towns with wastewater treatment plants have been assigned to river basins according to the point of discharge from the plant into the receiving waters. If all water is reused and none is discharged into waterways, the treatment plant is assigned to a basin according to the location of the plant.

All information for each of the 29 basins is provided for the period 1 July 2013 to 30 June 2014. Responsibilities for water management are reported in the accounts as they were during 2013–14. Any changes to responsibilities since the end of June 2014 will be reported in future water accounts.

6.1.4 Surface water resources section

Information on surface water in 2013–14 is presented in this section for each of the 29 river basins. There are three subsections: water balance, storages and flows, and entitlement volumes and diversions.

6.1.5 Surface water balance subsection

The surface water balance is the principal water accounting tool in the Victorian Water Accounts. The water balance provides a statement of the water flows in a basin for a specified year, in which the sum of the outflows from the area equals the sum of the inflows less the water accumulated in the area (i.e. water in storages).

A surface water balance is presented for all of the 29 basins except the Mallee basin and Millicent Coast basin. Owing to the lack of significant surface water resources in these basins, there is insufficient data available to prepare a water balance.

The three components of the water balance (storages, inflows, outflows) are explained below.

6.1.5.1 Major on-stream storages

The overall change in storage volume in a basin for the year is provided as the difference between the volume in storage at the start of the year and the end of the year. In general, only on-stream storages with a total capacity larger than 1,000 ML are included in this component of the water balance. While storages that are less than 1,000 ML are important locally, they are generally an insignificant proportion of total storage at a river basin and statewide level. Note that the volume of water in off-stream storages is not reported in the surface water balance because this would, in some instances, result in the double counting of water that has been diverted from rivers or extracted from groundwater.

6.1.5.2 Inflows

Inflows contribute to the volume of streamflow in waterways within a basin. An overview of the inflow components included in the water balance is provided below.

- **Catchment inflow**: this item represents the total volume of surface runoff from rainfall that becomes streamflow or is captured by small catchment dams. This is generally the unaccounted-for item in each water balance and is used as the balancing item. Catchment inflow is determined to be the difference between the total outflows, and the known inflows and accumulated storage volume.
  The only exception to this is the Murray basin. In the Murray basin this item represents known inflows, which include Victoria's share of inflows to Lake Dartmouth, Lake Hume and the Menindee Lakes, Victoria's share of inflows from the Kiewa River, and inflows from other Victorian basins (Ovens, Goulburn, Broken, Campaspe and Loddon) into the Murray River. It also includes estimated inflows to small catchment dams in the Murray basin to correspond with the estimated impacts of small catchment dams.
- **Internal spills from New South Wales's share of storage**: this item only applies in the Murray basin. When New South Wales's share of storage capacity is full, New South Wales's share of incoming inflows are credited to Victoria's share of capacity. This is referred to as an 'internal spill'.
- **Ceding from New South Wales's share of storage**: this item only applies in the Murray basin. This item represents an accounting adjustment to the River Murray Water Accounts maintained by the MDBA under the Murray–Darling Basin Agreement.
- **Rainfall on major storages**: this represents inflows from rain falling directly on major on-stream storages. Estimates are based on rainfall data and the surface area of storages.
- **Transfers from other basins**: transfers from other basins are included in a basin's water balance only where these transfers are known to affect streamflows in the receiving basin. These transfers (e.g. to rivers or on-stream storages) are included principally because the volume may contribute to the in-stream loss and/or outflow components of the water balance. If water transferred across basin boundaries is supplied directly into a distribution/reticulation system and does not affect streamflows, it is considered as a diversion to an end use (e.g. urban diversions, irrigation district diversions) and is not accounted for as a transfer in the water balance.
- **Return flow from irrigation**: return flows from irrigation are the outfalls from an irrigation system that return to waterways. These outfalls arise as part of the normal operation of systems that rely on delivering water by gravity. Return flows from power stations and major industry are also included in the water balance for the Latrobe basin.
- **Treated wastewater discharged back to river**: this component represents the volume of water discharged from wastewater treatment plants back into waterways. See Section 6.1.9 for more information.

6.1.5.3 Outflows

This term represents water that has left a waterway, whether by natural processes (such evaporation and seepage) or through being diverted by water corporations and individuals. An overview of the outflow components included in the water balance is provided below.

Diversions

Diversions are considered to be water that is deliberately diverted from a waterway to meet a specific use.

- **Urban diversions**: this item represents the total volume of water diverted from waterways by water corporations to supply urban customers.
- **Irrigation district diversions**: this component represents the bulk volume of water diverted from waterways by rural water corporations to supply customers within irrigation districts.
- **Licensed diversions from regulated or unregulated streams**: these diversions occur where the extraction and delivery of water to a property from a watercourse is the responsibility of the licence holder. Information on licensed diversions is reported separately for regulated and unregulated water sources. Domestic and stock water users are assumed to divert their full entitlement volume (unless otherwise reported by water corporations). The water balance excludes diversions under domestic and stock rights which do not require a licence. The volume associated with these rights is relatively small.
- **Transfers to other basins**: this component represents the transfer of water to another basin where it is either used or contributes to the in-stream loss in the other basin. The corresponding transaction is reported as an inflow in the receiving basin.
- **Environmental water diversions to wetlands**: environmental water is often used to support streamflows within a waterway and this contributes to the volume leaving a basin outlet. In some instances, however,

environmental water is diverted from a waterway to off-stream wetlands. Metered diversions to off-stream wetlands under environmental entitlements are accounted for in this component of the water balance.

- **Small catchment dams**: this item represents the estimated volume of extractions from small catchment dams within a basin. More information on how the volume of extractions is determined is provided in Section 6.1.8.1.

Losses

Losses refer to catchment inflows that are lost from the waterway via natural processes. Losses represent a volume that is unable to be diverted for use and that does not contribute to the flow at a basin outlet.

- **Evaporation losses from major storages**: this represents direct evaporation from major on-stream storages. It is estimated based on evaporation rates and the surface area of the storage.
- **Evaporation losses from small catchment dams**: this item represents the estimated volume of evaporation losses from small catchment dams within a basin. More information on how the evaporation loss is determined is provided in Section 6.1.8.1.
- **In-stream infiltration to groundwater, flows to floodplain and evaporation (also referred to as in-stream losses)**: this item represents the volume of water that is lost from the waterway via natural processes, and is not directly measurable. In the Murray basin, in-stream losses for the year are considered to be the unaccounted-for item in the water balance and are used as the balancing items. In this instance, in-stream losses are determined to be the difference between the known outflows, and the total inflows and net change in storage volume.
  In most other basins, in-stream losses for the year are estimated based on loss functions used in water resource models such as REALM. Where suitable models are available, in-stream losses are derived by applying measured streamflow data for the year into the loss functions included in the model. The basins with suitable models are documented in Table 6-1. In-stream losses have not been estimated for the following basins where a suitable model is not available: East Gippsland, Snowy, Tambo, Latrobe, South Gippsland, Yarra, Corangamite, Otway Coast, Hopkins and Portland Coast.

Water passed at outlet of basin

Generally, this item represents the total volume of flow that passes the outlet of the basin. The outlets vary from basin to basin and include:

- **Outflows to ocean**: common in southern Victoria, where most rivers flow to the sea.
- **Outflows to other rivers**: common in northern Victoria, where most rivers flow north and join the Murray River.
- **Outflows to terminal lakes**: several rivers in western Victoria don’t outflow to the ocean or to other rivers, but to lakes that are referred to ‘terminal lakes’.
- **Outflows to another state**: the outlet of the Murray River is considered to be the boundary with South Australia for accounting purposes. Flow across the boundary into South Australia from Victoria’s share of the Murray River resources is considered to be water passed at the outlet of the basin.

The volume of water passed at basin outlets is estimated using gauged streamflow data at a point as close to the basin outlet as possible and then extrapolating that gauged data to ungauged basin areas.

In the Murray basin, the total volume of water deducted from Victoria’s share of the resource, in line with interstate accounting under the Murray–Darling Basin Agreement, is represented as water passed at the basin outlet. These volumes include:

- **Internal spills to New South Wales’s share of storage**: this item only applies in the Murray basin. When Victoria’s share of storage capacity is full, Victoria’s share of incoming inflows is credited to New South Wales’s share of capacity. This is referred to as an ‘internal spill’
- **Ceding to New South Wales’s share of storage**: this item only applies in the Murray basin. It represents Victoria’s ‘ceding’ obligations to provide water in storage to New South Wales under the Murray–Darling Basin Agreement.

Table 6-1 Models used to derive in-stream losses for 2013–14

Basin(s)	Model(s)
Kiewa	Kiewa River REALM
Ovens	Ovens River REALM (the volume derived using the model represents the average annual in-stream loss over the period 1891–2006)
Broken, Goulburn, Campaspe, Loddon	Goulburn Simulation Model (this model covers the Goulburn, Broken, Campaspe and Loddon systems)
Avoca	Avon River REALM
Wimmera	Wimmera–Glenelg REALM
Mitchell	Mitchell River REALM, Mitchell River Streamflow Management Plan REALM
Thomson	Thomson Macalister REALM
Bunyip	Tarago and Bunyip River REALM
Maribyrnong	Maribyrnong REALM
Werribee	Werribee REALM
Moorabool, Barwon	Barwon Moorabool REALM
Glenelg	Glenelg River REALM, Wimmera–Glenelg REALM

6.1.6 Storages and flows subsection

This section provides an overview of inflows and volumes in storage within each basin. A chart is presented that plots catchment inflow from the water balance and the total capacity and volume of water held in major storages (including both off- and on-stream storages) in the basin for the past nine years. Information on storages in each basin is presented, including the capacity, starting and ending volume in store, rainfall and evaporation. It also provides an amount representing catchment inflow less regulated releases; this volume is the balancing item for each storage and represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

6.1.7 Entitlement volumes and diversions subsection

This section presents information on diversions used in the surface water balance. It provides an overview of the entitlements granted to individuals or corporations in the basin. It also reports the diversions by water corporations under bulk entitlements, diversions to off-stream wetlands under environmental entitlements, licensed diversions from unregulated streams by private diverters, and diversions and losses from small catchment dams.

6.1.7.1 Entitlement volumes

Details of all entitlements to water in each basin are reported in this section. Entitlements can include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Bulk entitlements specify a maximum volume of water that may be diverted over a given number of years. The ‘Annual entitlement volume’ column provides the maximum volume that may be diverted in any one year and where the entitlement volume is an amount specified over more than one year, the total volume that may be taken over the period of the entitlement is shown in the notes. For example the Gisborne – Barringo Creek bulk entitlement in the Maribyrnong basin specifies that up to 585 ML can be diverted in any one year, while the maximum volume that can be taken over any five-year period is 1,600 ML (320 ML annual average).

In the large regulated systems, bulk entitlements are normally specified in one of two ways:

- Source bulk entitlement is an entitlement to harvest water directly from a water source. Source entitlements typically cover multiple storages operated in an integrated way within a river basin. They also include obligations to divert or release water to supply ‘primary entitlement holders’ such as customers within irrigation districts, licensed diverters in regulated streams, water corporations that hold delivery bulk entitlements, and environmental entitlements held by the VEWH.
- 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 water corporation.

The ‘Bulk entitlement volume’ for a source bulk entitlement will include the volumes supplied to delivery entitlement holders and other primary entitlement holders specified in the source bulk entitlement. To account for this, primary entitlements are presented inset as a part of the source bulk entitlement. Appendix D lists all Victoria’s bulk entitlements and their entitlement holders.

6.1.8 Allocation account balances

Allocation available under bulk entitlements and licences is presented in this section. Allocation represents the actual water that is available for use and trade in the 2013–14 water year. Individuals or authorities that hold water entitlements in Victoria are allocated water based on the size of their entitlement and the available resource. For example, in 2013–14 entitlement holders with low reliability water shares in the Werribee system were allocated 15%

of their entitlement. That is, for every 100 ML of entitlement they owned, they were allocated 15 ML of water that could be used or traded. The tables in this section summarise the water transactions for each river basin by entitlement holder or by entitlement holder type (i.e. the total water transactions for all water share holders in a particular basin). Where a source bulk entitlement exists, a total diversion is reported. This represents the volume of water diverted from the waterway to supply the primary entitlements that are specified in the bulk entitlement. Where there is a difference between the total diversion from the waterway and the amount supplied to primary entitlement holders, an amount is allocated to an operating provision line item. This allows for any known or unknown loss and any unaccounted-for gain in the system.

6.1.8.1 Estimated small catchment dam impacts

Small catchment dams (also known as catchment farm dams) are dams that are not located on a defined watercourse but harvest water from their local catchment. The presence of small catchment dams changes the hydrology in a basin due to their effects on the rate of overland flow (surface runoff), evaporation and groundwater seepage. Small catchment dams reduce the volume of surface runoff that might otherwise become streamflow in a basin.

The total volume of water harvested by small catchment dams has been determined based on estimates of the total volume of small catchment dams in a basin obtained from DELWP's Sustainable Diversions Limits project in 2002 and Flow Stressed Ranking Procedure project in 2005, and computer-based simulation modelling of the impact of small catchment dams on mean annual streamflow.

The estimated total water harvested by (or total impact of) small catchment dams in a basin is represented in the water balance as two separate components:

- The estimated volume that owners extract from dams to supply their needs is accounted for as a diversion in the surface water balance. The volume extracted is determined based on the estimated total capacity and the assumed use of small catchment dams in a basin. (Dams are categorised as being for either domestic and stock purposes or commercial and irrigation purposes based on their estimated size).
- The estimated volume of evaporation from small catchment dams is accounted for as a loss in the surface water balance. This volume is determined to be the difference between the estimated total water harvested (or total impact of) small catchment dams and the estimated volume extracted for use.

All volumes presented for small catchment dams are annual average figures. In extremely dry years, these annual average figures are factored down to reflect the reduced water availability from lower rainfall. The 2013–14 year was not considered to be an extremely dry year for any of Victoria's 29 basins, therefore the average annual volumes have been applied.

6.1.9 Recycled water section

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.

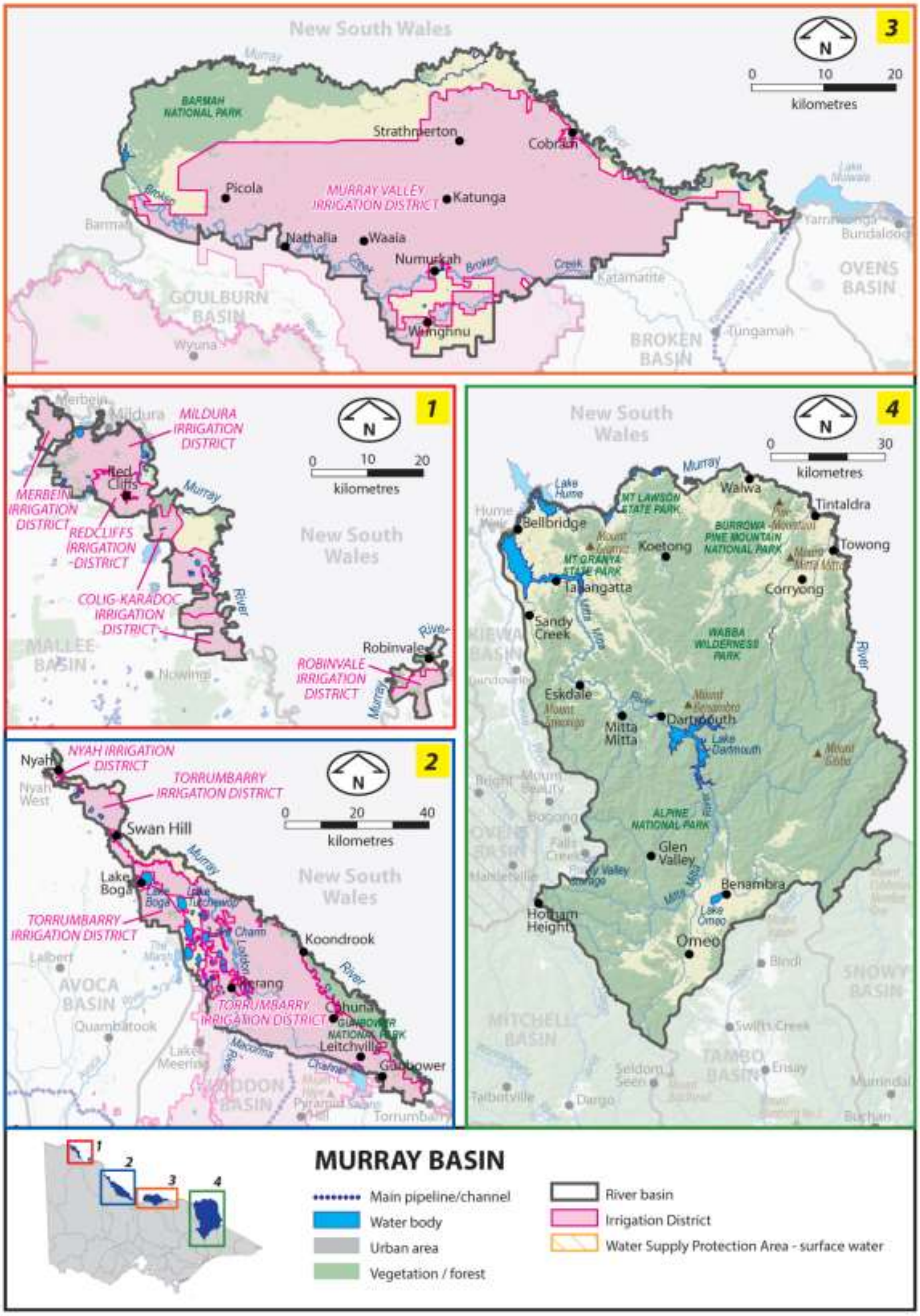
A table in each basin chapter provides the following information:

- the volume of wastewater produced (excluding evaporation)
- the total volume recycled, and a breakdown into the following end-use categories:
- – 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
- – the volume discharged to the environment (ocean outfalls or inland water discharges).

6.2 Murray basin (Victoria)

The Murray River forms the border with New South Wales. Victoria shares the volume of water held in the Murray–Darling basin's storages with New South Wales under the Murray–Darling Basin Agreement. For the purposes of this report, the Murray basin includes the Upper Murray basin and areas in Victoria supplied from the Murray River downstream of Lake Hume (Figure 6-1).

Figure 6-1 Map of the Murray basin (Victoria)



6.2.1 Water resources overview

Rainfall across the Murray basin in 2013–14 was 100 to 125% of the long-term average in much of the basin, with a small area receiving slightly below-average rainfall of 80 to 100%.

Catchment inflows to the Murray basin in 2013–14 were 60% of the long-term average, lower compared with 2012–13 when inflows were 81% of the long-term average.

The volume held in Victoria's share of the major Murray system storages started at 83% of capacity at the beginning of July and was at 70% of capacity at the end of June 2014.

Allocations in the regulated Murray system began the year at 42%. The allocation for high reliability water shares reached 100% by mid-September 2013. There was no allocation for low reliability water shares in 2013–14.

No urban water use restrictions applied in the Murray basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year.

The MDBA is responsible under the *Water Act 2007* (Cwth) for the planning and management of Murray–Darling basin water resources on behalf of Victoria, New South Wales, Queensland, the Australian Capital Territory and South Australia. Under the Murray–Darling Basin Agreement, Victoria shares the waters of the Murray River with New South Wales and South Australia. Under normal conditions, Victoria is entitled to a 50% share of all flows upstream of Doctors Point near Albury-Wodonga (i.e. flows to Hume and Dartmouth reservoirs and from the Kiewa River), a 50% share of inflows to the Menindee Lakes storage, and all flows entering the Murray from the Ovens, Goulburn, Broken and Campaspe rivers. Victoria is also required under the agreement to supply half of South Australia's monthly entitlement flow from the water available to it.

Goulburn-Murray Water, in its role as resource manager, is responsible for allocating water to bulk entitlement and water share holders from Victoria's share of the water supply storages in the Murray basin.

Table 6-2 shows the responsibilities of the authorities within the Victorian-controlled parts of the Murray basin in 2013–14.

Table 6-2 Responsibilities for water resources management in the Murray basin (Victoria)

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
MDBA				Jointly coordinates waterway management along the Murray River and operates the Murray River supply system
DELWP				Coordinates Victoria's input to resource management associated with the Murray River
State Water New South Wales				Operates Lake Hume, Euston Weir and the Menindee Lakes on behalf of the MDBA
South Australian Water Corporation				Operates Lake Victoria and several locks on behalf of the MDBA
Goulburn–Murray Water	Supplies Murray Valley, Torrumbarry, Woorinen, Tresco and Nyah irrigation areas	Manages private diversions on the Victorian side of the Murray basin upstream of Nyah		Operates Lake Dartmouth, Yarrawonga Weir (Lake Mulwala), Torrumbarry Weir and Mildura Weir on behalf of the MDBA
Lower Murray Water	Supplies Red Cliffs, Robinvale, Merbein and the First Mildura irrigation districts	Manages private diversions in the Sunraysia region	Supplies towns along the Murray River from Swan Hill to the South Australian border	
North East Water			Supplies towns upstream of Lake Mulwala	Obliged to meet passing flow requirements
Goulburn Valley Water			Supplies towns in the Murray Valley Irrigation Area	
Coliban Water			Supplies towns in the Torrumbarry Irrigation Area	
East Gippsland Water			Supplies Omeo and Dinner Plain	

Murray basin (Victoria)

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Grampians Wimmera Mallee Water			Supplies domestic and stock water to towns and farms in the Northern Mallee area	
VEWH				Holds and manages environmental entitlements in the basin
North East CMA				Manages waterways within the North East CMA area
Mallee CMA				Manages waterways within the Mallee CMA area

Environmental Water Reserve

Important environmental assets depend on the EWR in the Murray basin. The Barmah–Millewa Forest, Gunbower Forest, Hattah Lakes and Kerang Wetlands are located along the Murray River and are all internationally significant wetlands listed under the Ramsar Convention and Living Murray icon sites. The Lindsay Wallpolla Mulcra Islands Living Murray icon site also depends on the EWR in the Murray basin. These sites rely on the freshwater inputs from the Murray River to function ecologically.

In 2013–14 the Murray basin (Victoria) EWR comprised the following components:

- the *Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999*, comprising 28,750 ML of high reliability and 40,000 ML unregulated entitlements held by the VEWH
- the *Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999* – Living Murray, comprising 9,589 ML of high reliability, 101,850 ML of low reliability and 34,300 ML of unregulated entitlements held by the VEWH on behalf of the MDBA
- the *Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999* – Barmah–Millewa Environmental Water Allocation – a significant operational rule embedded in consumptive entitlements, comprising 50,000 ML of high reliability and 25,000 ML of low reliability entitlement held by the VEWH
- the *Environmental Entitlement (River Murray – NVIRP Stage 1) 2012* of 13,560 ML held by the VEWH, which includes mitigation water allocated for the purposes of watering specific environmental sites that have been identified through the Goulburn-Murray Water Connections Project environmental approvals processes
- the *Bulk Entitlement (River Murray – Snowy Environmental Reserve) Conversion Order 2004*, comprising 29,794 ML of high reliability entitlement
- water shares – Snowy River Environmental Reserve comprising 11,392 ML of high reliability and 6,415 ML of low reliability entitlement held by the VEWH
- water set aside for the environment through the operation of passing flows released by MDBA 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.

A total of 213,093 ML of environmental entitlement water held by the VEWH was delivered to Living Murray icon sites in Victoria (Barmah Forest, Gunbower Creek and Forest, Hattah Lakes and Lindsay Wallpolla Mulcra Islands) in 2013–14. In addition, 122,159 ML of Commonwealth environmental water was delivered to the Living Murray icon sites through VEWH accounts. Barmah Forest also received 167,700 ML of environmental water from Commonwealth environmental water, Living Murray and New South Wales Office of Water water holdings held in New South Wales.

Environmental water from the *Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999* was also delivered to wetlands across northern Victoria, with 8,617 ML delivered to lower Murray wetlands in the Mallee basin. Mallee wetlands also received 2,667 ML of Commonwealth environmental water. Wetlands in north-central Victoria received a total of 8,547 ML of environmental entitlement water held by the VEWH, sourced from the *Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999* and the *Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005*.

6.2.2 Surface water resources

6.2.2.1 Water balance

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; and outflows from other Victorian rivers (Ovens, Goulburn, Campaspe and Loddon) and Broken Creek into the Murray River.

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	2013–14 (ML) (3)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	3,782,415	4,090,380
Volume in storage at end of year	3,170,910	3,782,415
Change in storage	**(611,505)**	**(307,965)**
Inflows		
Catchment inflow(1)	4,562,480	6,143,993
Rainfall on major storages	104,178	150,443
Internal spills from NSW share of storage	0	200
Ceding from NSW share of storage	0	0
Return flow from irrigation	272,162	203,826
Treated wastewater discharged back to river	3,586	3,313
Total inflows	**4,942,406**	**6,501,775**
Outflows		
Diversions		
Urban diversions	36,319	38,227
Irrigation district diversions	1,135,176	1,134,371
Licensed diversions from regulated streams	355,913	426,413
Licensed diversions from unregulated streams	2,159	1,578
Environmental water diversions	142,405	7,768
Small catchment dams	6,445	6,445
Total diversions	**1,678,417**	**1,614,802**
Losses		
Evaporation losses from major storages	205,064	690,799
Evaporation from small catchment dams	1,164	1,164
In-stream infiltration to groundwater, flows to floodplain and evaporation(2)	750,666	270,325
Total losses	**956,894**	**962,288**
Water passed at outlet of basin		
Murray River flow to South Australia from Victoria's allocation	2,437,400	4,015,600
Internal spills to NSW share of storages	414,400	100,250
Ceding to NSW storages per Murray–Darling Basin Agreement	66,800	116,800
Total water passed at outlet of basin	**2,918,600**	**4,232,650**
Total outflows	**5,553,911**	**6,809,740**

Notes:

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

(2) This is the balancing item in this water balance. It is the difference between Victoria's share of the total outflows, total inflows and net change in storage volume.

(3) The volumes in this table may not be consistent with the MDBA's Water Audit Monitoring Report due to different accounting entities and methods.

6.2.2.2 Storages and flows

The volume held in major storages in the Murray basin began 2013–14 at 3,782,415 ML (83% of capacity) and ended the year at 3,170,910 ML (70% of capacity) (Table 6-4). This includes Victoria's share of Lake Cullulleraine, Lake Dartmouth, Lake Hume, Lake Victoria and the Menindee Lakes. The volume reported in the 'catchment inflow less regulated releases' column of Table 6-4 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Murray basin (Victoria)

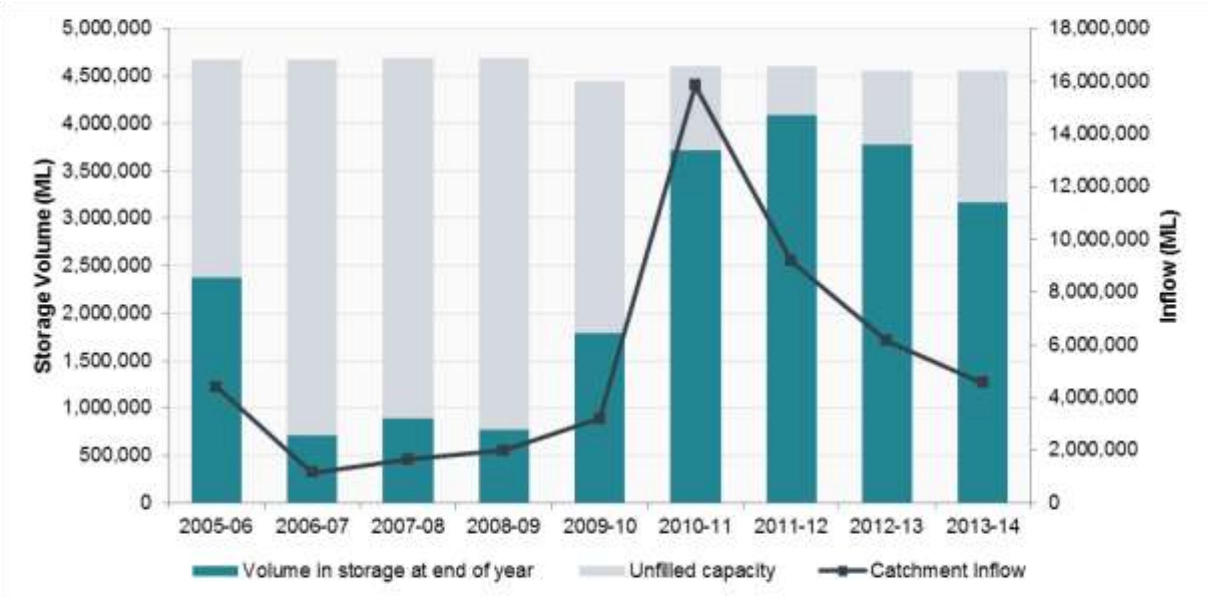
Table 6-4 Storage volumes in the Murray basin (Victoria)

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Lake Cullulleraine	5,270	4,785	578	3,464	2,511	4,410
Lake Dartmouth (Vic share)	1,928,116	1,879,150	34,300	34,400	48,950	1,928,000
Lake Hume (Vic share)	1,502,579	1,112,480	63,000	98,600	(72,780)	1,004,100
Lake Victoria (Vic share)	338,500	244,900	6,300	68,600	51,800	234,400
Menindee Lakes (Vic share)	785,000	541,100	0	0	(541,100)	0
Total	**4,559,465**	**3,782,415**	**104,178**	**205,064**	**(510,619)**	**3,170,910**

Victoria's share of catchment inflows were 60% of the long-term average of 7,618,000 ML, lower than 2012–13, when catchment inflows were 81% of the long-term average (Figure 6-2).

The Victorian component of water flowing from the Murray basin to South Australia was 2,437,400 ML in 2013–14. This represented 53% of the catchment inflows into the basin, compared with 65% in 2012–13.

Figure 6-2 All major storages and catchment inflows in the Murray basin (Victoria)



6.2.2.3 Entitlement volumes and diversions

East Gippsland Water, Coliban Water, Goulburn Valley Water, North East Water, Grampians Wimmera Mallee Water, Goulburn-Murray Water and Lower Murray Water all hold bulk entitlements in the Murray basin. Surface water is also diverted by licensed diverters, and is also harvested in small catchment dams.

Entitlements in the Murray basin include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Murray basin are outlined in Table 6-5.

Table 6-5 Entitlement volumes in the Murray basin (Victoria)

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (River Murray – Goulburn–Murray Water) Conversion Order 1999	
High reliability water shares	867,707
Low reliability water shares	294,737
High reliability supply by agreements	1,459
Low reliability supply by agreements	597
Loss provisions(1)	281,717
Mid Murray storages - loss provision	47,371
Subtotal: Bulk Entitlement (River Murray – Goulburn–Murray Water) Conversion Order 1999	**1,493,588**
Bulk Entitlement (River Murray – Lower Murray Urban and Rural Water – Irrigation) Conversion Order 1999	
High reliability water shares	331,662
Low reliability water shares	6,410
High reliability supply by agreements	1,312
Waterworks districts	714
Provision for unrecognised domestic and stock / house and garden supplies	535
Loss provisions(1)	20,192
Subtotal: Bulk Entitlement (River Murray – Lower Murray Urban and Rural Water – Irrigation) Conversion Order 1999	**360,826**
Bulk Entitlement (River Murray – Lower Murray Urban and Rural Water – Urban) Conversion Order 1999	**30,971**
Bulk Entitlement (River Murray – Grampians Wimmera Mallee Water) Conversion Order 1999	**3,492**
Bulk Entitlement (River Murray – North East Water) Conversion Order 1999	**13,236**
Bulk Entitlement (River Murray – Goulburn Valley Water) Conversion Order 1999	**5,593**
Bulk Entitlement (River Murray – Coliban Water) Conversion Order 1999	**6,285**
Bulk Entitlement (River Murray – South East Water) Order 2012 (2)	**n/a**
Bulk Entitlement (River Murray – City West Water) Order 2012 (2)	**n/a**
Bulk Entitlement (River Murray – Yarra Valley Water) Order 2012 (2)	**n/a**
Bulk Entitlement (Corryong) Conversion Order 2000	**680**
Bulk Entitlement (Cudgewa) Conversion Order 2000	**29**
Bulk Entitlement (Dartmouth) Conversion Order 2000	**60**
Bulk Entitlement (Omeo) Conversion Order 2008	**77**
Bulk Entitlement (Walwa) Conversion Order 2000	**61**
Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999	
High reliability entitlement	39,371
Low reliability entitlement	105,744
Unregulated entitlement	74,300
Subtotal: Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999	**219,415**
Environmental Entitlement (River Murray – NVIRP Stage 1) 2012 (3)	**n/a**
Bulk Entitlement (River Murray – Snowy Environmental Reserve) Conversion Order 2004	**29,794**
Take and use licences – unregulated surface water	**17,056**
Total volume of water entitlements in the Murray basin	**2,181,162**

Notes:

(1) The volumes specified are the loss entitlement volumes recorded in the Victorian Water Register.

(2) The water allocation available in a given year for use by the Melbourne retailers under these bulk entitlements, is equal to one third of the total phase 3 water savings achieved in the previous year in the Murray component of the Goulburn-Murray Irrigation District from the Goulburn–Murray Water Connections Project Stage 1 as verified by an audit.

(3) The water allocation available in a given year for use by the VEWH under this bulk entitlement, is equal to one third of the total phase 3 water savings achieved in the previous year in the Murray component of the Goulburn-Murray Irrigation District from the Goulburn–Murray Water Connections Project Stage 1 as verified by an audit.

n/a: not applicable

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-6. Entitlements to water in regulated systems in the Murray basin provide for the right to carry over unused allocation to the next season. In the Murray basin these entitlement holders can carry over unused water up to 100% of their entitlement volume; any unused water above this amount is written off as an end-of-season forfeiture. Water held above entitlement volume is also subject to a risk of spill; 603,118 ML was written off due to actual spill events in 2013–14. Water corporations' diversions under bulk entitlements for 2013–14 are presented in Table 6-6. Diversions under these bulk entitlements are assessed against the Murray–Darling basin annual cap target for the Murray–Kiewa–Ovens valley. Details of this assessment are published annually in the MDBA's Water Audit Monitoring Report.

The VEWH diverted 142,405 ML to off-stream wetlands from water available under Victorian environmental entitlements and water traded in from the Commonwealth Environmental Water Holder (CEWH). Further information on environmental entitlements held by the VEWH is provided in Chapter 4.

Table 6-6 Allocation account balance summary for the Murray basin (Victoria)

Water entitlement	Opening carryover (ML)	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	Write-off due to spill (ML)	End-of-season forfeitures (ML)	Carryover carried forward (ML)
River Murray – Goulburn-Murray Water							
Water shares	397,610	855,951	(133,260)	579,635	224,311	15,610	300,745
Supply by agreements	1,587	1,459	220	1,188	1,354	44	680
Losses in district	-	-	-	151,323	0	-	0
Other operating losses(1)	-	-	-	56,665	-	-	-
Net diversion: River Murray – Goulburn-Murray Water(2)				**788,810**			
River Murray – Lower Murray Urban and Rural Water – Irrigation							
Water shares	350,765	342,147	129,165	412,759	318,606	6,086	84,625
Supply by agreements	1,206	1,312	(4)	757	1,260	42	455
Loss provisions	-	-	-	13,037	-	-	-
Diversion: River Murray – Lower Murray Water(3)				**426,553**			
River Murray – Lower Murray Water (Urban)	8,443	30,971	(12,043)	18,798	7,777	40	756
River Murray – Wimmera Mallee Water	(54)	3,486	760	3,564	0	31	597
River Murray – North East Water(4)	3,439	14,704	(5,750)	8,367	3,168	(27)	884
River Murray – Goulburn Valley Water	1,139	5,593	(965)	4,551	1,049	8	158
River Murray – Coliban Water	9,113	6,285	(2,500)	4,268	8,394	12	224
River Murray – Melbourne Retailers(5)	12,649	14,313	(14,314)	0	0	632	12,016
Corryong	-	680	0	233	-	447	-
Cudgewa	-	29	0	0	-	29	-
Dartmouth	-	60	0	27	-	33	-
Omeo	-	77	0	54	-	23	-
Walwa	-	61	0	20	-	41	-
River Murray – Flora and Fauna							
High reliability entitlement(6)	31,675	388,523	(292,554)	99,068	23,917	90	4,570
Low reliability entitlement(6)	0	81,849	(11,543)	67,465	0	0	2,841
Unregulated entitlement	-	6,034	0	6,034	-	0	-
Subtotal: River Murray – Flora and Fauna(7)				**172,567**			
River Murray – NVIRP Stage 1(8)	27,284	15,040	133,923	145,864	13,282	855	16,246
River Murray – Snowy Environmental Reserve	0	29,794	(29,794)	0	0	0	0
Take and use licences – unregulated surface water	-	17,056	0	2,159	-	14,897	-

Notes:

(1) Other operating losses primarily include the change in storage and other effects of the Victorian Mid Murray storages (Kow Swamp, Lake Charm, Kangaroo Lake and Lake Boga).
(2) The water use reported in this line item represents the net diversion to supply primary entitlements and fulfil other operating requirements under the Goulburn–Murray Water Murray system source bulk entitlement.
(3) The water use reported in this line item represents the bulk diversion to supply primary entitlements and fulfil other operating requirements under the Lower Murray Urban and Rural Water – Irrigation Murray system source bulk entitlement.
(4) Allocation includes return flows of 1,468 ML credited to North East Water for return flows from West Wodonga Treatment Plant.
(5) Melbourne retailers' transactions are held in one account as they each own equal shares of the available allocation.
(6) Allocation includes return flows of 437,293 ML credited to the VEWH from deliveries of environmental water.
(7) Water use reported under the Flora and Fauna bulk entitlement represents both in-stream use and actual diversions from the waterway; of the 172,567 ML reported, 134,467 ML represents an actual diversion from the waterway.
(8) Water use here represents both in-stream use and actual diversions from the waterway; of the 145,864 ML reported, 7,938 ML represents an actual diversion from the waterway.

The estimated total capacity of, and total water harvested from, small catchment dams within the Murray basin is small compared with other basins (Table 6-7).

Table 6-7 Estimated small catchment dam information for the Murray basin (Victoria)

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	7,154	3,577	n/a
Registered commercial and irrigation	3,414	2,868	n/a
Total	**10,568**	**6,445**	**7,609**

n/a: information not available.

6.2.3 Recycled water

Around 46% of the volume of wastewater passing through treatment plants in the basin was recycled for consumptive use (Table 6-8), mostly for agricultural purposes. This is similar to the proportion recycled and water consumption rates in 2012–13.

Murray basin (Victoria)

Table 6-8 Volume of recycled water in the Murray basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	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[3] (ML)
Bellbridge	35	35	100%	0	35	0	0	0	0
Bundalong	0	0	0%	0	0	0	0	0	0
Cobram	324	324	100%	0	324	0	0	0	0
Cohuna	0	0	0%	0	0	0	0	0	0
Corryong	123	123	100%	0	123	0	0	0	0
Dartmouth	3	0	0%	0	0	0	0	3	0
Gunbower / Leitchville	0	0	0%	0	0	0	0	0	0
Koondrook	75	0	0%	0	0	0	0	0	75
Koorlong	2,268	2,261	100%	0	2,261	0	0	0	7
Lake Boga	47	0	0%	0	0	0	0	0	47
Merbein	155	18	12%	0	18	0	0	0	137
Mildura	1,107	703	63%	0	703	0	0	0	404
Murrabit	6	0	0%	0	0	0	0	0	6
Nathalia	73	73	100%	0	73	0	0	0	0
Numurkah	186	186	100%	0	186	0	0	0	0
Nyah/Nyah West	91	0	0%	0	0	0	0	0	91
Omeo	20	22	110%	0	22	0	0	0	(2)
Robinvale	247	220	89%	0	220	0	0	0	27
Strathmerton	0	0	0%	0	0	0	0	0	0
Swan Hill	1,182	0	0%	0	0	0	0	0	1,182
Tallangatta	123	123	100%	0	123	0	0	0	0
Wodonga	3,898	315	8%	315	0	0	0	3,583	0
Yarrawonga	374	374	100%	0	374	0	0	0	0
Total 2013–14	**10,337**	**4,777**	**46%**	**315**	**4,462**	**0**	**0**	**3,586**	**1,974**
Total 2012–13	10,295	4,470	43%	388	4,083	0	0	3,313	2,512

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

(2) 'Within process' refers to 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.3 Kiewa basin

The Kiewa basin (Figure 6-3) is located in northern Victoria and drains to the Murray River. The Kiewa River is approximately 100 km long, extending from the Bogong High Plains, draining northward to the Murray River.

Figure 6-3 Map of the Kiewa basin

6.3.1 Water resources overview

In 2013–14, rainfall in the Kiewa basin was 100 to 125% of the long-term average. Catchment inflows were 88% of the long-term average, compared with 89% in 2012–13. The volume of water flowing out of the Kiewa River into the Murray basin represented 93% of the Kiewa basin's total inflows.

The major water storages in the Kiewa basin finished the year at 41% of capacity, compared with 71% of capacity at the start of the year.

No urban water use restrictions applied in the Kiewa basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. An irrigation ban applied to Bight Creek in January 2013 remained in place for the 2013–14 water year; a number of other irrigation bans were added from December 2013 with 13 restrictions on unregulated streams applicable in the Kiewa basin in June 2014.

Table 6-9 shows the responsibilities of the authorities within the Kiewa basin.

Table 6-9 Responsibilities for water resources management in the Kiewa basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Goulburn–Murray Water	Manages private diversions		
North East Water		Supplies towns across the 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 generation Obliged to meet passing flow requirements
North East CMA			Manages waterways for the whole of the Kiewa basin

Environmental Water Reserve

Important environmental assets, such as threatened remnant vegetation and the Murray cod, exist in the reaches of the West Kiewa and Lower Kiewa rivers and depend on water from the EWR in the Kiewa basin. Water from the Kiewa basin also flows into the Murray River, helping to protect environmental assets within the Murray basin.

In 2013–14, the EWR 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 Ltd
- 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.

6.3.2 Surface water resources

6.3.2.1 Water balance

The total volumes of water available and supplied from water resources in the Kiewa basin for 2013–14 are shown in Table 6-10. Inflows to the Kiewa basin, which are shared between New South Wales and Victoria, are reported as a consolidated volume. Outflows from the Kiewa basin are shared on a fifty-fifty basis between Victoria and New South Wales in the Murray system.

Outflows from the Kiewa basin were slightly higher in 2013–14 (Table 6-10) than those reported in the 2012–13 Victorian Water Accounts. Only a small proportion of the surface water resources in the Kiewa basin (1.1%) was extracted for consumptive use.

Table 6-10 Balance of surface water in the Kiewa basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	21,045	20,213
Volume in storage at end of year	11,828	21,045
Change in storage	**(9,217)**	**832**
Inflows		
Catchment inflow(1)	605,828	612,663
Rainfall on major storages	3,690	3,598
Treated wastewater discharged back to river	311	321
Total inflows	**609,829**	**616,583**
Outflows		
Diversions		
Urban diversions	585	598
Licensed diversions from unregulated streams	2,034	6,124
Small catchment dams	3,927	3,927
Total diversions	***6,546***	***10,649***
Losses		
Evaporation losses from major storages	2,920	2,763
Evaporation from small catchment dams	1,099	1,099
In-stream infiltration to groundwater, flows to floodplain and evaporation	38,859	40,398
Total losses	***42,878***	***44,260***
Water passed at outlet of basin		
Kiewa basin outflow to Murray River – Victoria share	284,811	280,421
Kiewa basin outflow to Murray River – NSW share	284,811	280,421
Total water passed at outlet of basin	***569,622***	***560,841***
Total outflows	**619,046**	**615,751**

Note:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.3.2.2 Storages and flows

Storage levels for all major on-stream and off-stream storages in the basin were 12,518 ML (41% of capacity) by the end of June 2014, compared with 21,803 ML (71% of capacity) at the start of July 2013 (Table 6-11). The volume reported in the ‘catchment inflow less regulated releases’ column is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Kiewa basin

Table 6-11 Storage volumes in the Kiewa basin

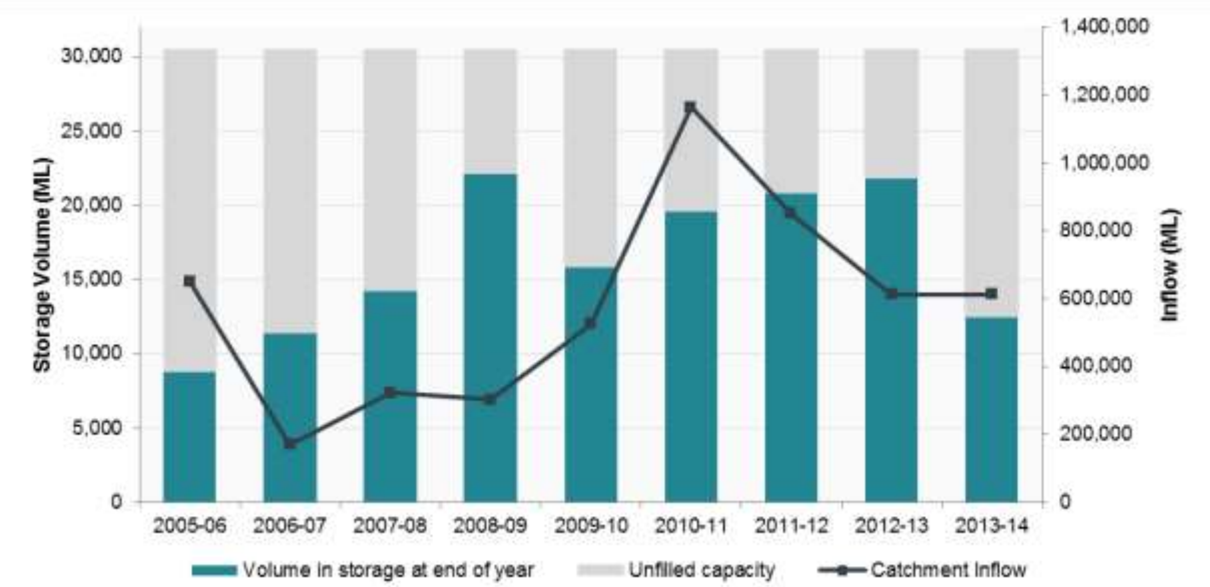
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Lake Guy	1,416	378	199	158	535	954
Rocky Valley	28,294	20,667	3,491	2,762	(10,522)	10,874
Total on-stream storages	***29,710***	***21,045***	***3,690***	***2,920***	***(9,987)***	***11,828***
Off-stream storages						
Clover Pondage	255	258	n/a	n/a	(68)	190
Pretty Valley Basin	500	500	n/a	n/a	0	500
Total off-stream storages	***755***	***758***	***n/a***	***n/a***	***(68)***	***690***
Total	**30,465**	**21,803**	**3,690**	**2,920**	**(10,055)**	**12,518**

n/a: information not available

The catchment inflow volume for 2013–14 was 605,828 ML, representing 88% of the long-term average of 689,000 ML. The volume of water flowing from the Kiewa basin into the Murray River increased to 569,622 ML in 2013–14 (including the New South Wales share of Kiewa River flows under the Murray–Darling Basin Agreement). This volume was approximately 8,000 ML more than the 2012–13 outflow volume of 560,841 ML. The volume of water flowing from the Kiewa basin into the Murray River in 2013–14 represented 93% of the total inflows into the Kiewa basin, which is similar to the percentage of inflows in the previous year.

Figure 6-4 illustrates total storage volume and catchment inflows for 2013–14 compared with the previous eight years.

Figure 6-4 All major storages and catchment inflows in the Kiewa basin



6.3.2.3 Entitlement volumes and diversions

In the Kiewa basin, surface water is diverted by North East Water and licensed diverters, and water is harvested in small catchment dams.

Entitlements include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Kiewa basin are outlined in Table 6-12.

Table 6-12 Entitlement volumes in the Kiewa basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Kiewa – Hydro) Conversion Order 1997(1)	n/a
Bulk Entitlement (Kiewa – Tangambalanga) Conversion Order 2000	179
Bulk Entitlement (Mount Beauty – Tawonga) Conversion Order 1997	718
Bulk Entitlement (Yackandandah) Conversion Order 2001	209
Take and use licences – unregulated surface water	15,794
Total volume of water entitlements in the Kiewa basin	**16,901**

Note:
(1) This bulk entitlement held by AGL Hydro Ltd is for non-consumptive purposes. All water diverted under this entitlement must be returned to the waterway.
n/a: information not available

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-13. Diversions under these bulk entitlements are assessed against the Murray–Darling basin annual cap target for the Murray–Kiewa–Ovens valley. Details of this assessment are published annually in the MDBA's *Water Audit Monitoring Report.*

Table 6-13 Allocation account balance summary for the Kiewa basin

Water entitlements	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Kiewa – Hydro(1)	0	0	0	0
Kiewa – Tangambalanga	179	0	0	179
Mount Beauty – Tawonga	718	0	413	305
Yackandandah	209	0	172	38
Take and use licences – unregulated surface water	15,794	0	2,034	13,760

Note:
(1) This bulk entitlement held by AGL Hydro Ltd is for non-consumptive purposes. All water diverted under this entitlement must be returned to the waterway, therefore no volumes are reported as diversions for the purposes of this table.

The estimated volume of water harvested from small catchment dams in the Kiewa basin is provided in Table 6-14.

Table 6-14 Estimated small catchment dam information for the Kiewa basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	3,972	1,986	n/a
Registered commercial and irrigation	2,311	1,941	n/a
Total	**6,283**	**3,927**	**5,026**

n/a: information not available.

6.3.3 Recycled water

There are four wastewater treatment plants in the Kiewa basin: three are operated by North East Water and the Dinner Plain Treatment Plant is operated by East Gippsland Water. The volume of water recycled and an indication of its end use is provided in Table 6-15. In addition to the recycled water reported below, 115 ML was returned from the Falls Creek Alpine Resort to Rocky Valley Creek during the water year.

Table 6-15 shows the volumes of water recycled in the Kiewa basin in 2013–14.

Kiewa basin

Table 6-15 Volume of recycled water in the Kiewa basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Baranduda	0	0	0%	0	0	0	0	0	0
Dinner Plain [4]	44	70	158%	0	70	0	0	0	(26)
Mount Beauty	199	3	2%	3	0	0	0	196	0
Yackandandah	55	55	100%	0	55	0	0	0	0
Total 2013–14	**298**	**128**	**43%**	**3**	**125**	**0**	**0**	**196**	**(26)**
Total 2012–13	309	125	40%	0	125	0	0	184	0

Notes:

(1) 'Beneficial allocation' refers to volume used to deliver specific environmental flow benefits.

(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

(4) The volume of water recycled exceeded the volume produced as water stored on-site carried over from the previous year.

6.4 Ovens basin

The Ovens basin (Figure 6-5) is located in north-east Victoria and covers an area of 7,985 km^2. Its area extends from the Murray River in the north to the Great Dividing Range in the south, and is bordered by the Broken basin in the west and the Kiewa basin in the east.

Figure 6-5 Map of the Ovens basin

6.4.1 Water resources overview

In 2013–14, rainfall across the Ovens basin was 100 to 125% of the long-term average in much of the basin, with some areas receiving slightly below-average rainfall of 80 to 100%.

Catchment inflows in 2013–14 were 83% of the long-term average annual volume, representing an increase from the previous year. The volume of water flowing out of the Ovens basin into the Murray River represented 96% of the Ovens basin's total inflows.

The total volume of water held in major storages in the Ovens basin finished the year at 81% capacity, higher than the 70% at the start of the year. No urban water use restrictions applied in the Ovens basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. Licensed diversions on unregulated streams were unrestricted in late 2013, but similar to the year before a hot, dry summer led to restrictions in up to 19 streams by March 2014. By June 2014, no irrigation bans were being applied in the basin.

Table 6-16 shows the responsibilities of the authorities within the Ovens basin.

Table 6-16 Responsibilities for water resources management in the Ovens basin

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 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 CMA				Manages waterways for the whole of the Ovens basin

Environmental Water Reserve

The Lower Ovens River, which contains heritage and iconic 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 the Murray basin's environmental assets.

In 2013–14 the Ovens basin EWR comprised:

- 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, including those set out in the Upper Ovens River WMP
- all other water in the basin not allocated for consumptive use.

There is also 70 ML of Commonwealth environmental water entitlement held in Lake Buffalo and Lake William Hovell in the Ovens system.

6.4.2 Surface water resources

6.4.2.1 Water balance

The total volumes of water available and supplied from water resources in the Ovens basin are shown in Table 6-17. The volume of surface water resources in 2013–14 increased to 1,456,965 ML, compared with 1,238,231 ML in 2012–13. Total water use was similar to the previous year, with total use of 34,545 ML in 2013–14 compared with 35,947 ML in 2012–13.

A surface water balance for the Ovens basin is shown in Table 6-17.

Table 6-17 Balance of surface water in the Ovens basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	26,342	28,475
Volume in storage at end of year	30,522	26,342
Change in storage	**4,180**	**(2,133)**
Inflows		
Catchment inflow(1)	1,450,612	1,234,059
Rainfall on major storages	4,492	3,009
Treated effluent discharged back to river	1,861	1,253
Total inflows	**1,456,965**	**1,238,321**
Outflows		
Diversions		
Urban diversions	5,349	5,508
Licensed diversions from regulated streams	6,138	6,951
Licensed diversions from unregulated streams	7,170	7,600
Small catchment dams	15,888	15,888
Total diversions	***34,545***	***35,947***
Losses		
Evaporation losses from major storages	3,254	3,441
Evaporation from small catchment dams	4,514	4,514
In-stream infiltration to groundwater, flows to floodplain and evaporation	14,936	14,936
Total losses	***22,704***	***22,890***
Water passed at outlet of basin		
Ovens basin outflow to Murray River	1,395,536	1,181,616
Total water passed at outlet of basin	***1,395,536***	***1,181,616***
Total outflows	**1,452,785**	**1,240,454**

Note:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.4.2.2 Storages and flows

The total volume of water held in major storages in the Ovens basin was 26,342 ML at 1 July 2013 and 30,522 ML or 81% of capacity by end June 2014 (Table 6-18). The volume reported in the 'catchment inflow less regulated releases' column in Table 6-18 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Table 6-18 Storage volumes in the Ovens basin

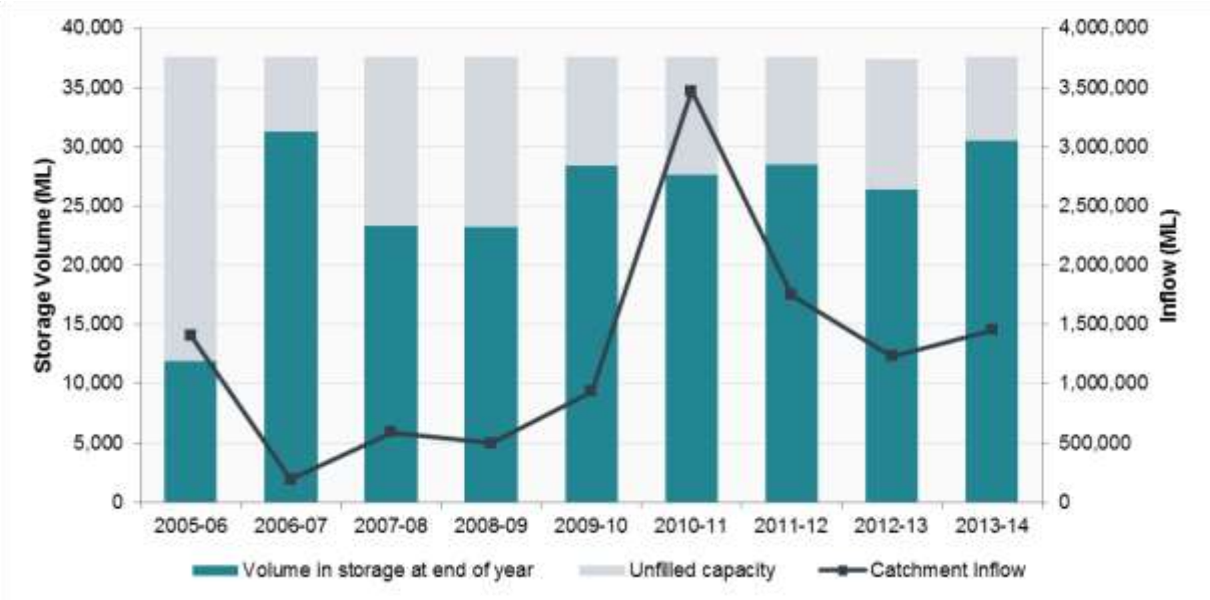
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Lake Buffalo	23,900	12,773	3,041	2,538	3,026	16,302
Lake William Hovell	13,690	13,569	1,451	716	(84)	14,220
Total	**37,590**	**26,342**	**4,492**	**3,254**	**2,942**	**30,522**

Catchment inflows in 2013–14 were 83% of the long-term annual average (1,758,000 ML), compared with 70% in 2012–13. The volume of water flowing from the Ovens basin into the Murray River was 1,395,536 ML in 2013–14. This represented 96% of the total inflows into the basin, compared with 95% in 2012–13.

Figure 6-6 shows the storage levels and inflow volumes in the Ovens basin from 2005–06 to 2013–14.

Ovens basin

Figure 6-6 All major storages and catchment inflows in the Ovens basin



6.4.2.3 Entitlement volumes and diversions

In the Ovens basin, water is diverted by Goulburn–Murray Water, North East Water and licensed diverters, and water is harvested in small catchment dams.

Entitlements in the Ovens basin include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Ovens basin are outlined in Table 6-19.

Table 6-19 Entitlement volumes in the Ovens basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Ovens System – Goulburn–Murray Water) Conversion Order 2004(1)	
High reliability water shares	26,261
Low reliability water shares	12,535
Bulk Entitlement (Ovens System – Moyhu, Oxley and Wangaratta – North East Water) Conversion Order 2004	7,832
Subtotal: Bulk Entitlement (Ovens System – Goulburn–Murray Water) Conversion Order 2004	**46,628**
Bulk Entitlement (Beechworth) Conversion Order 2001	**1,100**
Bulk Entitlement (Bright) Conversion Order 2000	**704**
Bulk Entitlement (Chiltern) Conversion Order 2000	**180**
Bulk Entitlement (Glenrowan) Conversion Order 1999	**90**
Bulk Entitlement (Harrietville) Conversion Order 1999	**91**
Bulk Entitlement (Myrtleford) Conversion Order 2001(2)	**1,470**
Bulk Entitlement (Porepunkah) Conversion Order 1999	**166**
Bulk Entitlement (Springhurst) Conversion Order 1999	**36**
Bulk Entitlement (Whitfield) Conversion Order 1999	**34**
Take and use licences – unregulated surface water	**18,097**
Total volume of water entitlements in the Ovens basin	**68,596**

Note:

(1) Under this bulk entitlement, Goulburn–Murray Water operates Lake Buffalo and Lake William Hovell to supply to water share holders in the regulated part of the Ovens system, and to supply water to North East Water's Ovens System bulk entitlement for the townships of Wangaratta, Oxley and Moyhu.

(2) This entitlement specifies that up to 1,470 ML can be diverted in any one year. The maximum volume that can be taken over any two-year period is 2,424 ML (1,212 ML annual average).

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-20. Diversions under these bulk entitlements are assessed against the Murray–Darling basin annual cap target for the Murray–Kiewa–Ovens valley. Details of this assessment are published annually in the MDBA's *Water Audit Monitoring Report.*

Table 6-20 Allocation account balance summary for the Ovens basin

Water entitlements	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Ovens system – Goulburn–Murray Water				
Water shares[(1)]	26,878	0	6,208	20,670
Ovens System – Moyhu, Oxley and Wangaratta	7,832	0	3,624	4,208
Diversion: Ovens system – Goulburn–Murray Water[(2)]			**9,762**	
Beechworth	1,100	0	505	595
Bright	704	0	537	167
Chiltern[(3)]	180	0	0	180
Glenrowan	90	0	12	78
Harrietville	91	0	47	44
Myrtleford	1,470	0	624	846
Porepunkah[(4)]	166	0	0	166
Springhurst	36	0	0	36
Whitfield	34	0	0	34
Take and use licences – unregulated surface water[(5)]	18,182	180	7,170	11,192

Notes:

(1) Water use reported includes 70 ML of environmental in-stream use. This amount is not reflected in the water balance in Table 6-17 as it does not reflect an actual diversion from the waterway.

(2) The water use reported in this line item represents the bulk diversion to supply primary entitlements under the Ovens system source bulk entitlement. It does not include water delivered in-stream for environmental purposes.

(3) North East Water has not diverted any water under this bulk entitlement since February 2008 when Chiltern was connected to the Wodonga supply system.

(4) North East Water has not diverted any water under this bulk entitlement since January 2009 when Porepunkah was connected to the Bright supply system.

(5) Net trade encompasses temporary and permanent trades in and out of the Ovens basin, the net value of 180 ML represents water traded in from the Upper Ovens GMU.

The estimated volume of water harvested from small catchment dams represents the largest diversion of surface water in the Ovens basin (Table 6-21).

Table 6-21 Estimated small catchment dam information for the Ovens basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	14,739	7,370	n/a
Registered commercial and irrigation	10,141	8,518	n/a
Total	**24,880**	**15,888**	**20,402**

n/a: information not available.

6.4.3 Recycled water

North East Water operates all wastewater treatment plants in the Ovens basin. Approximately 25% of the wastewater passing through treatment plants in the basin in 2013–14 was recycled, less than the estimated 34% in 2012–13.

Table 6-22 shows the volumes of water recycled in the Ovens basin in 2013–14.

Ovens basin

Table 6-22 Volume of recycled water in the Ovens basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Barnawartha	0	0	0%	0	0	0	0	0	0
Beechworth	269	56	21%	0	56	0	0	213	0
Bright / Porepunkah	234	26	11%	26	0	0	0	208	0
Chiltern	63	63	100%	0	63	0	0	0	0
Myrtleford	333	0	0%	0	0	0	0	333	0
Rutherglen / Wahgunyah	126	126	100%	59	67	0	0	0	0
Wangaratta	1,469	363	25%	4	359	0	0	1,106	0
Total 2013-14	**2,494**	**634**	**25%**	**89**	**545**	**0**	**0**	**1,860**	**0**
Total 2012-13	1,896	643	34%	92	551	0	0	1,253	0

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

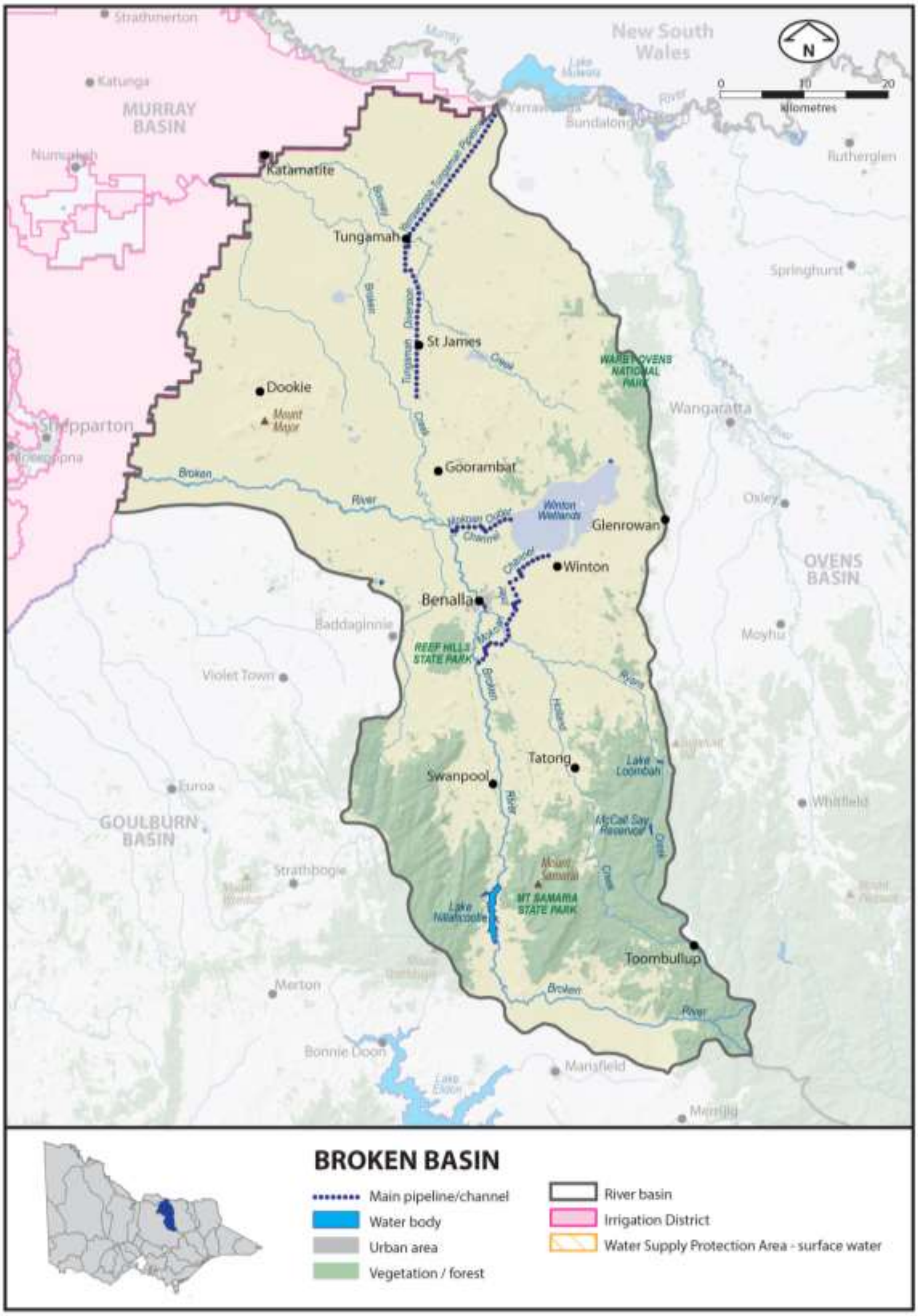
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

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

6.5 Broken basin

The Broken basin (Figure 6-7) is located in northern Victoria. It includes the Broken River, which flows into the Goulburn River at Shepparton, and Broken Creek, which flows into the Murray River at Barmah. For the purposes of the water accounts, the Broken basin excludes the Murray Valley Irrigation Area.

Figure 6-7 Map of the Broken basin



6.5.1 Water resources overview

In 2013–14, rainfall across the Broken basin was 100 to 125% of the long-term average in much of the basin, with a small area receiving 80 to 100% of average rainfall. Total catchment inflows were 68% of the long-term average and were a slight increase from the previous year. The amount of water flowing from the Broken basin into the Murray River represented 74% of the total inflows into the basin in 2013–14.

Major storages in the Broken basin were at 83% of capacity at the end of the year, after being at 62% of capacity at the start.

The year began with a 33% August allocation for high reliability water shares for Broken system irrigators. By mid-October, high reliability water shares had increased to 100% allocation. Low reliability water shares also reached 100% by the middle of November.

There were no restrictions on urban water use in the Broken basin during 2013–14, with all towns remaining on permanent water saving rules throughout the year. An irrigation ban put in place on Boosey Creek in November 2012 was lifted in August 2013 and then reapplied in December. Hollands Creek and Ryans Creek were also subject to bans from January to April 2014. All other streams in the basin were unrestricted.

Table 6-23 shows the responsibilities of the authorities within the Broken basin.

Table 6-23 Responsibilities for water resources management in the Broken basin

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 licensed diversions	Provides bulk water supplies to Goulburn Valley Water(1) and North East Water	Operates Lake Nillahcootie and weirs on Broken River Obliged to meet passing flow requirements
North East Water			Supplies towns across most of the Broken basin, including Benalla	Operates Loombah-McCall Say Reservoir Obliged to meet passing flow requirements
Goulburn Valley Water			Supplies towns in the west of the basin, including Dookie(1)	
Goulburn Broken CMA				Manages waterways for the whole of the Broken basin

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

Environmental Water Reserve

Important environmental assets, such as the Murray cod, the trout cod and significant areas of intact riparian and floodplain vegetation, depend on the Broken basin EWR. Similarly dependent are sites in Broken Creek and Lower Broken Creek that contain native fish habitat and a wetland of national significance. Water from the Broken basin also feeds into the Murray basin, helping to maintain internationally significant environmental assets within that basin.

In 2013–14, the EWR in the Broken basin comprised:

- 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.

A total of 38,594 ML of Commonwealth environmental water was delivered in the Broken system in 2013–14.

6.5.2 Surface water resources

6.5.2.1 Water balance

A surface water balance for the Broken basin is shown in Table 6-24.

Table 6-24 Balance of surface water in the Broken basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	26,220	42,245
Volume in storage at end of year	35,040	26,220
Change in storage	**8,819**	**(16,025)**
Inflows		
Catchment inflow(1)	210,402	201,296
Rainfall on major storages	4,705	3,042
Total inflows	**215,107**	**204,338**
Outflows		
Diversions		
Urban diversions	1,336	1,478
Licensed diversions from regulated streams	8,748	9,275
Licensed diversions from unregulated streams	1,613	1,315
Environmental water diversion	122	0
Small catchment dams	15,738	15,738
Total diversions	***27,557***	***27,806***
Losses		
Evaporation losses from major storages	4,468	4,203
Evaporation from small catchment dams	7,227	7,227
In-stream infiltration to groundwater, flows to floodplain and evaporation	11,028	9,609
Total losses	***22,723***	***21,039***
Water passed at outlet of basin		
Broken River at Gowangardie to Goulburn basin	149,976	168,572
Boosey Creek at Tungamah to Murray basin	4,783	1,787
Broken Creek at Katamatite to Murray basin	1,248	1,159
Total water passed at outlet of basin	***156,008***	***171,518***
Total outflows	**206,288**	**220,363**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.5.2.2 Storages and flows

The volume of water held in major storages in the Broken basin was 35,040 ML at the end of June 2014, representing a net increase in storage volume from the start of the year (Table 6-25). Table 6.5.3 shows detailed information for Lake Nillahcootie and Loombah-McCall Say Reservoir. The volume reported in the 'catchment inflow less regulated releases' column in Table 6-25 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Table 6-25 Storage volumes in the Broken basin

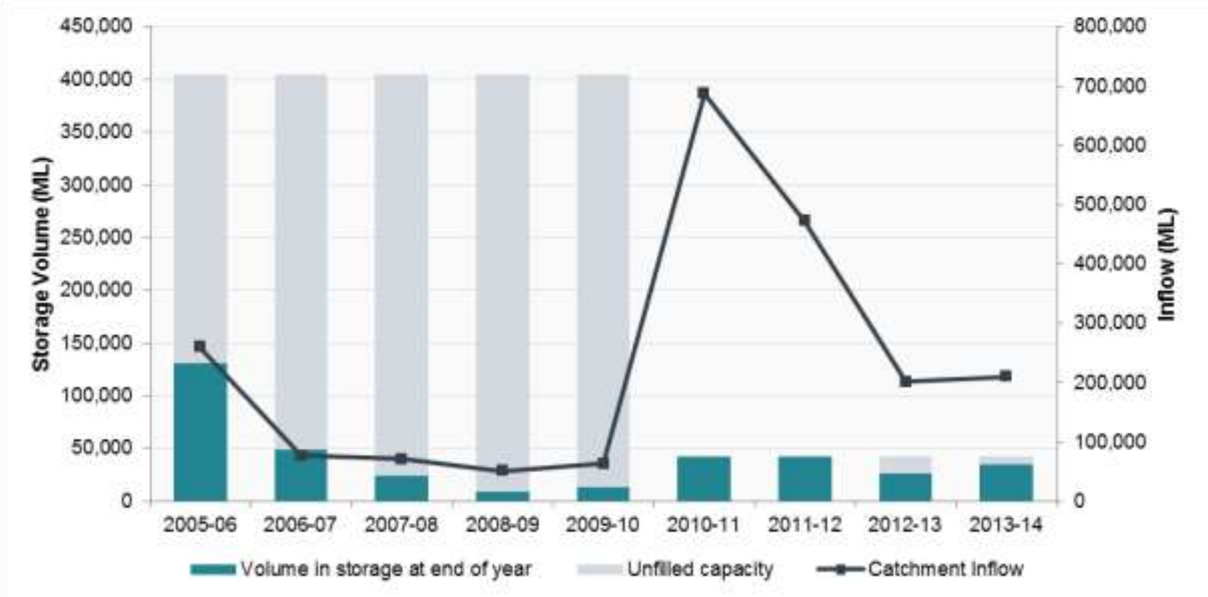
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Lake Nillahcootie	40,400	25,054	4,308	3,726	7,656	33,293
Loombah-McCall Say	1,747	1,166	397	742	926	1,747
Total	**42,147**	**26,220**	**4,705**	**4,468**	**8,582**	**35,040**

Catchment inflows were 68% of the long-term average of 308,000 ML, a slight increase compared with the volume of inflows in 2012–13 (Figure 6-8).

Broken basin

The amount of water flowing from the Broken basin into the Murray River decreased to 156,008 ML in 2013–14. This represented 74% of the Broken basin's total inflows, compared with 84% in 2012–13.

Figure 6-8 All major storages and catchment inflows in the Broken basin



Note:

(1) Before 2010–11, Lake Mokoan was included as a storage within the Broken basin. Lake Mokoan was decommissioned in 2010 and water supply from this storage ceased, therefore it is no longer included in the total storage capacity for Broken basin.

6.5.2.3 Entitlement volumes and diversions

In the Broken basin, surface water is diverted by Goulburn–Murray Water, North East Water and licensed diverters, and water is harvested in small catchment dams.

Entitlements in the Broken basin include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Broken basin are outlined in Table 6-26.

Table 6-26 Entitlement volumes in the Broken basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Broken System – Goulburn–Murray Water) Conversion Order 2004[(1)]	
High reliability water shares	17,625
Low reliability water shares	3,345
Bulk Entitlement (Broken System – Tungamah Devenish and St James – North East Water) Conversion Order 2004	135
Loss provision	1,850
Subtotal: Bulk Entitlement (Broken System – Goulburn–Murray Water) Conversion Order 2004	**22,955**
Bulk Entitlement (Loombah-McCall Say) Conversion Order 2001	**2,324**
Take and use licences – unregulated surface water	**2,990**
Total volume of water entitlements in the Broken basin	**28,269**

Note:

(1) Under this bulk entitlement, Goulburn–Murray Water operates Lake Nillahcootie to supply water share holders in the regulated part of the Broken system, and to supply water to North East Water's bulk entitlement for the townships of Tungamah, Devenish and St James.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-27. Entitlements to water in regulated systems in the Broken basin provide for the right to carry over unused allocation to the next season. In the Broken basin these entitlement holders can carry over unused water up to 50% of their entitlement volume; any unused water above this amount is written off (end-of-season forfeiture).

Diversions under bulk entitlements in the Broken basin are assessed against the Murray–Darling basin annual cap target for the Goulburn–Broken–Loddon valley. Details of this assessment are published annually in the MDBA's Water Audit Monitoring Report.

Table 6-27 Allocation account balance summary for the Broken basin

Water entitlements	Opening carryover (ML)	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)	Carryover carried forward (ML)
Broken System – Goulburn–Murray Water						
Water shares(1)	8,604	12,366	0	5,726	7,837	7,408
Tungamah, Devenish and St. James(2)	64	71	0	0	71	64
Loss provision	-	-	-	3,144	-	-
Diversion: Broken system – Goulburn–Murray Water(3)				**8,870**		
Loombah-McCall Say (Benalla)	-	2,324	0	1,336	988	-
Take and use licences – unregulated surface water	-	2,990	0	1,613	1,377	-

Notes:

(1) Water use reported includes 122 ML of environmental use, the amount was diverted to Moodies swamp.

(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. In 2013–14 these towns continued to be supplied water via a pipeline from Yarrawonga in the Murray system.

(3) The water use reported in this line item represents the bulk diversion to supply primary entitlements under the Broken system source bulk entitlement, it does not include water delivered in-stream for environmental purposes.

The estimated volume of water harvested from small catchment dams represented the largest diversion of surface water in the Broken basin (Table 6-28).

Table 6-28 Estimated small catchment dam information for the Broken basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	15,382	7,691	n/a
Registered commercial and irrigation	9,580	8,047	n/a
Total	**24,962**	**15,738**	**22,965**

6.5.3 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 341 ML in 2012–13 to 232 ML in 2013–14. As in 2012–13, 100% of the wastewater produced in 2013–14 was recycled. Table 6-29 below details the recycling undertaken at Benalla in 2013–14.

Table 6-29 Volume of recycled water in the Broken basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Benalla	232	232	100%	0	232	0	0	0	0
Total 2013–14	**232**	**232**	**100%**	**0**	**232**	**0**	**0**	**0**	**0**
Total 2012–13	341	341	100%	0	341	0	0	0	0

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

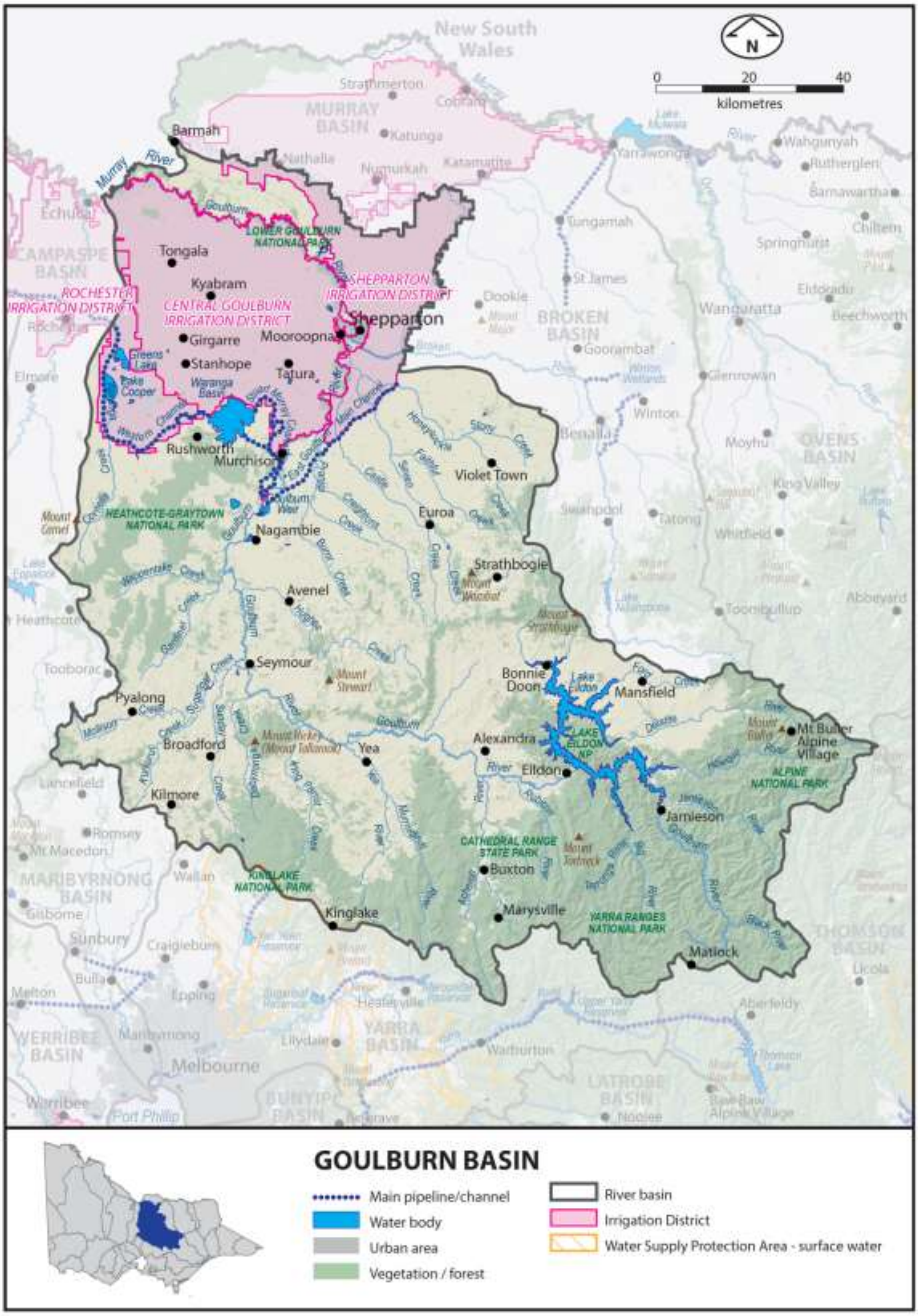
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

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

6.6 Goulburn basin

The Goulburn basin (Figure 6-9) is located in northern Victoria and extends from the Great Dividing Range near Woods Point to the Murray River near Echuca in the north-west.

Figure 6-9 Map of the Goulburn basin



6.6.1 Water resources overview

In 2013–14, rainfall across the Goulburn basin was between 80 and 125% of the long-term average, with higher-than-average rainfall in the north of the basin and lower-than-average rainfall in the south. The amount of water flowing from the Goulburn basin into the Murray River represented 37% of the total inflows into the basin.

The volume of water in major storages in the Goulburn basin started the year at 66% of capacity and ended the year at 71% of capacity.

The seasonal allocation for high reliability water shares started at 51% and reached 100% in September. There was no allocation for low reliability water shares in 2013–14.

No urban water use restrictions applied in the Goulburn basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. Several irrigation bans were put in place in early 2014. In March there were irrigation bans in place in Sunday Creek, Hughes Creek, Faithfulls Creek and Seven Creeks as well as a Stage 3 roster applied to Yea River and its tributaries. By June 2014 all unregulated waterways were again unrestricted.

Table 6-30 shows the responsibilities of various authorities within the Goulburn basin.

Table 6-30 Responsibilities for water resources management in the Goulburn basin

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 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
VEWH				Holds and manages environmental entitlements in the basin
Goulburn Broken CMA				Manages waterways for the whole of the Goulburn basin

Environmental Water Reserve

Important environmental assets – such as significant areas of intact riparian and floodplains vegetation, wetlands of national significance 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 in the Goulburn basin that rely on the EWR include:

- Lower Goulburn River (downstream of Goulburn Weir) which contains a wetland of national significance, native fish habitat and floodplain national park
- Reedy Swamp, 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, the largest river red gum forest in the world, a Ramsar and Living Murray icon site, a national park and a site where native fish breed.

In 2013–14, the Goulburn basin EWR comprised:

- the *Environmental Entitlement (Goulburn System – Living Murray) 2007*, comprising of 39,625 ML of high reliability water and 156,980 ML of low reliability water held by the VEWH
- the Goulburn River Environmental Entitlement 2010 of 1,432 ML of high reliability water held by the VEWH
- the *Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012* of 28,449 ML held by the VEWH, which includes mitigation water allocated for the purposes of watering specific environmental sites that have been identified through the Goulburn–Murray Water Connections Project environmental approvals processes

- the *Bulk Entitlement (Snowy – Environment) Order 2005* comprising 30,252 ML of high reliability and 8,156 ML of low reliability entitlement
- water shares – *Snowy River Environmental Reserve* comprising 6,401 ML of high reliability and 17,852 ML of low reliability entitlement held by the VEWH
- 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
- the *Silver and Wallaby Creeks Environmental Entitlement 2006*, which provides passing flow rules on Silver and Wallaby creeks
- all other water in the basin not allocated for consumptive use.

A total of 312,349 ML of environmental entitlement water was delivered in the Goulburn system in 2013–14. This comprised 97,349 ML from entitlements held by the VEWH and 215,000 ML of Commonwealth environmental water. In addition, 351 ML of environmental entitlement water was delivered to Goulburn Broken wetlands in 2013–14 (230 ML from entitlements held by the VEWH and 121 ML of Commonwealth environmental water).

6.6.2 Surface water resources

6.6.2.1 Water balance

A surface water balance for the Goulburn basin is shown in Table 6-31.

Table 6-31 Balance of surface water in the Goulburn basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	2,366,591	3,024,175
Volume in storage at end of year	2,440,563	2,366,591
Change in storage	**73,972**	**(657,584)**
Inflows		
Catchment inflow(1)	2,249,371	2,362,390
Rainfall on major storages	111,537	74,708
Inflow from Broken River at Gowangardie	149,976	168,572
Inflow from Loddon via the Goulburn supplement	6,628	32,362
Return flow from irrigation	0	0
Transfer from Campaspe via Waranga Western Channel	0	2,796
Treated wastewater discharged back to river	514	1,944
Total inflows	**2,518,026**	**2,642,772**
Outflows		
Diversions		
Urban diversions	25,121	25,704
Irrigation district diversions	1,108,654	1,104,295
Licensed diversions from regulated streams	59,634	49,880
Licensed diversions from unregulated streams	6,354	11,224
Transfer from Silver and Wallaby creeks to Yarra basin	1,880	1,071
Transfers to Melbourne via North-South pipeline(2)	0	0
Environmental water diversions	50	0
Small catchment dams	47,513	47,513
Total diversions	**1,249,205**	**1,239,687**
Losses		
Evaporation losses from major storages	110,080	118,524
Losses from small catchment dams	10,065	10,065
In-stream infiltration to groundwater, flows to floodplain and evaporation	135,028	208,460
Total losses	**255,173**	**337,049**

Water passed at outlet of basin		
Goulburn River to Campaspe River via Waranga Western Channel	0	0
Goulburn River outflow to Murray River	920,450	1,711,882
Goulburn River outflow to Murray River via Broken Creek	19,226	11,738
Total water passed at outlet of basin	**939,676**	**1,723,620**
Total outflows	**2,444,055**	**3,300,356**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

(2) There were no transfers to the Yarra basin via the North-South pipeline in the 2013–14 water year.

6.6.2.2 Storages and flows

Levels for all major storages in the basin were 2,718,240 ML at the end June 2014, or 71% of the total storage capacity, compared with 2,542,166 ML at the start of July 2013 (Table 6-32). The volume reported in the 'catchment inflow less regulated releases' column in Table 6-32 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Only volumes for major on-stream storages have been included in the water balance; major off-stream storages such as Waranga basin and Greens Lake have not been included.

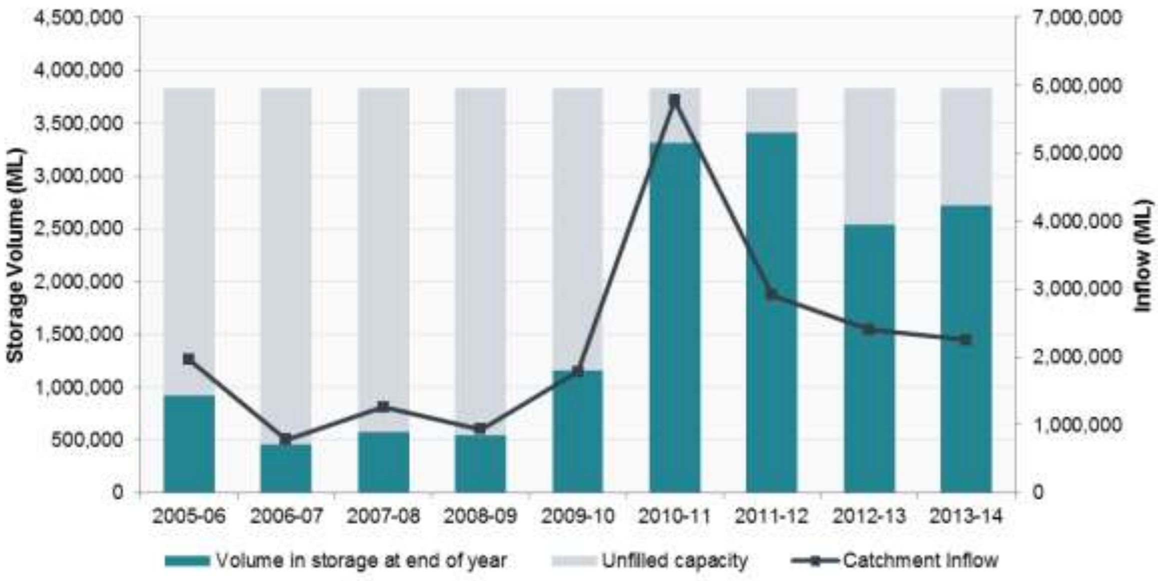
Table 6-32 Storage volumes in the Goulburn basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Goulburn Weir	25,500	24,965	6,875	12,019	4,530	24,351
Lake Eildon	3,334,158	2,339,976	104,574	97,868	68,011	2,414,693
Sunday Creek Reservoir	1,700	1,650	88	192	(27)	1,519
Total on-stream storages	**3,361,358**	**2,366,591**	**111,537**	**110,080**	**72,514**	**2,440,563**
Off-stream storages						
Greens Lake	32,440	10,436	2,327	4,750	12,357	20,370
Waranga Basin	432,362	165,139	24,444	50,580	118,304	257,307
Total off-stream storages	**464,802**	**175,575**	**26,771**	**55,330**	**130,661**	**277,677**
Total	**3,826,160**	**2,542,166**	**138,308**	**165,410**	**203,175**	**2,718,240**

Catchment inflows to the Goulburn basin in 2013–14 were 71% of the long-term average (Figure 6-10). The amount of water flowing from the Goulburn basin into the Murray River decreased to 939,676 ML in 2013–14. This represented 37% of the total inflows into the Goulburn basin, a decrease from 72% in 2012–13.

Goulburn basin

Figure 6-10 All major storages and catchment inflows in the Goulburn basin



6.6.2.3 Entitlement volumes and diversions

Goulburn–Murray Water, Coliban Water, Goulburn Valley Water, Grampians Wimmera Mallee Water, the Melbourne metropolitan retailers (City West Water, South East Water and Yarra Valley Water) and AGL Hydro Ltd all hold bulk entitlements in the Goulburn basin. Surface water is also diverted by licensed diverters and is harvested in small catchment dams.

Entitlements in the Goulburn basin include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Goulburn basin are outlined in Table 6-33.

Table 6-33 Entitlement volumes in the Goulburn basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Eildon - Goulburn Weir) Conversion Order 1995(1)	
High reliability water shares	1,006,561
Low reliability water shares	442,448
High reliability supply by agreements	4,484
Low reliability supply by agreements	1,851
Water allowances – Water works districts	1,917
BE (Goulburn Channel System – CW) Order 2012	2,420
BE (Goulburn River – GVW) Order 2012	26,299
BE (Goulburn Channel System – GVW) Order 2012	7,191
Bulk Entitlement (Quambatook – Grampians Wimmera Mallee Water) Order 2006	100
Goulburn System – Melbourne Metropolitan Retailers	0
Bulk Entitlement (Goulburn System – City West Water) Order 2012(2)	n/a
Bulk Entitlement (Goulburn System – South East Water) Order 2012(2)	n/a
Bulk Entitlement (Goulburn System – Yarra Valley Water) Order 2012(2)	n/a
Subtotal: Goulburn System – Melbourne Metropolitan Retailers	0
Environmental Entitlement (Goulburn System – Living Murray) 2007	196,605
Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012(3)	n/a
Bulk Entitlement (Goulburn System – Snowy Environmental Reserve) Order 2004	38,408
Goulburn River Environmental Entitlement 2010	1,432
Loss provision(4)	386,541
Subtotal: Bulk Entitlement (Eildon – Goulburn Weir) Conversion Order 1995	**2,116,257**

Bulk Entitlement (Broadford, Kilmore and Wallan) Conversion and Augmentation Order 2003[(5)]	**2,875**
Bulk Entitlement (Buxton) Conversion Order 1995	**110**
Bulk Entitlement (Euroa System) Conversion Order 2001	**1,990**
Bulk Entitlement (Longwood) Conversion Order 1995	**120**
Bulk Entitlement (Mansfield) Conversion Order 1995	**1,300**
Bulk Entitlement (Marysville) Conversion Order 1995	**462**
Bulk Entitlement (Pyalong) Conversion Order 1997	**75**
Silver and Wallaby Creeks - Melbourne Metropolitan Retailers	0
Bulk Entitlement (Silver & Wallaby Creeks – Melbourne Water for City West Water Limited) Conversion Order 2006[(6)]	n/a
Bulk Entitlement (Silver & Wallaby Creeks – Melbourne Water for South East Water Limited) Conversion Order 2006[(6)]	n/a
Bulk Entitlement (Silver & Wallaby Creeks – Melbourne Water for Yarra Valley Water Limited) Conversion Order 2006[(6)]	n/a
Subtotal: Silver and Wallaby Creeks - Melbourne Metropolitan Retailers[(6)]	**22,000**
Bulk Entitlement (Strathbogie) Conversion Order 2012	**23**
Bulk Entitlement (Thornton) Conversion Order 1995	**120**
Bulk Entitlement (Upper Delatite) Conversion Order 1995	**235**
Bulk Entitlement (Violet Town) Conversion Order 1997	**20**
Bulk Entitlement (Woods Point) Conversion Order 1995	**30**
Bulk Entitlement (Yea) Conversion Order 1997	**438**
Bulk Entitlement (Rubicon – Southern Hydro Ltd) Conversion Order 1997[(7)]	**0**
Silver and Wallaby Creeks Environmental Entitlement 2006	**n/a**
Take and use licences – unregulated surface water	**25,729**
Total volume of water entitlements in the Goulburn basin	**2,171,783**

Notes:

(1) Under Goulburn–Murray Water's Eildon-Goulburn Weir bulk entitlement, the water corporation operates the Goulburn system to supply Goulburn system water share holders, bulk entitlements held by Coliban Water, Goulburn Valley Water and Grampians Wimmera Mallee Water for towns supplied from irrigation districts, and entitlements held by the VEWH.

(2) The Retail Water Corporations hold equal shares to this bulk entitlement. The water allocation available in a given year for use by the Melbourne retailers under this bulk entitlement, is equal to one third of the total phase 3 water savings achieved in the previous year in the Goulburn component of the Goulburn–Murray Irrigation District from the Goulburn–Murray Water Connections Project Stage 1 as verified by an audit.

(3) The water allocation available in a given year for use by the VEWH under this bulk entitlement is equal to one third of the total phase 3 water savings achieved in the previous year in the Goulburn component of the Goulburn-Murray Irrigation District from the Goulburn–Murray Water Connections Project Stage 1 as verified by an audit.

(4) The volume specified is the loss entitlement volume recorded in the Victorian Water Register.

(5) This entitlement specifies that up to 2,875 ML can be diverted in any one year. The maximum volume that can be taken over any 10-year period is 22,380 ML (2,238 ML annual average).

(6) The retail water corporations hold an equal share of the 22,000 ML bulk entitlement on the Silver and Wallaby Creeks. Compliance with a three-year diversion limit of 66,000 ML is assessed using a three-year rolling total diversion.

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

n/a: not applicable

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-34. Entitlements to water in regulated systems in the Goulburn basin provide for the right to carry over unused allocation to the next season. In the Goulburn basin these entitlement holders can carry over unused water up to 100% of their entitlement volume. Any unused water above this amount is written off as an end-of-season forfeiture. Water held above entitlement volume is also subject to a risk of spill; there were no spill events in 2013–14 affecting customers' accounts.

The VEWH holds the Bulk Entitlement (Goulburn System – Snowy Environmental Reserve) Order 2004 in trust for the Snowy River. Allocation to the entitlement is traded out of VEWH environmental accounts to supply consumptive users who would otherwise have been supplied through water diverted from the Snowy system. By reducing the demand by consumptive users for water from the Snowy system, this water can be used to maximise environmental flows in both the Snowy and Murray rivers. Information on this entitlement is available in Table 4-3 in Chapter 4.

Diversions under bulk entitlements for 2013–14 are presented in Table 6-34. Diversions under these bulk entitlements are assessed against the Murray–Darling basin annual cap target for the Goulburn–Broken–Loddon valley. Details of this assessment are published annually in the MDBA's *Water Audit Monitoring Report*.

Table 6-34 Allocation account balance summary for the Goulburn basin

Water entitlement	Opening carryover (ML)	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	Write-off due to spill (ML)	End-of-season forfeitures (ML)	Carryover carried forward (ML)
Eildon – Goulburn Weir							
Water shares	344,718	1,010,233	(107,197)	830,290	0	32,188	385,274
Supply by agreements	2,307	4,484	(32)	3,913	0	374	2,472
Water allowances – Water works districts	-	1,917	0	683	-	1,234	-
Goulburn Channel System – CW	1,164	2,420	(1,000)	1,762	0	(35)	856
Goulburn River and Eildon – GVW	468	26,299	(12,080)	14,649	0	5	33
Goulburn Channel System – GVW	791	7,191	(2,870)	5,092	0	4	17
Quambatook – GWMWater	20	100	0	86	0	(3)	37
Goulburn System – Melbourne Retailers	25,749	25,213	(25,204)	7	0	0	24,464
Environmental Entitlement Goulburn System – Living Murray[(1)]	45,049	39,625	0	64,000	0	76	20,598
Goulburn System – NVIRP Stage 1[(2)]	25,937	26,182	229,258	257,788	0	1,179	22,410
Goulburn System – Snowy Environmental Reserve	0	30,252	(30,252)	0	0	0	0
Goulburn River Environmental Entitlement[(1)]	0	1,432	0	1,432	0	0	0
Operating provisions (whole of system)[(3)]	-	-	-	154,384	-	-	-
Loss Provisions	-	-	-	179,010	-	-	-
Diversion: Eildon – Goulburn Weir[(4)]				**1,189,927**			
Broadford, Kilmore and Wallan	-	2,875	0	1,309	-	1,566	-
Buxton	-	110	0	0	-	110	-
Euroa system	-	1,990	0	680	-	1,310	-
Longwood	-	120	0	62	-	58	-
Mansfield	-	1,300	0	943	-	358	-
Marysville	-	462	0	187	-	275	-
Pyalong	-	75	0	31	-	44	-
Silver and Wallaby Creeks – Melbourne metropolitan retailers	-	22,000	0	1,880	-	20,120	-
Strathbogie	-	23	0	13	-	10	-
Thornton	-	120	0	0	-	120	-
Upper Delatite	-	235	0	64	-	171	-
Violet Town	-	20	0	0	-	20	-
Woods Point	-	30	0	8	-	22	-
Yea	-	438	0	235	-	203	-
Rubicon – Hydro Ltd	-	-	-	-	-	-	-
Silver and Wallaby Creeks Environmental Entitlement	-	-	-	-	-	-	-
Take and use licences – unregulated surface water	-	25,729	(49)	6,354	-	19,326	-

Notes:

(1) The water use reported here is in-stream use and is therefore not included in the calculation of total diversion for the Eildon – Goulburn Weir bulk entitlement.

(2) Water use reported includes 50 ML of environmental use – the amount was diverted to Black Swamp.

(3) This reflects use of water to manage the system including net transfer of water to off-stream storages (largely explained by drawdown of Waranga basin and Greens Lake during the water year).

(4) The water use reported in this line item represents the bulk diversion to supply primary entitlements and fulfil other operating requirements under the Goulburn system source bulk entitlement.

The estimated volume of water harvested from small catchment dams in the Goulburn basin is provided in Table 6-35.

Table 6-35 Estimated small catchment dam information for the Goulburn basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	35,876	17,938	n/a
Registered commercial and irrigation	35,207	29,574	n/a
Total	**71,084**	**47,513**	**57,578**

n/a: information not available.

6.6.3 Recycled water

Goulburn Valley Water operates all wastewater treatment plants in the Goulburn basin. Approximately 94% of the volume of wastewater passing through treatment plants in the basin was recycled, an increase of 16% compared with 2012–13. The percentage of wastewater that was recycled varied at each treatment plant. In addition to the recycled water reported below, 151 ML was returned from the Mount Buller Resort to Black Dog Creek and other waterways during the water year.

Table 6-36 shows the volumes of water recycled in the Goulburn basin in 2013–14.

Table 6-36 Volume of recycled water in the Goulburn basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End- use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Alexandra	186	24	13%	0	24	0	0	162	0
Avenel	28	28	100%	0	28	0	0	0	0
Bonnie Doon	16	16	100%	0	16	0	0	0	0
Broadford	131	131	100%	0	131	0	0	0	0
Eildon	135	0	0%	0	0	0	0	135	0
Euroa	181	181	100%	51	130	0	0	0	0
Girgarre	0	0	0%	0	0	0	0	0	0
Kilmore	319	306	96%	0	306	0	0	13	0
Kyabram/Merrigum	314	314	100%	0	314	0	0	0	0
Mansfield	284	257	90%	71	186	0	0	27	0
Marysville	40	40	100%	40	0	0	0	0	0
Mooroopna	661	616	93%	0	616	0	0	0	45
Murchison	0	0	0%	0	0	0	0	0	0
Nagambie	121	121	100%	0	121	0	0	0	0
Seymour	396	396	100%	62	334	0	0	0	0
Shepparton	2,579	2,579	100%	0	2,579	0	0	0	0
Stanhope / Rushworth	14	14	100%	0	14	0	0	0	0
Tatura	748	723	97%	0	723	0	0	25	0
Tongala	128	128	100%	0	128	0	0	0	0
Upper Delatite	53	53	100%	0	53	0	0	0	0
Violet Town	13	13	100%	0	13	0	0	0	0
Yea	72	72	100%	39	33	0	0	0	0
Total 2013–14	**6,419**	**6,012**	**94%**	**263**	**5,749**	**0**	**0**	**362**	**45**
Total 2012–13	8,330	6,538	78%	291	6,247	0	0	1,792	0

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

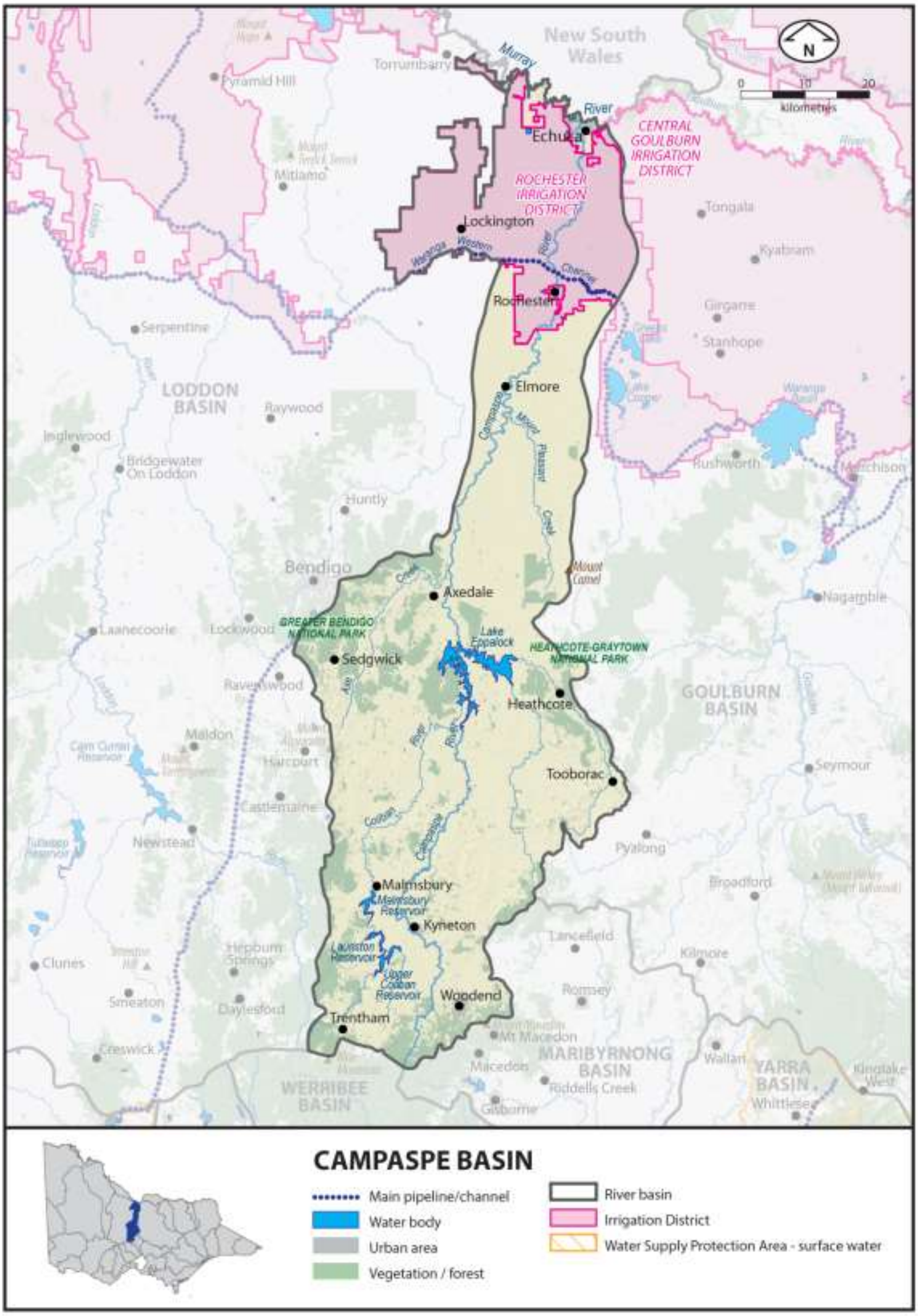
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

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

6.7 Campaspe basin

The Campaspe basin (Figure 6-11) occupies 417,900 ha of north-central Victoria. It extends 150 km south from the Murray River to the Great Dividing Range and is 45 km across at its widest point.

Figure 6-11 Map of the Campaspe basin



6.7.1 Water resources overview

Rainfall across the Campaspe basin in 2013–14 was 100 to 125% of the long-term average in much of the basin, with its southern area receiving 80 to 100% average rainfall. Catchment inflows to the Campaspe basin were 46% of the long-term average compared with 47% in 2012–13.

The year began with a 100% allocation for high reliability water shares for Campaspe system irrigators. Low reliability water shares reached 46% by the middle of December.

The volume of water in major storages in the Campaspe basin finished the year lower than it began. Campaspe storages held 75% of capacity at the start of the year and 73% at the end of June 2014. A number of restrictions for irrigation diversions from unregulated waterways were applied throughout the year, peaking at a total of 19 irrigation bans in April and May 2014. No urban water use restrictions applied in the Campaspe basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year.

Table 6-37 shows the responsibilities of the authorities within the Campaspe basin.

Table 6-37 Responsibilities for water resources management in the Campaspe basin

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 area	Manages 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 most 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
VEWH				Holds and manages environmental entitlements in the basin
North Central CMA				Manages waterways in the whole of the Campaspe basin

Environmental Water Reserve

Important environmental assets – such as endangered flora and fauna species (including the Murray cod and painted snipe) and communities of threatened riparian vegetation – 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.

In 2013–14, the Campaspe basin EWR comprised:

- the *Campaspe River Environmental Entitlement 2013* comprising 20,652 ML of high reliability water and 2,966 ML of low reliability water held by the VEWH
- the *Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007* comprising 126 ML of high reliability and 5,048 ML of low reliability entitlement held by the VEWH
- 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
- 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.

A total of 14,565 ML of environmental entitlement water was delivered in the Campaspe basin in 2013–14. This comprised 8,048 ML from entitlements held by the VEWH and 6,517 ML of Commonwealth environmental water.

6.7.2 Surface water resources

6.7.2.1 Water balance

A surface water balance for the Campaspe basin is shown in Table 6-38.

Table 6-38 Balance of surface water in the Campaspe basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	278,410	330,507
Volume in storage at end of year	272,348	290,238
Change in storage	**(6,062)**	**(40,269)**
Inflows		
Catchment inflow(1)	161,438	165,079
Rainfall on major storages	21,616	15,548
Transfer from Waranga Western Channel to Lake Eppalock	207	361
Transfer to Campaspe basin from Waranga Western Channel	0	0
Treated wastewater discharged back to river	752	577
Total inflows	**184,013**	**181,565**
Outflows		
Diversions		
Urban diversions	15,028	16,643
Diversion for Coliban Water rural entitlements	10,153	10,809
Licensed diversions from regulated streams	10,097	11,558
Licensed diversions from unregulated streams	1,201	3,275
Small catchment dams	28,776	28,776
Transfer from Campaspe basin to Western Waranga Channel	0	2,796
Transfer from Campaspe Basin to White Swan Reservoir	207	43
Total diversions	**65,462**	**73,900**
Losses		
Evaporation losses from major storages	40,095	44,366
Losses from small catchment dams	14,794	14,794
In-stream infiltration to groundwater, flows to floodplain and evaporation	5,444	7,496
Total losses	**60,334**	**66,656**
Water passed at outlet of basin		
Campaspe River outflow to Murray River	64,280	81,278
Total water passed at outlet of basin	**64,280**	**81,278**
Total outflows	**190,076**	**221,834**

Notes:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.7.2.2 Storages and flows

Levels for all major storages in the basin totalled 274,972 ML (73% of capacity) by the end of June 2014 compared with 281,036 ML (75% of capacity) in July 2013 (Table 6-39). In the Campaspe basin, major on-stream storages include Lake Eppalock and the Lauriston, Malmsbury and Upper Coliban reservoirs. The volume reported in the ‘catchment inflow less regulated releases’ column in Table 6-39 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

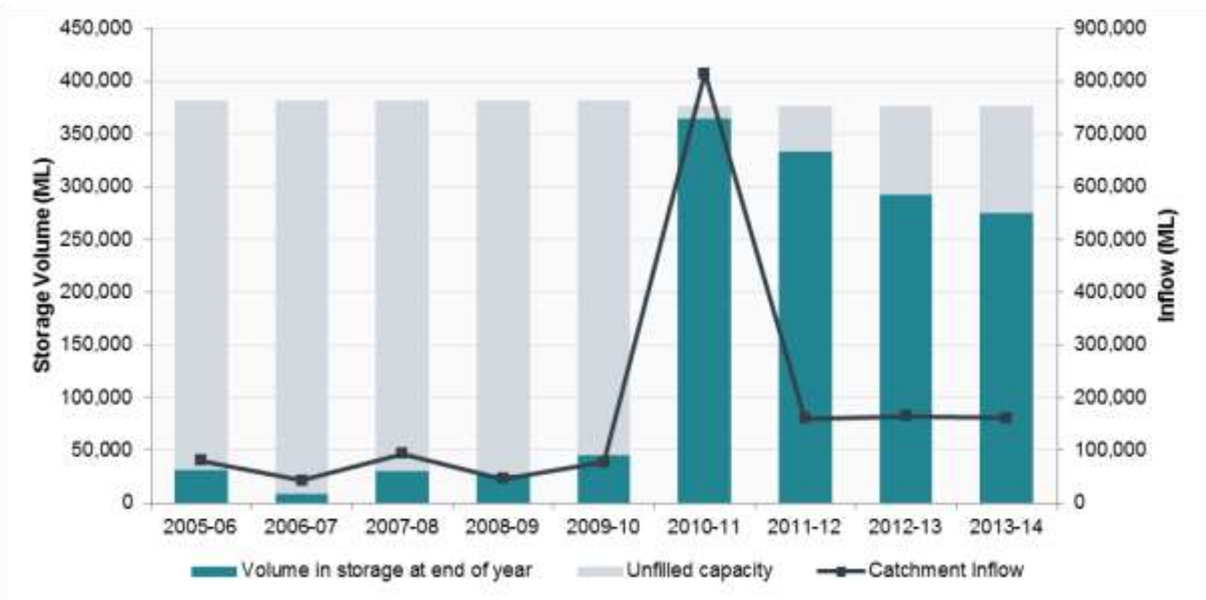
Table 6-39 Storage volumes in the Campaspe basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Lake Eppalock	304,651	231,510	15,647	32,392	9,855	224,620
Lauriston Reservoir	19,790	14,890	1,535	1,991	1,346	15,780
Malmsbury Reservoir	12,034	4,124	1,404	1,925	2,535	6,138
Upper Coliban Reservoir	37,770	27,886	3,030	3,787	(1,319)	25,810
Total on-stream storages	**374,245**	**278,410**	**21,616**	**40,095**	**12,417**	**272,348**
Off-stream storages						
Campaspe Weir	2,624	2,626	n/a	n/a	(2)	2,624
Total off-stream storages	**2,624**	**2,626**	**n/a**	**n/a**	**(2)**	**2,624**
Total	**376,869**	**281,036**	**21,616**	**40,095**	**12,415**	**274,972**

n/a: information not available

Catchment inflows to the Campaspe basin amounted to 161,438 ML in 2013–14, which is 46% of the long-term average (352,000 ML) (Figure 6-12). The amount of water flowing from the Campaspe basin into the Murray River in 2013–14 was 64,280 ML, representing 35% of the total inflows to the basin.

Figure 6-12 All major storages and catchment inflows in the Campaspe basin



6.7.2.3 Entitlement volumes and diversions

Goulburn–Murray Water, Coliban Water and Western Water hold bulk entitlements in the Campaspe basin. Surface water is also diverted by licensed diverters and harvested in small catchment dams.

Entitlements include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Campaspe basin are outlined in Table 6-40.

Campaspe basin

Table 6-40 Entitlement volumes in the Campaspe basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Campaspe System – Goulburn–Murray Water) Conversion Order 2000[(1)]	
High reliability water shares	23,465
Low reliability water shares	19,175
Bulk Entitlement (Axedale Goornong and Part Rochester) Conversion Order 1999[(2)]	349
Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007	5,174
Campaspe River Environmental Entitlement 2013	23,618
Provision for system operation[(3)]	11,809
Subtotal: Bulk Entitlement (Campaspe System – Goulburn–Murray Water) Conversion Order 2000	**83,590**
Bulk Entitlement (Campaspe System – Coliban Water) Conversion Order 1999[(4)]	
Rural entitlements	15,742
Urban commitments	34,518
Subtotal: Bulk Entitlement (Campaspe System – Coliban Water) Conversion Order 1999	**50,260**
Bulk Entitlement (Trentham) Conversion Order 2012[(5)]	**120**
Bulk Entitlement (Woodend) Conversion Order 2004	**470**
Take and use licences – unregulated surface water (Goulburn–Murray Water)	**3,309**
Total volume of water entitlements in the Campaspe basin	**137,749**

Notes:

(1) Under this bulk entitlement, Goulburn–Murray Water releases water from Lake Eppalock to supply water share holders in the Campaspe system, to supply Coliban Water's Axedale and Goornong bulk entitlement and to supply the VEWH's environmental entitlement. The water that Goulburn–Murray Water may take is limited to an average annual volume of 83,590 ML over any period of 10 consecutive years.

(2) Coliban Water may take, under its Axedale, Goornong and Rochester bulk entitlement, a maximum annual volume of 215 ML for Axedale and Goornong and an average of 134 per year over any consecutive 10-year period for Rochester.

(3) This volume includes allowance for volume supplied to the Goulburn system via the Campaspe supplement.

(4) Under this bulk entitlement, Coliban Water releases water from Lake Eppalock to supply rural and urban commitments. The water that Coliban Water may take is limited to an average annual volume of 50,260 ML over any period of three consecutive years.

(5) Coliban Water can take, under the Trentham bulk entitlement, an average of 120 ML per year over a three-year period.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-41. Entitlements to water in regulated systems in the Campaspe basin provide for the right to carry over unused allocation to the next season. In the Campaspe basin these entitlement holders can carry over unused water up to 100% of their entitlement volume; any unused water above this amount is written off as an end-of-season forfeiture. Water held above entitlement volume is also subject to a risk of spill; there were no spill events in 2013–14 affecting customers' accounts.

Diversions under these bulk entitlements are assessed against the Murray–Darling basin annual cap target for the Campaspe valley. Details of this assessment are published annually in the MDBA's Water Audit Monitoring Report.

The VEWH holds an environmental entitlement for the Campaspe River, but the water available under the entitlement is used to support streamflows and is not diverted out of the waterway.

Table 6-41 Allocation account balance summary for the Campaspe basin

Water entitlements	Opening carryover (ML)	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	Write-off due to spill (ML)	End-of-season forfeitures (ML)	Carryover carried forward (ML)
Campaspe System – Goulburn–Murray Water							
Water shares	22,635	31,600	(28,460)	10,097	0	2,090	13,587
Axedale, Goornong and Rochester	332	349	0	55	0	294	332
Campaspe River – Living Murray Initiative[(1)]	1,768	2,448	0	1,768	0	0	2,448
Campaspe River Environmental Entitlement 2013[(2)]	0	22,016	1,517	11,676	0	2,308	9,549
Plus provision for system operation	-	-	-	0	-	-	-
Diversion: Campaspe System – Goulburn–Murray Water				**10,152**			
Campaspe System – Coliban Water							

Rural entitlements	-	15,742	0	4,578	-	11,164	-
Urban commitments	-	34,518	0	13,159	-	21,359	-
Plus provision for system operation	-	-	-	7,080	-	-	-
Diversion: Campaspe System – Coliban Water				**24,817**			
Trentham	-	120	0	109	-	11	-
Woodend	-	470	0	200	-	270	-
Take and use licences – unregulated surface water (Goulburn–Murray Water)	-	3,309	0	1,201	-	2,108	-

Notes:

(1) The water use reported under these two entitlements is in-stream use and is therefore not included in the calculation of total diversion for the Campaspe system – Goulburn–Murray Water bulk entitlement.

(2) The water use reported here is in-stream use and is therefore not included in the calculation of total diversion for the Campaspe system – Goulburn–Murray Water bulk entitlement.

The estimated volume of water harvested from small catchment dams represents the largest diversion of surface water in the Campaspe basin (Table 6-42).

Table 6-42 Estimated small catchment dam information for the Campaspe basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	15,036	7,518	n/a
Registered commercial and irrigation	25,307	21,258	n/a
Total	**40,343**	**28,776**	**43,570**

n/a: Information not available.

6.7.3 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 65% of the wastewater discharged from treatment plants in the basin was recycled, mostly for agricultural use (Table 6-43).

Table 6-43 Volume of recycled water in the Campaspe basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Axedale	7	7	96%	7	0	0	0	0	0
Echuca	709	811	114%	0	811	0	0	0	(102)
Elmore	0	0	0%	0	0	0	0	0	0
Heathcote	119	105	88%	105	0	0	0	14	0
Kyneton	751	277	37%	87	190	0	0	474	0
Lockington	0	0	0%	0	0	0	0	0	0
Rochester	0	0	0%	0	0	0	0	0	0
Woodend	323	44	14%	44	0	0	0	264	15
Total 2013–14	**1,909**	**1,244**	**65%**	**243**	**1,001**	**0**	**0**	**752**	**(87)**
Total 2012–13	2,147	1,572	73%	288	1,283	0	1	577	(2)

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

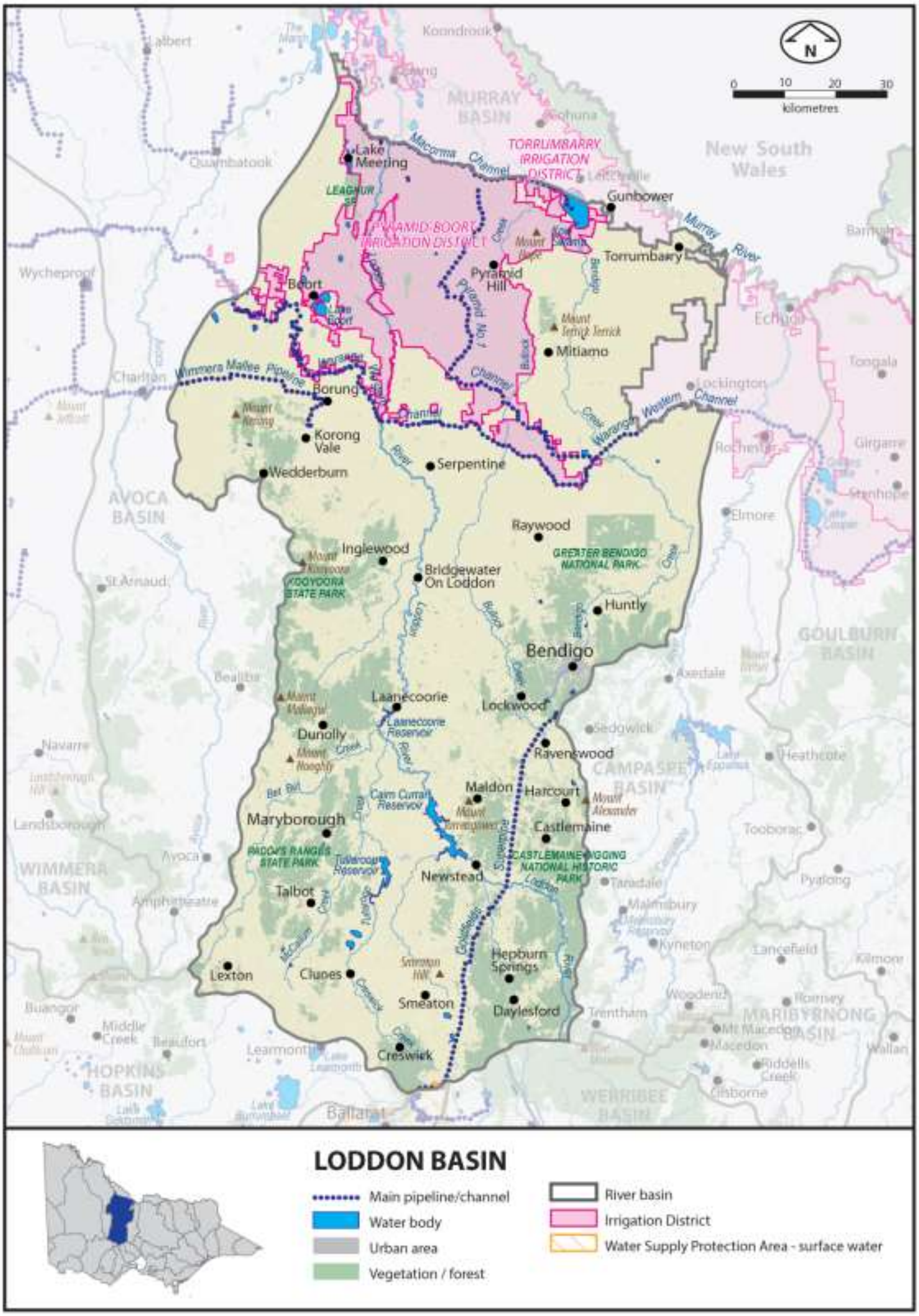
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.8 Loddon basin

The Loddon basin (Figure 6-13) is located in northern Victoria and includes the Loddon River, Bullarook River and various other small tributaries such as Bendigo Creek. The basin is crossed by the Waranga Western Channel, which provides water to users in the Loddon basin from the Goulburn basin (i.e. the Pyramid Hill – Boort Irrigation District). For the purposes of the water accounts, the Loddon basin excludes the Torrumbarry Irrigation Area, which is mostly supplied from the Murray River.

Figure 6-13 Map of the Loddon basin



6.8.1 Water resources overview

In 2013–14, rainfall across the Loddon basin was 80 to 100% of the long-term average across most of the basin, although the east had 100 to 125% of average rainfall. A small area in the west of the Loddon basin had the lowest rainfall in the state, receiving just 60 to 80% of the long-term average. The catchment inflow volume was 42% of the long-term average.

The volume of water in major storages in the Loddon basin was at 64% of capacity at the start of the year and by the end of June 2014 was at 55%.

The year began with a 51% allocation for high reliability water shares for the Loddon system. By the start of September, Loddon high reliability water shares had increased to 100% allocation. Loddon low reliability water shares did not receive allocation for the 2013–14 year. Water shares in the Bullarook system had 100% high reliability and 100% low reliability allocation by the start of October.

No urban water use restrictions applied in the Loddon basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. Bans on licensed diversions were in place for most streams in the Loddon basin during summer, with most continuing into autumn.

Table 6-44 shows the responsibilities of the authorities within the Loddon basin.

Table 6-44 Responsibilities for water resources management in the Loddon basin

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 sourced from the Goulburn basin	Manages licensed diversions	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
Grampians Wimmera Mallee Water			Provides bulk supply to Coliban Water for towns supplied from the Wimmera–Mallee system (Borung, Korong Vale, Wedderburn and 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, Castlemaine, Pyramid Hill and Boort	
VEWH				Holds and manages environmental entitlements in the basin
North Central CMA				Manages waterways for the whole of the Loddon basin

Environmental Water Reserve

Important environmental assets – such as endangered flora and fauna species (including the Murray cod and painted snipe) and communities of threatened riparian vegetation – 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 and Gunbower Forest. The latter has Ramsar-listed wetlands which support 37 threatened and endangered flora and fauna species; these wetlands are shallow freshwater marshes and freshwater meadows, both of which are rare. Tullaroop Creek in the Loddon River system also has a population of regionally significant blackfish.

In 2013–14, the Loddon basin EWR comprised:

- the *Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005*, comprising 3,480 ML of high reliability, 2,024 ML of low reliability and 7,490 ML of trigger-based water entitlements held by the VEWH
- The *Environmental Entitlement (Birch Creek – Bullarook System) 2009*, which includes 470 ML of high reliability water and passing flows and 100 ML of trigger-based environmental water held by the VEWH
- 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
- 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.

A total of 9,368 ML of environmental entitlement water was delivered in the Loddon system in 2013–14. This comprised 6,593 ML from entitlements held by the VEWH and 2,775 ML of Commonwealth environmental water.

6.8.2 Surface water resources

6.8.2.1 Water balance

A surface water balance for the Loddon basin is shown in Table 6-45.

Table 6-45 Balance of surface water in the Loddon basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	148,483	200,771
Volume in storage at end of year	128,747	148,483
Change in storage	**(19,736)**	**(52,288)**
Inflows		
Catchment inflow(1)	157,132	194,784
Rainfall on major storages	11,673	11,699
Treated wastewater discharged back to river	5,204	4,470
Total inflows	**174,009**	**215,884**
Outflows		
Diversions		
Urban diversions	4,278	3,604
Licensed diversions and irrigation diversions from regulated streams	12,202	13,370
Transfer to Goulburn basin (through Loddon supplement)	6,628	32,362
Licensed diversions from unregulated streams	7,263	16,610
Environmental water diversion	2,000	0
Small catchment dams	50,037	50,037
Total diversions	***82,408***	***115,983***
Losses		
Evaporation losses from major storages	29,008	34,255
Losses from small catchment dams	29,579	29,579
In-stream infiltration to groundwater, flows to floodplain and evaporation	17,621	24,404
Total losses	***76,208***	***88,238***
Water passed at outlet of basin		
Loddon River outflow to Murray River (Appin South)	27,984	51,808
Wandella Creek at Fairley	0	0
Mount Hope Creek at Mitiamo	6,906	4,317
Bullock Creek, Calivil Creek and Nine Mile Creek	239	2,896
Total water passed at outlet of basin	***35,129***	***59,020***
Total outflows	**193,745**	**263,241**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.8.2.2 Storages and flows

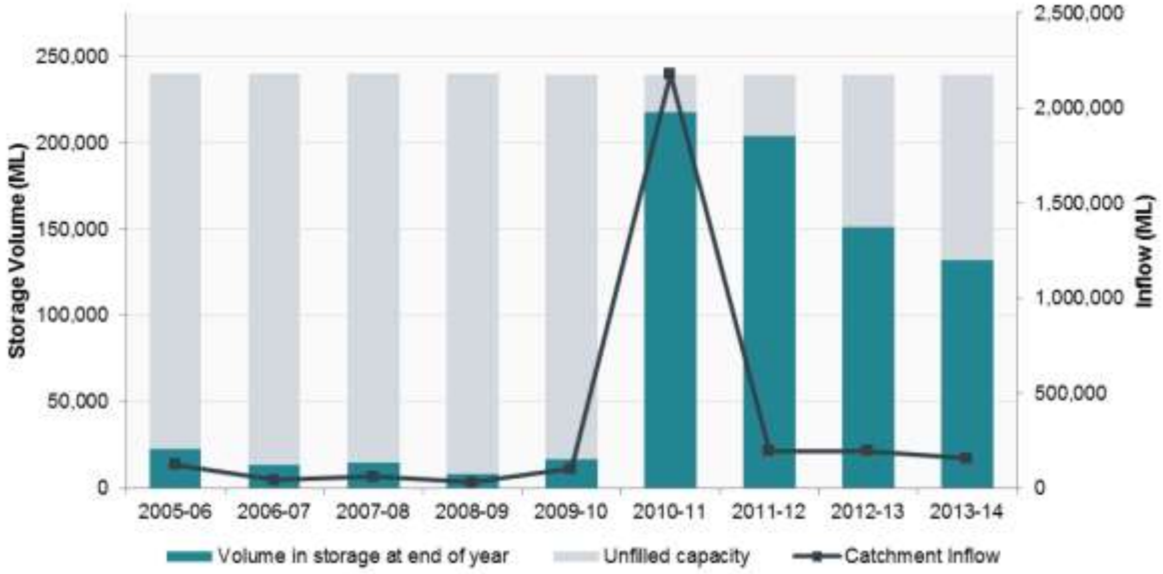
The volume of water held in major storages was 132,003 ML (55% of capacity) at the end of June 2014 compared with 151,985 ML (64% of capacity) at the start of the year (Table 6-46). The volume reported in the 'catchment inflow less regulated releases' column is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year. Cairn Curran Reservoir, which comprises nearly two-thirds of the storage capacity in the basin, finished the year with 83,990 ML in storage (57% of capacity).

Table 6-46 Storage volumes in the Loddon basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Cairn Curran Reservoir	147,130	97,400	6,101	17,702	(1,808)	83,990
Hepburn Lagoon	2,457	992	1,196	1,196	456	1,448
Laanecoorie Reservoir	7,940	4,806	844	2,948	(81)	2,622
Newlyn Reservoir	3,012	1,389	702	727	276	1,640
Tullaroop Reservoir	72,950	43,896	2,830	6,436	(1,243)	39,048
Total on-stream storages	***233,489***	***148,483***	***11,673***	***29,008***	***(2,401)***	***128,747***
Off-stream storages						
Evansford Reservoir	1,346	891	103	305	360	1,049
Sandhurst Reservoir	2,590	2,072	146	274	(439)	1,505
Spring Gully Reservoir	1,680	539	136	271	298	702
Total off-stream storages	***5,616***	***3,502***	***385***	***850***	***219***	***3,256***
Total	**239,105**	**151,985**	**12,058**	**29,858**	**(2,182)**	**132,003**

Catchment inflows were 42% of the long-term average of 373,000 ML, a decrease compared with the volume of inflows in 2012–13 (Figure 6-14). The amount of water flowing from the Loddon basin was 35,129 ML in 2013–14. This represents 22% of the total Loddon basin inflows.

Figure 6-14 All major storages and catchment inflows in the Loddon basin



6.8.2.3 Entitlement volumes and diversions

In the Loddon basin, surface water is diverted by Goulburn–Murray Water, Central Highlands Water, Coliban Water, and the VEWH, all of which hold bulk entitlements in the basin. Surface water is also diverted by licensed diverters and harvested in small catchment dams.

Entitlements in the Loddon basin include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Loddon basin are outlined in Table 6-47.

Loddon basin

Table 6-47 Entitlement volumes in the Loddon basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Loddon System – Goulburn–Murray Water) Conversion Order 2005[1]	
High reliability water shares – Loddon	21,391
Low reliability water shares – Loddon	8,083
Water allowances – Water works districts	205
Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005	12,994
Bulk Entitlement (Loddon System – Part Maryborough – Central Highlands Water) Conversion Order 2005	1,200
Bulk Entitlement (Loddon System – Coliban Water) Conversion Order 2005	820
Goulburn supplement[2]	88,000
Subtotal: Bulk Entitlement (Loddon System – Goulburn–Murray Water) Conversion Order 2005	**132,693**
Bulk Entitlement (Bullarook system – Goulburn–Murray Water) Conversion Order 2009[3]	
High reliability water shares – Bullarook	758
Low reliability water shares – Bullarook	381
Bulk Entitlement (Bullarook System – Central Highlands Water) Conversion Order 2009	500
Environmental Entitlement (Birch Creek – Bullarook System) 2009	100
Subtotal: Bulk Entitlement (Bullarook system – Goulburn–Murray Water) Conversion Order 2009	**1,739**
Bulk Entitlement (Creswick) Conversion Order 2004	**500**
Bulk Entitlement (Daylesford – Hepburn Springs) Conversion Order 2004	**916**
Bulk Entitlement (Evansford – Talbot System – Part Maryborough – Central Highlands Water) Conversion Order 2006	**3,000**
Bulk Entitlement (Lexton) Conversion Order 2004	**45**
Take and use licences – unregulated surface water	**22,707**
Total volume of water entitlements in the Loddon basin	**161,600**

Notes:

(1) Under this bulk entitlement, Goulburn–Murray Water operates Cairn Curran Reservoir, Tullaroop Reservoir, Laanecoorie Reservoir and Loddon Weir to supply water share holders in the Loddon system and to supply the Loddon system bulk entitlements held by Central Highlands Water, Coliban Water and the VEWH.

(2) The Loddon system – Goulburn–Murray Water bulk entitlement specifies that after ensuring all Loddon system high reliability entitlements can be satisfied in the current year and are provided for in the following year, supplies from the Loddon system can be used to supplement the Goulburn system.

(3) Under this bulk entitlement, Goulburn–Murray Water operates Newlyn Reservoir and Hepburns Lagoon to supply water share holders in the Bullarook system and to supply the Bullarook system bulk entitlements held by Central Highlands Water and the VEWH.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-48. Entitlements to water in regulated systems in the Loddon basin provide for the right to carry over unused allocation to the next season. In the Loddon basin these entitlement holders can carry over unused water up to 50% of their entitlement volume; any unused water above this amount is written off (end-of-season forfeiture).

Diversions under these bulk entitlements are assessed against the Murray–Darling basin annual cap target for the Goulburn–Broken–Loddon Valley. Details of this assessment are published annually in the MDBA's Water Audit Monitoring Report.

The VEWH diverted 2,000 ML, available under the Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005, to off-stream wetlands in 2013–14. Other water released under the entitlement (7,736 ML) was used to support streamflows in the Loddon River.

Table 6-48 Allocation account balance summary for the Loddon basin

Water entitlement	Opening carryover (ML)	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)	Carryover carried forward (ML)
Loddon System – Goulburn–Murray Water						
Water shares – Loddon	6,007	16,723	(7,551)	8,470	1,722	4,988
Water allowances – Water works districts	-	205	0	0	205	-
Loddon River – Environmental Reserve(1)	2,000	10,970	3,775	9,936	4,149	2,660
Loddon System – Part Maryborough – Central Highlands Water	900	1,200	30	1,256	0	874
Loddon System – Coliban Water	390	431	0	391	40	390
Loddon supplement(2)	-	-	-	6,628	-	-
Operating provisions (whole of system)(3)	-	-	-	2,894	-	-
Diversion: Loddon system – Goulburn–Murray Water(4)				**21,639**		
Bullarook System – Goulburn–Murray Water						
Water shares – Bullarook	149	989	0	838	106	195
Bullarook System – Central Highlands Water	238	263	0	121	141	238
Environmental Entitlement Birch Creek – Bullarook System	0	100	0	0	0	100
Diversion: Bullarook system – Goulburn–Murray Water(5)				**959**		
Creswick	-	500	0	490	10	-
Daylesford – Hepburn Springs	-	916	0	660	256	-
Lexton	-	45	0	24	21	-
Evansford – Talbot System – Part Maryborough – Central Highlands Water	-	3,000	0	1,337	1,663	-
Take and use licences – unregulated surface water	-	22,707	0	7,263	15,444	-

Notes:

(1) 7,936 ML of the water use reported here is in-stream use and is therefore not included in the calculation of total diversion for the Loddon system – Goulburn–Murray Water bulk entitlement.

(2) The Loddon supplement supplies water to the Goulburn system, providing for entitlement holders with Goulburn water shares. As such, the volume is reported as a transfer to the Goulburn basin.

(3) This reflects use of water to manage the Loddon system, it equals the amount diverted to Serpentine Creek and not used by customers.

(4) The water use reported in this line item represents the bulk diversion to supply primary entitlements and fulfil other operating requirements under the Loddon system source bulk entitlement.

(5) The water use reported in this line item represents the bulk diversion to supply primary entitlements under the Bullarook system source bulk entitlement.

The estimated volume of water harvested from small catchment dams represents the largest diversion of surface water in the Loddon basin (Table 6-49).

Table 6-49 Estimated small catchment dam information for the Loddon basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	31,649	15,825	n/a
Registered commercial and irrigation	40,729	34,212	n/a
Total	**72,378**	**50,037**	**79,616**

n/a: information not available.

6.8.3 Recycled water

Coliban Water and Central Highlands Water operate wastewater treatment plants in the Loddon basin. The total volume of wastewater produced in 2013–14 slightly increased, compared with 2012–13. The proportion of wastewater recycled in 2013–14 decreased to 27%, compared with 36% in 2012–13. This is presented in Table 6-50.

Loddon basin

Table 6-50 Volume of recycled water in the Loddon basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Bendigo	5,412	1,336	25%	666	670	0	0	4,076	0
Boort	22	22	100%	0	22	0	0	0	0
Bridgewater / Inglewood	0	0	0%	0	0	0	0	0	0
Castlemaine	1,210	82	7%	82	0	0	0	1,128	0
Clunes	0	0	0%	0	0	0	0	0	0
Daylesford	325	325	100%	16	309	0	0	0	0
Dunolly	11	11	100%	0	11	0	0	0	0
Kerang	526	0	0%	0	0	0	0	0	526
Maryborough	376	376	100%	66	310	0	0	0	0
Pyramid Hill	0	0	0%	0	0	0	0	0	0
Wedderburn	7	7	100%	0	7	0	0	0	0
Total 2013–14	**7,889**	**2,159**	**27%**	**830**	**1,329**	**0**	**0**	**5,204**	**526**
Total 2012–13	7,746	2,775	36%	1,132	1,643	0	0	4,470	501

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.9 East Gippsland basin

The East Gippsland basin (Figure 6-15) is the easternmost basin in Victoria. The headwaters of the Genoa River originate in New South Wales and flow through Victoria before reaching the ocean near Mallacoota. Other rivers in the basin include the Betka, Wingan, Thurra, Cann and Bemm rivers.

Figure 6-15 Map of the East Gippsland basin

6.9.1 Water resources overview

In 2013–14, rainfall in the East Gippsland basin was slightly lower than average at 80 to 100%.

Catchment inflows were 93% of the long-term annual average, a decrease from the 134% recorded in 2012–13. Consumptive use in the basin is generally very low compared with water availability, and almost 100% of inflows passed to Bass Strait in 2013–14.

No urban water use restrictions applied in the basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. All unregulated streams remained unrestricted as per the previous year.

Table 6-51 shows the responsibilities of the authorities within the East Gippsland basin.

Table 6-51 Responsibilities for water resources management in the East Gippsland basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages licensed diversions		
East Gippsland Water		Supplies urban water to towns including Mallacoota, Cann River and Bemm River	Obliged to meet passing flow requirements
East Gippsland CMA			Manages waterways for entire East Gippsland basin

Environmental Water Reserve

Environmental assets that rely on the EWR in the East Gippsland basin include the Sydenham, Tamboon and Mallacoota inlets (all nationally significant wetlands), pristine estuaries, heritage river reaches and the swamp skink, Australian grayling, Australian bass, tangle orchid and eastern curlew.

In 2013–14, the EWR in the East Gippsland basin comprised:

- water set aside for the environment through flow-sharing arrangements set out in 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.

6.9.2 Surface water resources

6.9.2.1 Water balance

The total volumes of water available and supplied from water resources in the East Gippsland basin are shown in Table 6-52. Very low volumes of surface water are used relative to the available resource in the basin.

No storage information is recorded in the water balance as there are no major on-stream storages in the East Gippsland basin.

Less than 1% of the catchment inflows were diverted for consumptive use, predominantly from small catchment dams.

Table 6-52 Balance of surface water in the East Gippsland basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	**-**	**-**
Inflows		
Catchment inflow(1)	666,465	953,355
Rainfall on major storages	-	-
Treated wastewater discharged back to river	0	25
Total inflows	**666,465**	**953,380**
Outflows		
Diversions		
Urban diversions	149	135
Licensed diversions from unregulated streams	90	137
Small catchment dams	1,100	1,100

Total diversions	***1,338***	***1,371***
Losses		
Evaporation losses from major storages	-	-
Evaporation from small catchment dams	67	67
In-stream infiltration to groundwater, flows to floodplain and evaporation[(2)]	n/a	n/a
Total losses	***67***	***67***
Water passed at outlet of basin		
River outflows	665,059	951,942
Total water passed at outlet of basin	***665,059***	***951,942***
Total outflows	**666,465**	**953,380**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.

(2) No suitable model is available to make an estimate of in-stream losses.

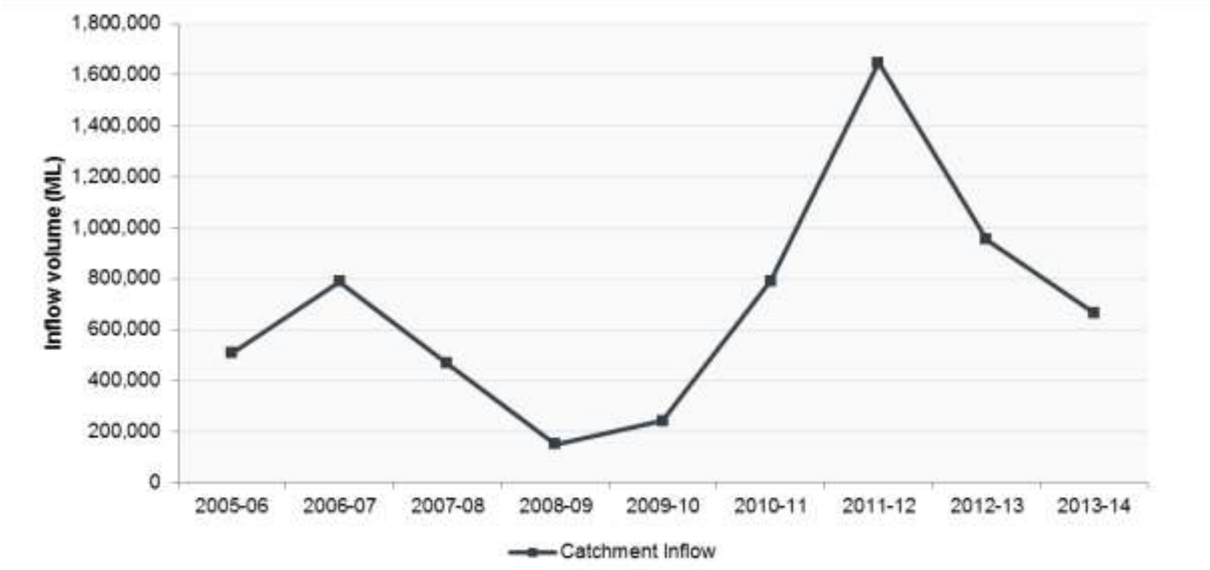
6.9.2.2 Storages and flows

Catchment inflows in 2013–14 were 93% of the long-term annual average of 714,000 ML. This was lower than the volume for 2012–13, which was 134% of the long-term average (Figure 6-16).

The amount of water flowing from the East Gippsland basin into Bass Strait was 665,059 ML in 2013–14, compared with 951,942 ML in 2012–13. Basin outflow was close to 100% of total inflows into the basin.

There are no major storages located within the East Gippsland basin.

Figure 6-16 Catchment inflows in the East Gippsland basin



6.9.2.3 Entitlement volumes and diversions

In the East Gippsland basin, surface water is diverted by East Gippsland Water and licensed diverters, and water is also harvested in small catchment dams.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the East Gippsland basin are outlined in Table 6-53.

Table 6-53 Entitlement volumes in the East Gippsland basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Bemm River) Conversion Order 1997	100
Bulk Entitlement (Cann River) Conversion Order 1997	192
Bulk Entitlement (Mallacoota) Conversion Order 1997	330
Take and use licences – unregulated surface water	660
Total volume of water entitlements in the East Gippsland basin	**1,282**

East Gippsland basin

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-54. The total volume of water diverted by bulk entitlement holders was similar to the volume reported in the 2012–13 Victorian Water Accounts.

As in previous years, the volume of water diverted from unregulated streams by take and use licence holders in the East Gippsland basin (Table 6-54) remains significantly lower than the total licence volume.

Table 6-54 Allocation account balance summary for the East Gippsland basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Bemm River	100	0	15	85
Cann River	192	0	40	152
Mallacoota	330	0	94	236
Take and use licences – unregulated surface water	660	0	90	570

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the East Gippsland basin (Table 6-55).

Table 6-55 Estimated small catchment dam information for the East Gippsland basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	770	385	555
Registered commercial and irrigation	851	714	612
Total	**1,621**	**1,100**	**1,167**

6.9.3 Recycled water

East Gippsland Water operates wastewater treatment plants at Bemm River, Cann River and Mallacoota. The volume of wastewater produced in 2013–14 decreased compared with 2012–13, and 68% was recycled for agricultural applications including pasture and tree plantations.

Table 6-56 shows the volumes of water recycled in the East Gippsland basin in 2013–14.

Table 6-56 Volume of recycled water in the East Gippsland basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Bemm River	11	10	95%	0	10	0	0	0	1
Cann River	20	19	95%	0	19	0	0	0	1
Mallacoota	117	72	62%	0	72	0	0	0	45
Total 2013–14	**148**	**101**	**68%**	**0**	**101**	**0**	**0**	**0**	**47**
Total 2012–13	162	137	85%	0	137	0	0	25	0

Notes:

(1) ‘Beneficial allocation’ refers to the volume used to deliver specific environmental flow benefits.

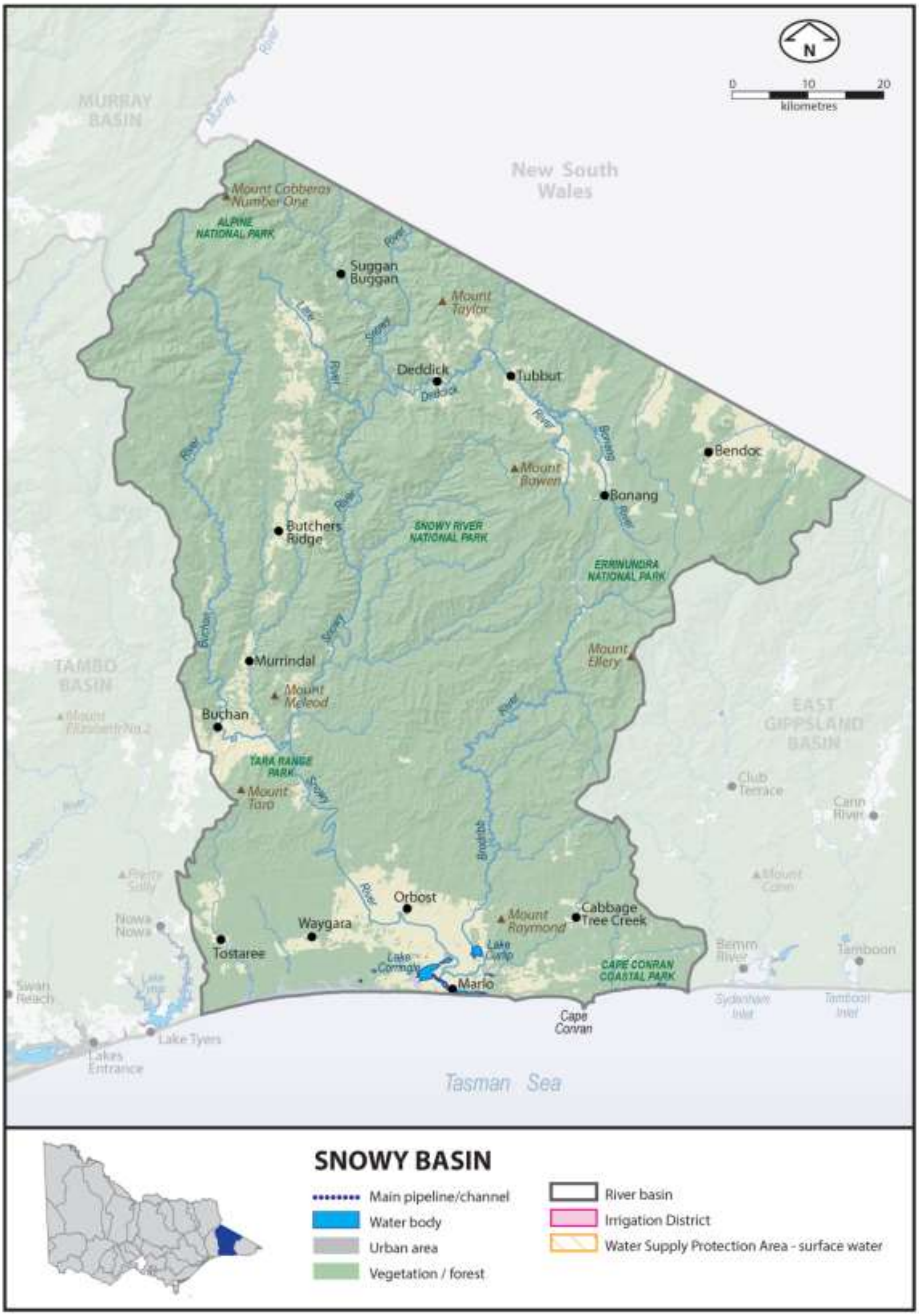
(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

(3) ‘Other’ refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.10 Snowy basin

The Snowy basin (Figure 6-17) is located in south-east Victoria. The Snowy River originates in New South Wales and is part of the Snowy Mountains Hydro-Electric Scheme, which connects it to the Murray and Murrumbidgee rivers. In the Victorian part of the basin, major tributaries such as the Deddick River, Buchan River and Brodrobb River join the Snowy River before it flows into the ocean at Marlo.

Figure 6-17 Map of the Snowy basin



6.10.1 Water resources overview

In 2013–14, rainfall in much of the Snowy basin ranged from 80 to 100% of the long-term average, with a small area receiving slightly above-average rainfall of 100 to 125%. Catchment inflows were above average. Total inflows from New South Wales and Victoria were 1,490,860 ML compared with 1,825,842 ML in the previous year. Consumptive water use in the Snowy basin is generally low compared with the total water resource, and more than 99% of the basin's total inflows for 2013–14 flowed into Bass Strait.

No urban water use restrictions applied in the Snowy basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. In 2014, Stage 1 restrictions were applied to Buchan River in February and removed in March; all other unregulated streams in the basin were unrestricted throughout the year.

Table 6-57 shows the responsibilities of the authorities within the Victorian portion of the Snowy basin.

Table 6-57 Responsibilities for water resources management in the Snowy basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages surface water licensed diversions		
East Gippsland Water		Supplies towns including Buchan, Orbost and Marlo	Obliged to meet passing flow requirements
VEWH			Manages environmental entitlements held in trust for the Snowy River
East Gippsland CMA			Manages waterways for the whole of the Snowy basin

Environmental Water Reserve

The health of the Snowy River depends on the EWR. Environmental assets include Australian grayling populations, Australian bass, the lower Snowy wetlands and estuary (which are nationally important wetlands), heritage river reaches, the Ewings Marsh wetlands complex and the Snowy River daisy.

In 2013–14 the EWR for the Snowy basin comprised:

- 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.

A total of 190,600 ML of environmental water was delivered in New South Wales reaches of the Snowy River. The delivery was aimed to achieve outcomes in the New South Wales reaches of the river, but also provided some downstream benefits to the Victorian reaches.

6.10.2 Surface water resources

6.10.2.1 Water balance

A surface water balance for the Snowy basin is shown in Table 6-58. As these accounts provide a record of water availability and use across Victoria, this balance only considers the portion of the Snowy basin that is located within Victoria.

No storage information is recorded in the water balance as there are no major on-stream storages in the Snowy basin.

Catchment inflows from the Victorian portion of the basin accounted for 74% of the total inflows to the Snowy basin. The volume of water diverted within the Victorian portion of the basin represents less than 1% of the total inflows.

Table 6-58 Balance of surface water in the Snowy basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	**-**	**-**
Inflows		
Catchment inflow from Victoria[(1)]	1,110,316	1,441,377
Catchment inflow from NSW[(2)]	380,544	384,465
Rainfall on major storages	-	-
Treated effluent discharged back to river	0	0
Total inflows	**1,490,860**	**1,825,842**
Outflows		
Diversions		
Urban diversions	687	725
Licensed diversions from unregulated streams	564	732
Small catchment dams	3,356	3,356
Total diversions	***4,607***	***4,812***
Losses		
Evaporation losses from major storages	-	-
Evaporation from small catchment dams	700	700
In-stream infiltration to groundwater, flows to floodplain and evaporation[(3)]	n/a	n/a
Total losses	***700***	***700***
Water passed at outlet of basin		
River outflows to the ocean	1,485,553	1,820,329
Total water passed at outlet of basin	***1,485,553***	***1,820,329***
Total outflows	**1,490,860**	**1,825,842**

Notes:
(1) Catchment inflow from Victoria is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.
(2) Catchment inflow from New South Wales recorded on the Snowy River at Burnt Hut Crossing (gauge 222013).
(3) No suitable model is available to make an estimate of in-stream losses.

6.10.2.2 Storages and flows

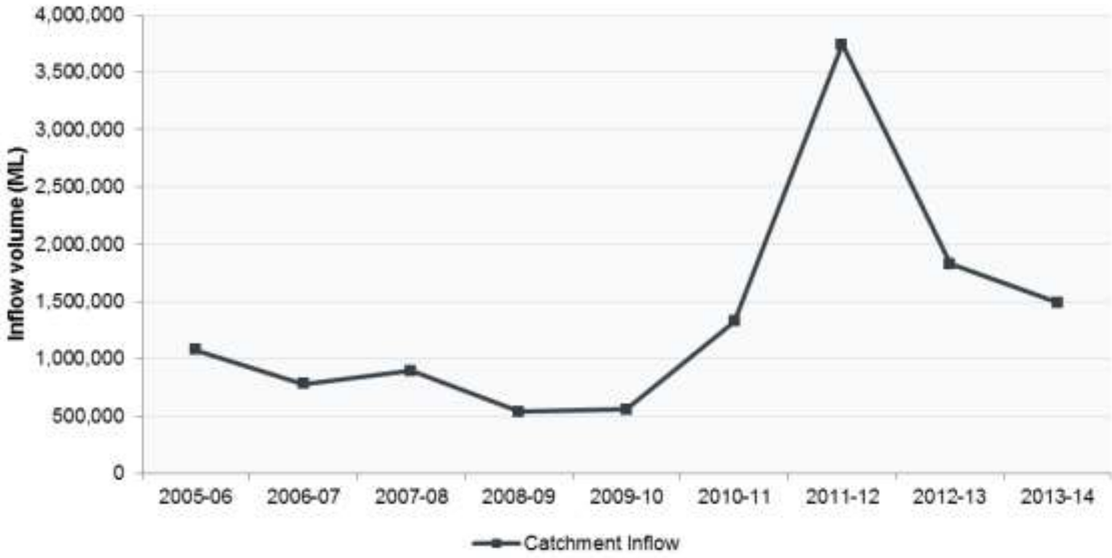
Total inflows to the Victorian portion of the basin were 1,110,316 ML, or 109% of the long-term average (of 1,022,000 ML), compared with 1,441,377 ML, or 141% of the long-term average in 2012–13 (Figure 6-18). Inflows from New South Wales are regulated by the Snowy Mountains Hydro-Electric Scheme. This inflow was 380,544 ML in 2013–14, down from 384,465 ML in 2012–13.

The amount of water flowing from the Snowy basin into Bass Strait was 1,485,553 ML in 2013–14. This represents more than 99% of total inflows to the basin.

There are no major storages located within the Victorian portion of the Snowy basin.

Snowy basin

Figure 6-18 Catchment inflows in the Snowy basin (including contribution from New South Wales)



6.10.2.3 Entitlement volumes and diversions

In the Snowy basin, surface water is diverted by East Gippsland Water and licensed diverters, and is also harvested in small catchment dams.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Snowy basin are outlined in Table 6-59.

Table 6-59 Entitlement volumes in the Snowy basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Buchan) Conversion Order 1997	170
Bulk Entitlement (Orbost System) Conversion Order 1997	2,031
Take and use licences – unregulated surface water	3,992
Total volume of water entitlements in the Snowy basin	**6,193**

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-60. The total volume of water diverted by bulk entitlement holders was similar to amount reported in the 2012–13 Victorian Water Accounts.

As in previous years, the volume of water diverted from unregulated streams by take and use licence holders in the Snowy basin (Table 6-60) remains significantly lower than the total licence volume. The volume of water diverted from unregulated streams by licence holders in the Snowy basin was 564 ML which was lower than the 2012–13 volume of 732 ML (Table 6-60).

Table 6-60 Allocation account balance summary for the Snowy basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Buchan	170	0	23	148
Orbost System	2,031	0	664	1,367
Take and use licences – unregulated surface water	3,992	0	564	3,428

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the Snowy basin (Table 6-61).

Table 6-61 Estimated small catchment dam information for the Snowy basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	3,143	1,572	n/a
Registered commercial and irrigation	2,124	1,784	n/a
Total	**5,267**	**3,356**	**4,056**

n/a: information not available

6.10.3 Recycled water

The Orbost wastewater treatment plant is the only treatment plant in the Snowy basin. In 2013–14, all of the wastewater passing through this treatment plant was recycled and used for agricultural applications including pasture and tree plantations (Table 6-62).

Table 6-62 Volume of recycled water in the Snowy basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Orbost	295	257	87%	0	257	0	0	0	38
Total 2013–14	**295**	**257**	**87%**	**0**	**257**	**0**	**0**	**0**	**38**
Total 2012–13	326	326	100%	0	326	0	0	0	0

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits

(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.11 Tambo basin

The Tambo basin (Figure 6-19) is located in south-east Victoria. The basin contains the Tambo River and the Nicholson River, which flow into the Gippsland Lakes.

Figure 6-19 Map of the Tambo basin

6.11.1 Water resources overview

In 2013–14, rainfall in the Tambo basin was 80 to 100% of the long-term average in much of the basin, with higher-than-average rainfall of 100 to 125% in areas in the very north and south of the basin.

There are no major authorised diversions in the Tambo basin. Its larger towns, such as Lakes Entrance, are supplied by the Bairnsdale water system. As such, approximately 96% of basin inflows flow to the Gippsland Lakes.

No urban water use restrictions applied in the Tambo basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. No bans were applied to rural users, with all unregulated streams remaining unrestricted.

Table 6-63 shows the responsibilities of the authorities within the Tambo basin.

Table 6-63 Responsibilities for water resources management in the Tambo basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages licensed diversions		
East Gippsland Water		Towns including Lakes Entrance, Bruthen and Swifts Creek are supplied from neighbouring basins	Obliged to meet passing flow requirements
East Gippsland CMA			Manages waterways in the whole of the Tambo basin

Environmental Water Reserve

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 function ecologically. Other environmental assets that rely on the EWR include fish populations (Australian grayling, black bream) and the Bosses, Nebbor, Russells and Tambo River East swamps, which are nationally important wetlands.

In 2013–14, the EWR in the Tambo basin comprised:

- water set aside for the environment through the operation of passing flow conditions on licensed diversions and consumptive bulk entitlements held by East Gippsland Water
- all other water in the basin not allocated for consumptive use.

6.11.2 Surface water resources

6.11.2.1 Water balance

The total volumes of water available and supplied from water resources in the Tambo basin are shown in Table 6-64. Consumptive use in the Tambo basin is low compared with the available resource in the basin.

No storage information is recorded in the water balance as there are no major on-stream storages in the Tambo basin.

Table 6-64 Balance of surface water in the Tambo basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	**0**	**0**
Inflows		
Catchment inflow(1)	144,683	309,242
Rainfall on major storages	-	-
Treated effluent discharged back to river	0	0
Total inflows	**144,683**	**309,242**
Outflows		
Diversions		
Urban diversions	48	31
Licensed diversions from unregulated streams	358	812

Small catchment dams	3,971	3,971
Total diversions	***4,376***	***4,813***
Losses		
Evaporation losses from major storages	-	-
Evaporation from small catchment dams	1,986	1,986
In-stream infiltration to groundwater, flows to floodplain and evaporation(2)	n/a	n/a
Total losses	***1,986***	***1,986***
Water passed at outlet of basin		
River outflows to the ocean	138,321	302,443
Total water passed at outlet of basin	***138,321***	***302,443***
Total outflows	**144,683**	**309,242**

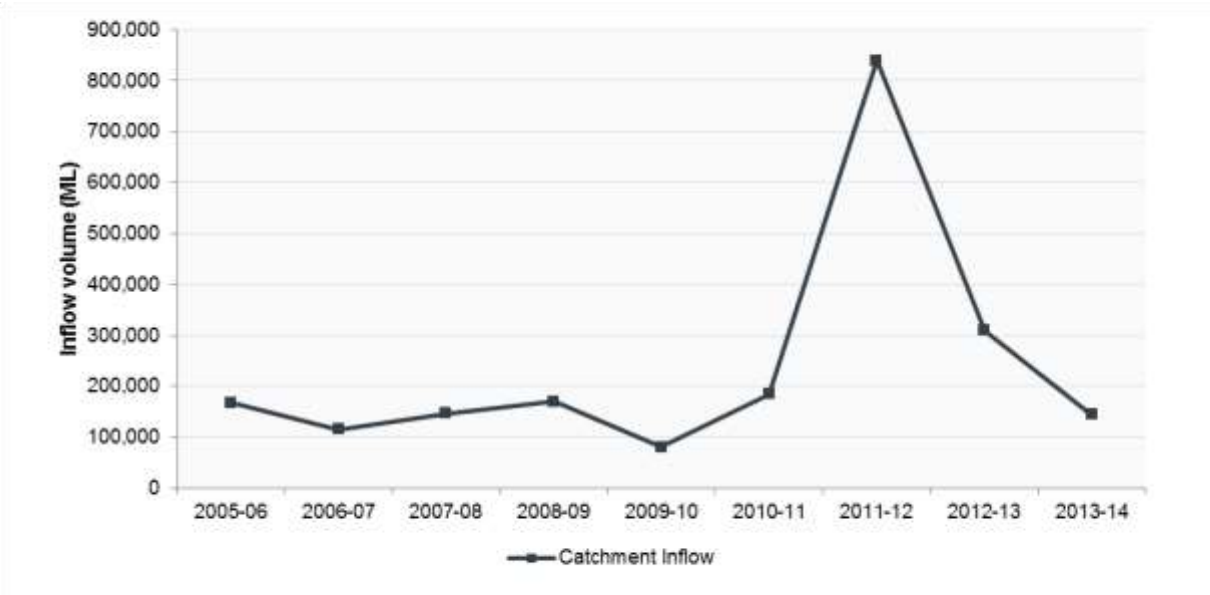
Notes:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows
(2) No suitable model is available to make an estimate of in-stream losses.
n/a: information not available

6.11.2.2 Storages and flows

Catchment inflows to the basin were 144,683 ML, or 49% of the long-term average (of 297,800 ML), compared with 309,242 ML or 104% of the long-term average in 2012–13 (Figure 6-20). The amount of water flowing from the Tambo basin into the Gippsland Lakes was 138,321 ML in 2013–14, which was approximately 96% of total inflows to the basin.

There are no major storages located within the Tambo basin.

Figure 6-20 Catchment inflows in the Tambo basin



6.11.2.3 Entitlement volumes and diversions

In the Tambo basin, surface water is diverted by East Gippsland Water and licensed diverters, and water is also harvested in small catchment dams.

Entitlements in the Tambo basin include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Tambo basin are outlined in Table 6-65.

Table 6-65 Entitlement volumes in the Tambo basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Nowa Nowa) Conversion Order 1997	118
Bulk Entitlement (Swifts Creek) Conversion Order 1997	224
Take and use licences – unregulated surface water	4,167
Total volume of water entitlements in Tambo basin	**4,509**

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-66.

The volume of water diverted from unregulated streams by licence holders in the Tambo basin was less in 2013–14 compared with the volume of 812 ML reported in the 2012–13 Victorian Water Accounts.

Table 6-66 Allocation account balance summary for the Tambo basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Nowa Nowa(1)	118	0	0	118
Swifts Creek	224	0	48	176
Take and use licences – unregulated surface water	4,167	0	358	3,809

Notes:
(1) No water was taken under the Nowa Nowa bulk entitlement in 2013–14. East Gippsland Water supplied this town under the Bairnsdale bulk entitlement, reported in Table 6-72 in the Mitchell basin.

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the Tambo basin (Table 6-67).

Table 6-67 Estimated small catchment dam information for the Tambo basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	4,494	2,247	n/a
Registered commercial and irrigation	2,052	1,724	n/a
Total	**6,546**	**3,971**	**5,957**

n/a: information not available.

6.11.3 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 agricultural applications including pasture, tree plantations, racecourses and golf courses.

Table 6-68 shows the volumes of water recycled in the Tambo basin in 2013–14.

Table 6-68 Volume of recycled water in the Tambo basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Lakes Entrance	671	635	95%	0	635	0	0	0	36
Metung (4)	112	163	145%	0	163	0	0	0	(51)
Total 2013–14	**783**	**798**	**102%**	**0**	**798**	**0**	**0**	**0**	**(15)**
Total 2012–13	668	668	100%	0	668	0	0	0	0

Notes:
(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.
(4) The volume of water recycled exceeded the volume produced as water stored on-site carried over from the previous year.

6.12 Mitchell basin

The Mitchell basin (Figure 6-21) is located in south-east Victoria and occupies 477,800 ha. Its waterways flow into the Gippsland Lakes near Bairnsdale.

Figure 6-21 Map of the Mitchell basin

6.12.1 Water resources overview

In 2013–14, rainfall in the Mitchell basin ranged between 80 to 100% of the long-term average in much of the basin, with the north of the basin receiving slightly above-average rainfall of 100 to 125%. Inflows in the Mitchell basin were 88% of the long-term average, compared with 82% in 2012–13. Consumptive use in the basin is generally low when compared with the total water resource. About 98% of the inflows were not diverted, and hence entered the Gippsland Lakes.

Stage 1 restrictions for both the Dargo and Wonanngatta rivers were lifted in August 2013. Stage 4 restrictions were applied to the Mitchell River in February and March 2014. All other licensed diversions were unrestricted.

No urban water use restrictions applied in the Mitchell basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year.

Table 6-69 shows the responsibilities of the authorities within the Mitchell basin.

Table 6-69 Responsibilities for water resources management in the Mitchell basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages licensed diversions		
East Gippsland Water		Supplies towns including Bairnsdale, Lakes Entrance and Paynesville	Obliged to meet passing flow requirements
East Gippsland CMA			Manages waterways in the Mitchell basin

Environmental Water Reserve

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 freshwater inputs from the Mitchell basin to function ecologically. Other environmental assets that rely on the EWR include heritage river reaches, fish populations (including Australian grayling and black bream), waterbirds (great egret) and botanical values (yellowwood).

In 2013–14, the EWR in the Mitchell basin comprised:

- 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.

6.12.2 Surface water resources

6.12.2.1 Water balance

A surface water balance for the Mitchell basin is shown in Table 6-70. 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. The river also supports irrigation on the Lindenow Flats. Diversions make up a relatively small proportion of total inflows, with approximately 2.3% of total basin inflows diverted for consumptive use.

No storage information is recorded in the water balance as there are no major on-stream storages in the Mitchell basin.

Table 6-70 Balance of surface water in the Mitchell basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	**-**	**-**
Inflows		
Catchment inflow(1)	782,716	722,170
Rainfall on major storages	-	-
Treated effluent discharged back to river	68	67
Total inflows	**782,784**	**722,237**
Outflows		

Diversions		
Urban diversions	4,655	4,957
Licensed diversions from unregulated streams	8,718	11,493
Small catchment dams	4,558	4,558
Total diversions	***17,930***	***21,008***
Losses		
Evaporation losses from major storages	-	-
Evaporation from small catchment dams	1,006	1,006
In-stream infiltration to groundwater, flows to floodplain and evaporation	882	623
Total losses	***1,888***	***1,629***
Water passed at outlet of basin		
River outflows to the ocean	762,965	699,601
Total water passed at outlet of basin	***762,965***	***699,601***
Total outflows	**782,784**	**722,237**

Note:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.

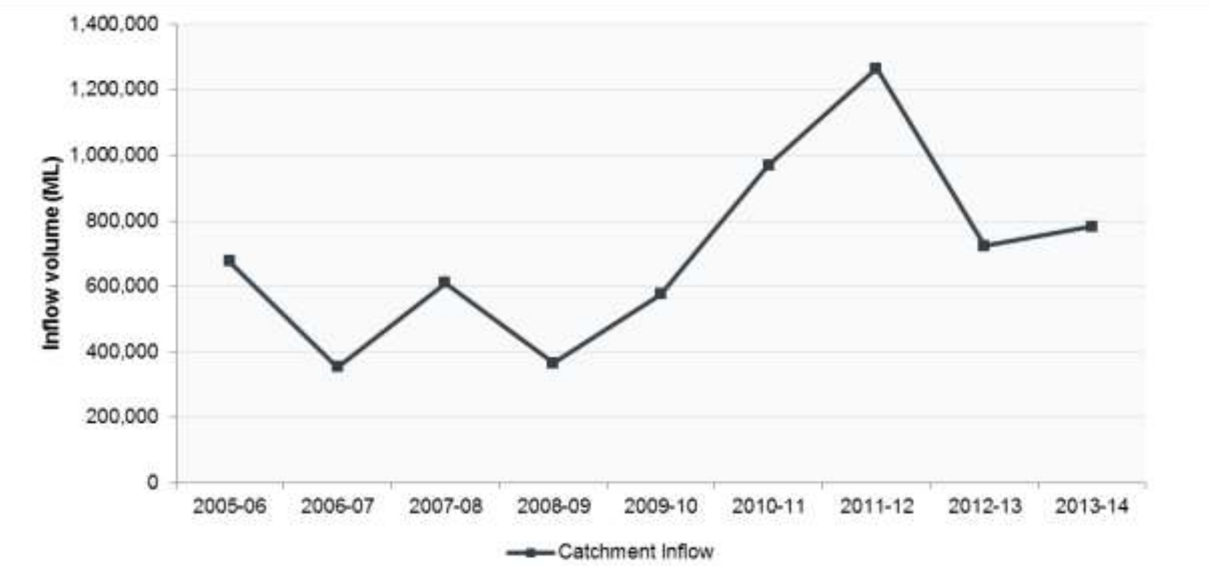
6.12.2.2 Storages and flows

Catchment inflows to the basin were 88% of the long-term average (of 884,500 ML), compared with 82% in 2012–13 (Figure 6-22).

The amount of water flowing from the Mitchell basin into the Gippsland Lakes was 762,965 ML in 2013–14, an increase from 699,601 ML recorded in 2012–13. The 2013–14 outflows were 98% of the total inflows into the basin.

There are no major storages located within the Mitchell basin.

Figure 6-22 Catchment inflows in the Mitchell basin



6.12.2.3 Entitlement volumes and diversions

In the Mitchell basin, surface water is diverted by East Gippsland Water and licensed diverters, and harvested in small catchment dams. The total volume of take and use licences in the Mitchell basin includes licences for irrigation as well as for domestic and stock purposes.

East Gippsland Water holds one bulk entitlement in the Mitchell basin, used to supply Bairnsdale, Lakes Entrance, Bruthen and surrounding towns.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Mitchell basin are outlined in Table 6-71.

Table 6-71 Entitlement volumes in the Mitchell basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Bairnsdale) Conversion Order 2000	9,208
Take and use licences – unregulated surface water	16,385
Total volume of water entitlements in the Mitchell basin	**25,593**

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-72.

The volume of water diverted from unregulated streams by licence holders in the Mitchell basin (8,718 ML) was less in 2013–14, compared with the volume of 11,493 ML reported in the 2012–13 Victorian Water Accounts.

Table 6-72 Allocation account balance summary for the Mitchell basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Bairnsdale	9,208	0	4,655	4,553
Take and use licences – unregulated surface water	16,385	0	8,718	7,667

The estimated volume of water harvested from small catchment dams is presented in Table 6-73.

Table 6-73 Estimated small catchment dam information for the Mitchell basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	4,218	2,109	n/a
Registered commercial and irrigation	2,915	2,449	n/a
Total	**7,133**	**4,558**	**5,564**

n/a: information not available.

6.12.3 Recycled water

The wastewater treatment plants at Bairnsdale, Lindenow and Paynesville are operated by East Gippsland Water.

All of the wastewater passing through the Paynesville treatment plants was recycled and used for applications including pasture, tree plantations, racecourses and golf courses (Table 6-74).

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. In addition to the recycled water reported in Table 6-74, 68 ML was returned to the environment from the alpine resorts during the water year.

Table 6-74 Volume of recycled water in the Mitchell basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Bairnsdale	1,443	1,436	99%	0	24	1,412	0	0	7
Lindenow	15	10	71%	0	0	10	0	0	5
Paynesville	266	207	78%	0	207	0	0	0	59
Total 2013–14	**1,724**	**1,653**	**96%**	**0**	**231**	**1,422**	**0**	**0**	**71**
Total 2012–13	1,387	1,387	100%	0	185	1,202	0	0	0

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.13 Thomson basin

The Thomson basin (Figure 6-23) is located in south-east Victoria. The Thomson and Macalister rivers join the Latrobe River before flowing into the Gippsland Lakes.

Figure 6-23 Map of the Thomson basin

6.13.1 Water resources overview

In 2013–14, rainfall in the Thomson basin ranged between 80 to 100% of the long-term average in much of the basin, with some wetter conditions (100 to 125%) in the north and north east. Catchment inflows were 65% of the long-term average, compared with 80% in 2012–13. The amount of water flowing from the Thomson basin into the Gippsland Lakes represented 68% of the total inflows in the basin in 2013–14.

Major storages in the Thomson basin started the year at 72% of capacity and were at 74% at the end of June 2014.

The year began with a 60% allocation for high reliability water shares for the Thomson/Macalister system; 100% allocation was announced by April 2014. Low reliability water shares also reached 5% by mid-April.

No urban water use restrictions applied in the Thomson basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. However, licensed surface water diverters on the Avon River experienced restrictions during 2014 with an irrigation ban starting in January upgraded to Stage 2 restrictions in March and then removed in May. An irrigation ban was also applied to Valencia Creek in January and February while all other waterways were unrestricted.

Table 6-75 shows the responsibilities of the authorities within the Thomson basin.

Table 6-75 Responsibilities for water resources management in the Thomson basin

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	Operates Lake Glenmaggie Obliged to meet passing flow requirements
Gippsland Water			Supplies towns including Sale, Maffra, Heyfield, Stratford and Boisdale	
VEWH				Holds and manages environmental entitlements in the basin
West Gippsland CMA				Manages waterways in the Thomson basin

Environmental Water Reserve

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 freshwater inputs from basins including the Thomson to function ecologically. The Upper Thomson River is a heritage river reach and its Australian grayling populations also rely on the Thomson EWR.

In 2013–14 the EWR in the Thomson basin comprised:

- the *Bulk Entitlement (Thomson River – Environment) Order 2005* comprising 10,000 ML of high reliability entitlement held by the VEWH
- the *Macalister River Environmental Entitlement 2010* comprising 12,461 ML of high reliability and 6,230 ML of low reliability water shares held by the VEWH
- 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.

6.13.2 Surface water resources

6.13.2.1 Water balance

A surface water balance for the Thomson basin is shown in Table 6-76. Irrigation water use in the Macalister Irrigation District was the source of most of the diversions within the basin.

A total volume of 189,068 ML was diverted to irrigation districts in 2013–14, lower than 2012–13. Melbourne Water's diversion from the Thomson Reservoir significantly increased to 132,197 ML in 2013–14.

Table 6-76 Balance of surface water in the Thomson basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	891,681	838,611
Volume in storage at end of year	919,542	891,681
Change in storage	**27,861**	**53,070**
Inflows		
Catchment inflow(1)	718,366	876,174
Rainfall on major storages	185,227	26,925
Return flow from irrigation	25,106	22,626
Treated effluent discharged back to river	30	216
Total inflows	**928,730**	**925,940**
Outflows		
Diversions		
Urban diversions	1,439	1,511
Transfers to Yarra River basin for urban use	132,197	25,148
Irrigation district diversions	189,068	198,851
Licensed diversions from regulated streams	19,440	21,117
Licensed diversions from unregulated streams	3,965	7,647
Small catchment dams	6,984	6,984
Total diversions	***353,093***	***261,258***
Losses		
Evaporation losses from major storages	38,719	28,776
Evaporation from small catchment dams	2,552	2,552
In-stream infiltration to groundwater, flows to floodplain and evaporation	16,298	17,460
Total losses	***57,568***	***48,787***
Water passed at outlet of basin		
River outflows to the Latrobe River	396,059	415,734
River outflows to the Lake Wellington(2)	94,148	147,091
Total water passed at outlet of basin	***490,207***	***562,825***
Total outflows	**900,869**	**872,870**

Note:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

(2) River outflows to the Lake Wellington includes Perry River volume of 25,696.44 ML

6.13.2.2 Storages and flows

The volume of water held in major storages was 919,542 ML (74% of capacity) at the end of June 2014, compared with 891,681 ML at the start of July 2013.

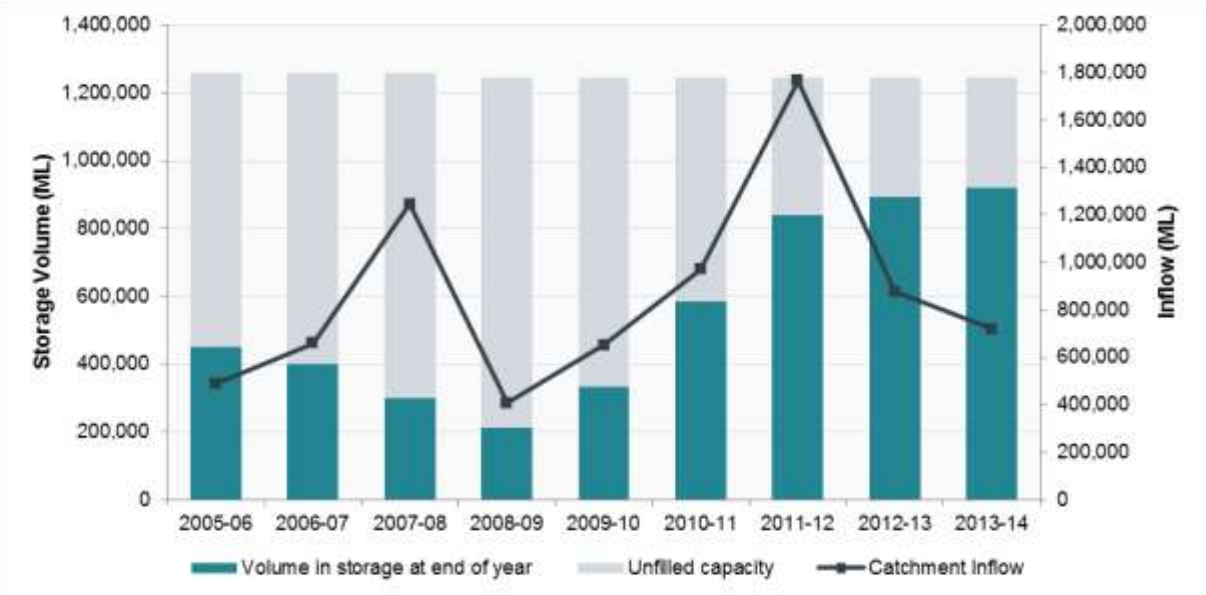
In the Thomson basin, major on-stream storages include the Thomson Reservoir and Lake Glenmaggie. Melbourne's biggest water storage, the Thomson Reservoir, began the year at 74% of capacity and increased to 76% by the end of June 2014. Lake Glenmaggie finished the year with a volume of 107,797 ML, which is 61% of its total capacity. The volume reported in the 'catchment inflow less regulated releases' column in Table 6-77 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Table 6-77 Storage volumes in the Thomson basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Lake Glenmaggie	177,640	103,993	10,183	18,786	12,406	107,797
Thomson Reservoir	1,068,000	787,688	175,044	19,933	(131,054)	811,745
Total	**1,245,640**	**891,681**	**185,227**	**38,719**	**(118,648)**	**919,542**

Catchment inflows to the Thomson basin amounted to 718,366 ML in 2013–14, which is 65% of the long-term average (Figure 6-24). The amount of water flowing from the Thomson basin into the Gippsland Lakes in 2013–14 was 490,207 ML, compared with 562,825 ML in 2012–13. This represents 68% of catchment inflows into the basin for 2013–14.

Figure 6-24 Major storages and catchment inflows in the Thomson basin



6.13.2.3 Entitlement volumes and diversions

Southern Rural Water, Gippsland Water and the Melbourne metropolitan retailers (City West Water, South East Water and Yarra Valley Water) hold bulk entitlements in the Thomson basin. Surface water is also diverted by licensed diverters, and is harvested in small catchment dams.

Entitlements include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Thomson basin are outlined in Table 6-78.

Table 6-78 Entitlement volumes in the Thomson basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Thomson Macalister – Southern Rural Water) Conversion Order 2001[1]	
High reliability water shares	147,520
Low reliability water shares	70,469
Bulk Entitlement (Thomson Macalister Towns – Gippsland Water) Conversion Order 2005	2,335
Macalister River Environmental Entitlement 2010	18,690
Subtotal: Bulk Entitlement (Thomson Macalister – Southern Rural Water) Conversion Order 2001	**239,015**
Transfer of Bulk Entitlement (Thomson River – Melbourne Retailers (combined)) Conversion Order 2001	
Transfer of Bulk Entitlement (Thomson River – Melbourne Water Corporation) Conversion Order 2001 to City West Water Limited 2006[2]	n/a
Transfer of Bulk Entitlement (Thomson River – Melbourne Water Corporation) Conversion Order 2001 to South East Water Limited 2006[2]	n/a

Transfer of Bulk Entitlement (Thomson River – Melbourne Water Corporation) Conversion Order 2001 to Yarra Valley Water Limited 2006(2)	n/a
Transfer of Bulk Entitlement (Thomson River – Melbourne Retailers (combined)) Conversion Order 2001	**171,800**
Bulk Entitlement (Thomson River – Environment) Conversion Order 2005	**10,000**
Take and use licences – unregulated surface water	**17,244**
Total volume of water entitlements in the Thomson basin	**438,059**

Notes:

(1) Under this bulk entitlement, Southern Rural Water operates Lake Glenmaggie and Cowwarr Weir to supply private diverters on the Thomson and Macalister rivers and water share holders in the Macalister Irrigation District, and to supply water to Gippsland Water's Thomson Macalister towns bulk entitlement.

(2) The Melbourne retailers hold the bulk entitlements on the Thomson River, which are assessed against a 15-year annual volume of 171,800 ML.

n/a: not applicable

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-79. The total volume of water diverted by bulk entitlement holders was higher in 2013–14 compared with the volume reported in the 2012–13 Victorian Water Accounts. The volume of water diverted from unregulated streams by licence holders in the Thomson basin was 3,965 ML, which was lower than the 2012–13 volume of 7,647 ML.

The VEWH holds environmental entitlements for the Thomson River and Macalister River, but the water available under these entitlements is used to support streamflows and is not diverted out of waterways in the basin.

Table 6-79 Allocation account balance summary for the Thomson basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Thomson Macalister – Southern Rural Water				
Water shares(1)	195,584	0	149,631	45,953
Thomson Macalister Towns – Gippsland Water	2,335	0	1,439	896
Macalister River Environmental Entitlement 2010(2)(3)	16,914	0	14,991	1,923
Operating provisions(4)	-	-	58,875	-
Diversion: Thomson Macalister – Southern Rural Water(5)			**209,945**	
Thomson River – Melbourne Retailers (combined)(6)(7)	171,800	0	132,197	39,603
Thomson River – Environment (3)	10,867	0	10,754	-
Take and use licences – unregulated surface water	17,244	0	3,965	13,278

Notes:

(1) Allocation issued includes 44,527 ML of spill allocation made available to water shares holders in 2013–14.

(2) Water use reported reflects environmental in-stream use. These amounts are not reflected in the water balance in Table 6-76 as they do not represent an actual diversion from the waterway. Unused water is available to carry over under these entitlements. Refer to Table 4-1.

(3) The environmental diversion reported here is not included in the total diversion for the Thomson Macalister – Southern Rural Water bulk entitlement as the water was not diverted out of the waterway.

(4) This reflects use of water to manage the system. It includes any loss incurred in supplying the primary entitlements.

(5) The water use reported in this line item represents the bulk diversion to supply primary entitlements and fulfil other operating requirements under the Thomson Macalister source bulk entitlement.

(6) The volume of water taken by the Melbourne metropolitan retailers under this bulk entitlement is assessed against a 15-year average annual volume of 171,800 ML. The corresponding average annual volume of diversions over the 15 years to 2013–14 was 107,251 ML.

(7) The combined volume of water taken by the Melbourne metropolitan retailers from the Thomson River basin, Yarra River basin and Silver and Wallaby creeks is assessed against a 15-year average annual volume of 555,000 ML. The corresponding average annual volume of diversions over the 15 years to 2012–13 was 403,910 ML.

The estimated volume of water harvested from small catchment dams in the Thomson basin is provided in Table 6-80.

Table 6-80 Estimated small catchment dam information for the Thomson basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	5,635	2,817	n/a
Registered commercial and irrigation	4,961	4,167	n/a
Total	**10,596**	**6,984**	**9,536**

n/a: information not available.

6.13.3 Recycled water

Gippsland Water operates four wastewater treatment plants in the Thomson basin. Recycled water is mainly used to irrigate pasture and sporting facilities such as the Maffra Recreational Reserve. The volume of wastewater produced in 2013–14 was lower than 2012–13. A total of 92% of wastewater was recycled in the basin in 2013–14 (Table 6-81).

Table 6-81 Volume of recycled water in the Thomson basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Heyfield	41	41	100%	0	41	0	0	0	0
Maffra	213	213	100%	8	205	0	0	0	0
Rawson	30	0	0%	0	0	0	0	30	0
Stratford	93	93	100%	0	93	0	0	0	0
Total 2013–14	**377**	**347**	**92%**	**8**	**339**	**0**	**0**	**30**	**0**
Total 2012–13	508	292	57%	4	288	0	0	216	0

Notes:

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

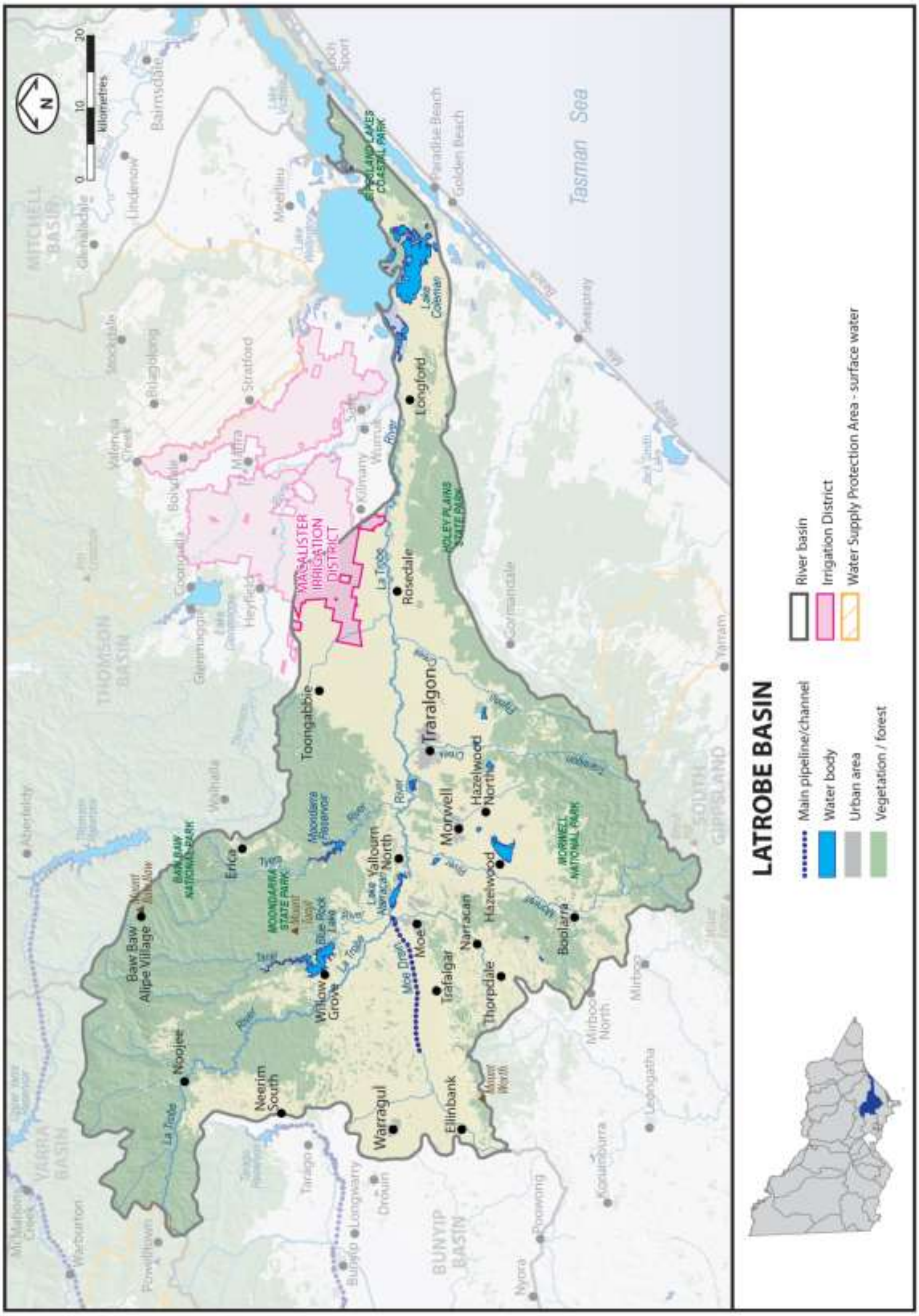
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.14 Latrobe basin

The Latrobe basin (Figure 6-25) lies between the Strzelecki Ranges and the Great Dividing Range. The Latrobe River flows east and joins the Thomson River before flowing into the Gippsland Lakes.

Figure 6-25 Map of the Latrobe basin



6.14.1 Water resources overview

In 2013–14, rainfall in the Latrobe basin was 80 to 100% of the long-term average in much of the basin, although some areas in the north and east of the basin received slightly higher-than-average rainfall (100 to 125%). The amount of water flowing from the Latrobe basin into the Gippsland Lakes (excluding the Thomson River) represented 87% of the catchment inflows in the basin in 2013–14.

The volume of water in major storages remained high throughout the year, starting and ending the year at 98% of capacity. No urban water use restrictions applied in the Latrobe basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. No restrictions on unregulated streams were applied.

Table 6-82 shows the responsibilities of the authorities within the Latrobe basin.

Table 6-82 Responsibilities for water resources management in the Latrobe basin

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 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, and other major industries	Operates Moondarra Reservoir Obliged to meet passing flow requirements
VEWH				Holds and manages environmental entitlements in the basin
West Gippsland CMA				Manages waterways in the Latrobe basin

Environmental Water Reserve

The Gippsland Lakes and the Australian grayling population 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 function ecologically. Australian grayling are listed in the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* and the Victorian *Flora and Fauna Guarantee Act 1988*.

In 2013–14, the EWR in the Latrobe basin comprised:

- the *Lower Latrobe Wetlands Environmental Entitlement 2010*[(1)] held by the VEWH which allows water to be diverted to floodplain wetlands, including Dowd Morass, Sale Common and Heart Morass when river levels are above heights as specified in the environmental entitlement
- the *Blue Rock Environmental Entitlement 2013,* providing a share of inflows equating to a long-term average of 18,737 ML per year in Blue Rock Reservoir held by the VEWH
- 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.

A total of 3,748 ML of environmental entitlement water was delivered in the Latrobe basin in 2013–14.

Note:

(1) This entitlement was originally named the *Latrobe River Environmental Entitlement 2010* and was renamed on 4 July 2013 to avoid confusion with the environmental entitlement for the Latrobe River *(Blue Rock Environmental Entitlement 2013)* allocated to implement Action 6.15 of the Gippsland Region Sustainable Water Strategy.

6.14.2 Surface water resources

6.14.2.1 Water balance

A surface water balance for the Latrobe basin is shown in Table 6-83. The major industrial water users in the basin include some electricity generators and Australian Paper. In 2013–14, these entities accounted for more than half the surface water diversions in the Latrobe basin. They also returned 45,193 ML to the Latrobe River system.

Table 6-83 Balance of surface water in the Latrobe basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	240,813	243,291
Volume in storage at end of year	241,433	240,813
Change in storage	**620**	**(2,478)**
Inflows		
Catchment inflow(1)	789,922	900,762
Rainfall on major storages	9,134	4,063
Return flow from power stations and major industry	45,193	50,880
Treated effluent discharged back to river	3,687	4,120
Total inflows	**847,935**	**959,825**
Outflows		
Diversions		
Urban and industrial diversions	108,873	112,401
Licensed diversions from regulated streams	5,196	6,007
Licensed diversions from unregulated streams	6,145	8,320
Small catchment dams	20,547	20,547
Total diversions	***140,761***	***147,275***
Losses		
Evaporation losses from major storages	13,475	7,592
Evaporation from small catchment dams	5,612	5,612
In-stream infiltration to groundwater, flows to floodplain and evaporation(2)	n/a	n/a
Total losses	***19,087***	***13,204***
Water passed at outlet of basin		
River outflows to the Gippsland Lakes (excluding Thomson River)	687,467	801,824
Total water passed at outlet of basin	***687,467***	***801,824***
Total outflows	**847,315**	**962,303**

Notes:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.
(2) No suitable model is available to make an estimate of in-stream losses.
n/a: information not available

6.14.2.2 Storages and flows

Storage levels for all major storages in the basin totalled 241,433 ML (98% of capacity) in June 2014, compared with 240,813 ML in July 2013 (Table 6-84). The volume reported in the 'catchment inflow less regulated releases' column in Table 6-84 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

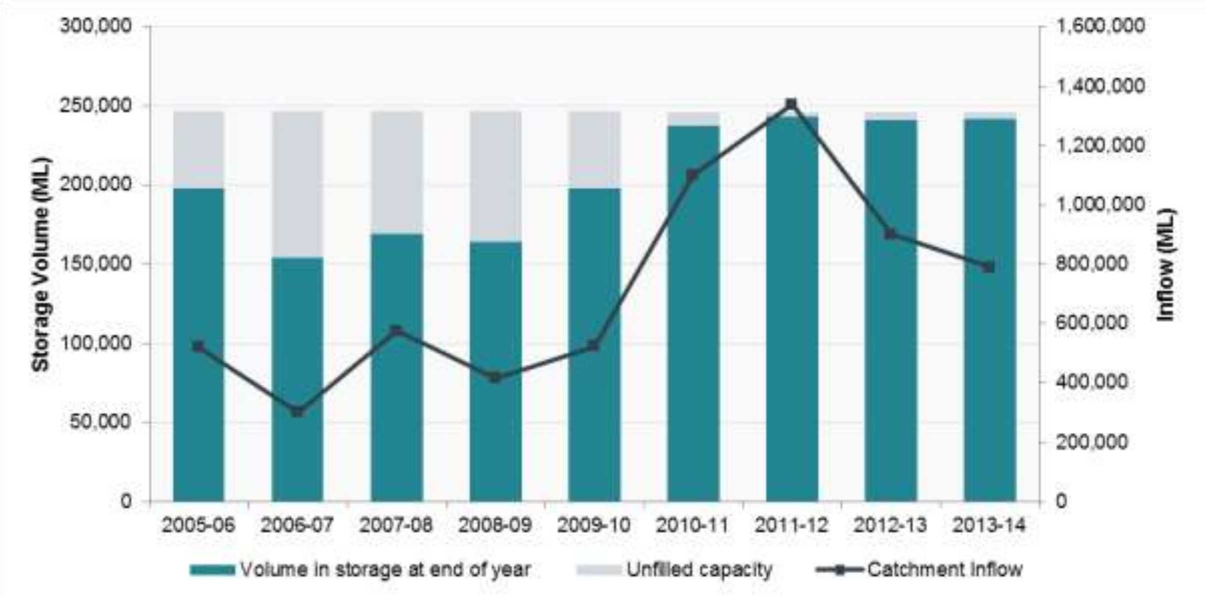
Only volumes for major on-stream storages have been included in the water balance. In the Latrobe basin, this includes Blue Rock Lake, Lake Narracan and Moondarra Reservoir. The largest storage in the basin is Blue Rock Lake, which has a capacity of approximately 208,000 ML. The volume of water held in Blue Rock Lake at the end of the year was 208,595 ML (100% of capacity).

Table 6-84 Storage volumes in the Latrobe basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Blue Rock Lake	208,188	205,668	5,746	8,372	5,553	208,595
Lake Narracan	7,230	4,845	1,778	2,362	(525)	3,736
Moondarra Reservoir	30,300	30,300	1,610	2,741	(67)	29,102
Total	**245,718**	**240,813**	**9,134**	**13,475**	**4,961**	**241,433**

Catchment inflows were 93% of the long-term average (of 847,400 ML), compared with 106% in 2012–13 (Figure 6-26). The amount of water flowing from the Latrobe basin into the Gippsland Lakes (excluding the Thomson River) decreased to 687,467 ML in 2013–14 from 801,824 ML in 2012–13.

Figure 6-26 All major storages and catchment inflows in the Latrobe basin



6.14.2.3 Entitlement volumes and diversions

In the Latrobe basin, surface water is diverted by Gippsland Water, Southern Rural Water, Latrobe Valley power stations, the VEWH and licensed diverters. Surface water is also harvested in small catchment dams.

Entitlements in the Latrobe basin include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Latrobe basin are outlined in Table 6-85.

Table 6-85 Entitlement volumes in the Latrobe basin

Water entitlements	Annual entitlement volume (ML)
Blue Rock Environmental Entitlement 2013(1)	n/a
Bulk Entitlement (Boolarra) Conversion Order 1997	145
Bulk Entitlement (Gippsland Water – Blue Rock) Conversion Order 1997	15,150
Bulk Entitlement (Erica) Conversion Order 1997	340
Bulk Entitlement (Latrobe – Southern Rural) Conversion Order 1996(2)	13,400
Latrobe Lower Wetlands Environmental Entitlement 2010(3)	n/a
Bulk Entitlement (Mirboo North) Conversion Order 1997	270
Bulk Entitlement (Moe – Narracan Creek) Conversion Order 1998	3,884
Bulk Entitlement (Moondarra Reservoir) Conversion Order 1997	62,000
Bulk Entitlement (Noojee) Conversion Order 1997	73

Latrobe basin

Bulk Entitlement (Thorpdale) Conversion Order 1997	80
Bulk Entitlement (Latrobe – Loy Yang B) Conversion Order 1996	20,000
Bulk Entitlement (Latrobe – Loy Yang A) Conversion Order 1996	40,000
Bulk Entitlement (Latrobe – Loy Yang 3/4 Bench) Conversion Order 1996	25,000
Bulk Entitlement (Latrobe – Yallourn) Conversion Order 1996	36,500
Bulk Entitlement (Latrobe Reserve) Order 2013 [(4)]	n/a
Take and use licences – unregulated surface water	18,817
Total volume of water entitlements in the Latrobe basin	**235,659**

Notes:

(1) The Blue Rock Environmental Entitlement consists of a 9% share of inflows into storage, with the actual volume available in any year varying depending on inflow conditions.

(2) This entitlement supplies water for take and use licences on the Tanjil River and Latrobe River Lower. For the 2013–14 year, 11,336 ML of entitlement was allocated for take and use licences.

(3) Use of this entitlement depends on suitable river heights, as specified in the entitlement.

(4) The Latrobe Reserve consists of a 22.73% share of inflows into Blue Rock Reservoir after passing flow requirements have been met.

n/a: not applicable

Allocation available under bulk entitlements held by water corporations, the Latrobe Valley power stations and licences in 2013–14 is shown in Table 6-86.

The Lower Latrobe Wetlands Environmental Entitlement 2010 held by the VEWH, provides for unregulated flows in the Latrobe River to be diverted to floodplain wetlands. The volume of unregulated flow available for diversion varies depending on seasonal conditions. No use was recorded against this entitlement in 2013–14.

Licence holders diverted a volume of 6,145 ML from unregulated streams in 2013–14, less than the 2012–13 volume of 8,320 ML (Table 6-86).

Table 6-86 Allocation account balance summary for the Latrobe basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Blue Rock Environmental Entitlement[(1)]	22,485	0	3,748	-
Boolarra	145	0	0	145
Gippsland Water – Blue Rock	15,150	0	3,283	11,867
Erica	340	0	96	244
Latrobe – Southern Rural Water[(2)]	12,398	0	5,196	7,202
Latrobe Lower Wetlands Environmental Entitlement[(3)]	-	0	-	-
Mirboo North	270	0	185	85
Moe – Narracan Creek	3,884	0	2,169	1,715
Moondarra Reservoir	62,000	0	46,990	15,010
Noojee[(4)]	73	0	0	73
Thorpdale	80	0	15	65
Latrobe – Loy Yang B	20,000	0	12,360	7,640
Latrobe – Loy Yang A	40,000	0	22,517	17,483
Latrobe – Loy Lang 3/4 Bench	25,000	0	0	25,000
Latrobe – Yallourn	36,500	0	21,258	15,242
Latrobe Reserve	-	-	-	-
Take and use licences – unregulated surface water	18,817	0	6,145	12,673

Notes:

(1) Allocation issued reflects the total available water for the year (including opening carryover). Water use reported reflects environmental in-stream use, this amount is not reflected in the water balance in Table 6-118 as it is not an actual diversion from the waterway. Unused water is available to carry over in this system. For details refer to Table 4-1.

(2) This represents the water allocated and used by take and use licence holders.

(3) Use of this entitlement depends on suitable river heights, as specified in the entitlement.

(4) Gippsland Water is not taking water from the Loch River under its Noojee bulk entitlement and instead supplies Noojee from Tarago Reservoir in the Bunyip basin.

The estimated volume of water harvested from small catchment dams makes up a significant portion of total surface water diversions in the Latrobe basin (Table 6-87).

Table 6-87 Estimated small catchment dam information for the Latrobe basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	13,009	6,505	11,448
Registered commercial and irrigation	16,717	14,042	14,711
Total	**29,726**	**20,547**	**26,159**

6.14.3 Recycled water

Gippsland Water treated more than 21,000 ML of wastewater in the Latrobe basin, most of which was highly saline and unsuitable for recycling and thus was discharged to Bass Strait. The volume of water recycled in 2013–14 decreased compared with 2012–13, and represented around 3% of the wastewater produced.

Table 6-88 shows the volumes of water recycled in the Latrobe basin in 2013–14.

Table 6-88 Volume of recycled water in the Latrobe basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Mirboo North	69	62	90%	10	52	0	0	0	7
Moe	2,165	0	0%	0	0	0	0	2,165	0
Morwell	608	608	100%	0	0	608	0	0	0
Dutson Downs (regional outfall sewer)	7,539	0	0%	0	0	0	0	0	7,539
Saline wastewater outfall pipeline	9,111	0	0%	0	0	0	0	0	9,111
Warragul	1,514	0	0%	0	0	0	0	1,514	0
Willow Grove	15	8	51%	0	8	0	0	7	0
Total 2013–14	**21,021**	**678**	**3%**	**10**	**60**	**608**	**0**	**3,686**	**16,657**
Total 2012–13	23,557	1,283	5%	700	28	555	0	4,120	18,154

Notes:

(1) ‘Beneficial allocation’ refers to the volume used to deliver specific environmental flow benefits.

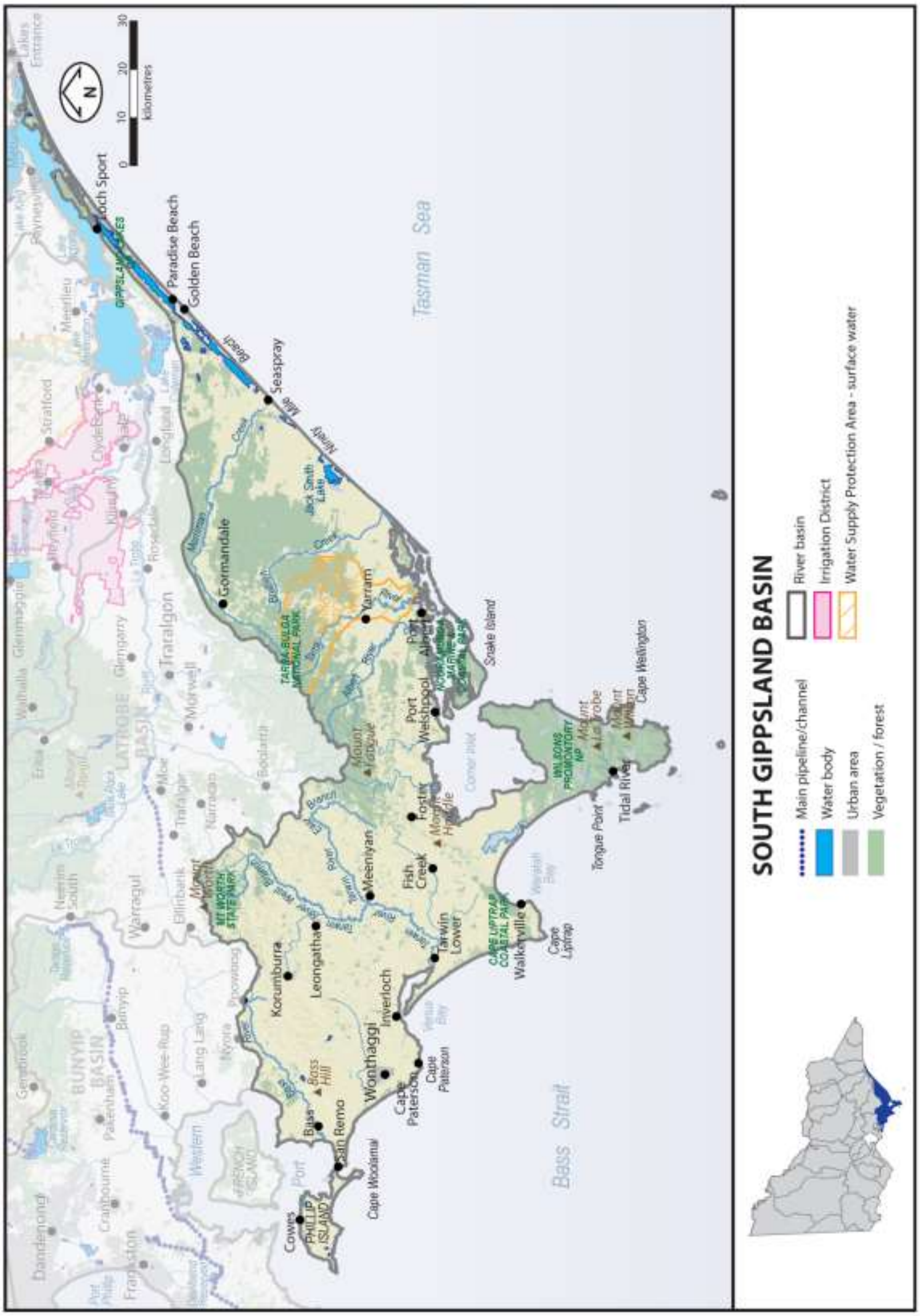
(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

(3) ‘Other’ refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.15 South Gippsland basin

The South Gippsland basin (Figure 6-27) is located in south-east Victoria. The basin includes the Bass River, which flows into Westernport Bay, and smaller rivers that flow directly into Bass Strait.

Figure 6-27 Map of the South Gippsland basin



6.15.1 Water resources overview

In 2013–14, rainfall over the South Gippsland basin was slightly above the long-term average (100 to 125%) in the east, and slightly below average in the west (80 to 100%).

Catchment inflows were 149% of the long-term average, an increase when compared with 112% in 2012–13. The amount of water flowing from the South Gippsland basin into Westernport Bay and Bass Strait represented 97% of the total inflows to the basin in 2013–14.

Irrigation bans in the Tarra and Jack rivers were lifted in July 2013. An irrigation ban was applied in Bruthen Creek from February until April 2014. All other unregulated streams in the basin were unrestricted.

No urban water use restrictions applied in the South Gippsland basin in 2013–14, with all towns remaining on permanent water savings rules throughout the year.

Table 6-89 shows the responsibilities of the authorities within the South Gippsland basin.

Table 6-89 Responsibilities for water resources management in the South Gippsland basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages 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	Obliged to meet passing flow requirements
Gippsland Water		Supplies towns in the far east of the basin including Seaspray	Obliged to meet passing flow requirements
West Gippsland CMA			Manages waterways in most of the South Gippsland basin
Melbourne Water			Manages waterways in the far west of the South Gippsland basin

Environmental Water Reserve

Important environmental assets in the South Gippsland basin depend on water from the EWR. 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 function ecologically. The Australian grayling population, listed in the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* and the Victorian *Flora and Fauna Guarantee Act 1988,* also relies on water from the South Gippsland EWR.

In 2013–14, the South Gippsland basin EWR comprised:

- 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.

6.15.2 Surface water resources

6.15.2.1 Water balance

A surface water balance for the South Gippsland basin is shown in Table 6-90. Diversions made up a relatively small proportion of total inflows, with around 3% of basin inflows diverted for consumptive use in 2013–14. Most inflows leave the basin and flow into Bass Strait or Westernport Bay.

South Gippsland basin

Table 6-90 Balance of surface water in the South Gippsland basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	6,459	8,271
Volume in storage at end of year	7,968	7,242
Change in storage	**1,509**	**(1,029)**
Inflows		
Catchment inflow(1)	1,361,864	1,017,893
Rainfall on major storages	1,845	1,416
Treated effluent discharged back to river	5,266	4,994
Total inflows	**1,368,975**	**1,024,304**
Outflows		
Diversions		
Urban diversions	7,429	7,688
Licensed diversions from unregulated streams	2,708	2,832
Small catchment dams	24,256	24,256
Total diversions	***34,393***	***34,776***
Losses		
Evaporation losses from major storages	1,503	1,867
Evaporation from small catchment dams	5,135	5,135
In-stream infiltration to groundwater, flows to floodplain and evaporation(2)	n/a	n/a
Total losses	***6,638***	***7,002***
Water passed at outlet of basin		
River outflows to Bass Strait and Western Port	1,326,435	983,554
Total water passed at outlet of basin	***1,326,435***	***983,554***
Total outflows	**1,367,466**	**1,025,333**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

(2) No suitable model is available to make an estimate of in-stream losses.\

n/a: information not available

6.15.2.2 Storages and flows

Storage levels for all major storages in the basin were 7,968 ML (76% of capacity) by the end of June 2014, compared with 6,459 ML in July 2013 (Table 6-91).

Table 6-91 shows detailed information for storages in the South Gippsland basin. The volume reported in the 'catchment inflow less regulated releases' column in Table 6-91 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

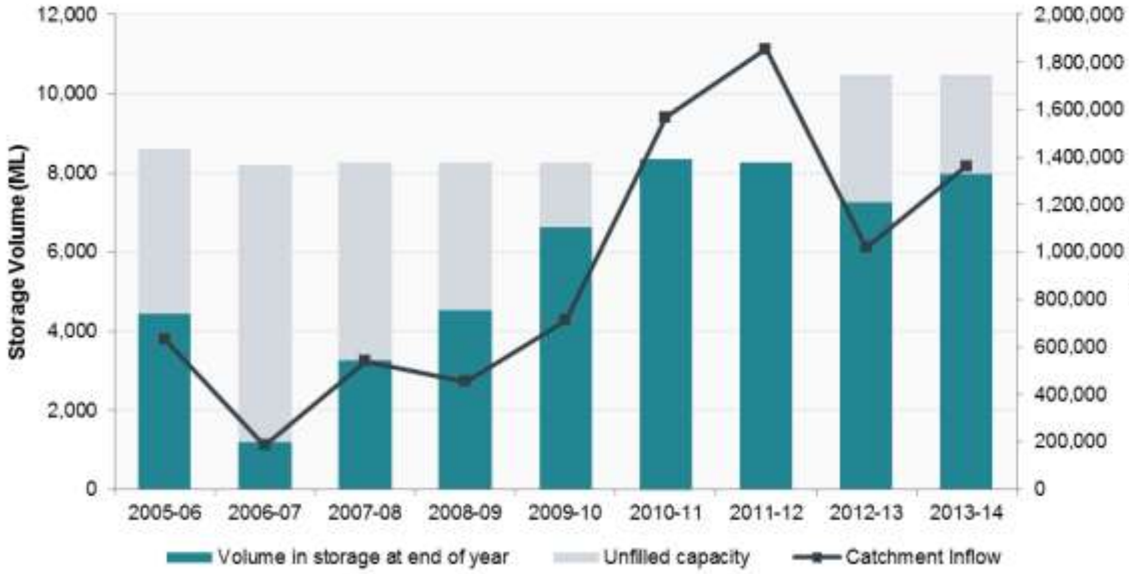
Table 6-91 Storage volumes in the South Gippsland basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Candowie Reservoir	4,463	1,234	689	634	2,128	3,417
Hyland Reservoir	671	671	100	75	(196)	500
Lance Creek Reservoir	4,200	3,737	867	651	(648)	3,304
Western Reservoir	1,137	817	190	143	(117)	747
Total	**10,471**	**6,459**	**1,845**	**1,503**	**1,166**	**7,968**

Catchment inflows were 1,361,864 ML or 149% of the long-term average (of 911,500 ML), an increase from 112% of the average in 2012–13 (Figure 6-28).

The amount of water flowing from the South Gippsland basin into Westernport Bay and Bass Strait was 1,326,435 ML in 2013–14. This represents 97% of the total inflows into the basin.

Figure 6-28 All major storages and catchment inflows in the South Gippsland basin



6.15.2.3 Entitlement volumes and diversions

In the South Gippsland basin, surface water is diverted by Gippsland Water, South Gippsland Water and Westernport Water. Melbourne Water may source desalinated seawater from the Wonthaggi Desalination Plant in the South Gippsland basin to supplement surface water supplies from the Melbourne headworks. Surface water is also diverted by licensed diverters and harvested in small catchment dams.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the South Gippsland basin are outlined in Table 6-92.

South Gippsland basin

Table 6-92 Entitlement volumes in the South Gippsland basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Devon North Alberton – Yarram and Port Albert) Conversion Order 1997	**853**
Bulk Entitlement (Dumbalk) Conversion Order 1997	**100**
Bulk Entitlement (Fish Creek) Conversion Order 1997	**251**
Bulk Entitlement (Foster) Conversion Order 1997	**326**
Bulk Entitlement (Korumburra) Conversion Order 1997	**1,000**
Bulk Entitlement (Leongatha) Conversion Order 1997	**2,476**
Bulk Entitlement (Loch, Poowong and Nyora) Conversion Order 1997	**420**
Bulk Entitlement (Meeniyan) Conversion Order 1997	**200**
Bulk Entitlement (Seaspray) Conversion Order 1997	**61**
Bulk Entitlement (Toora Port Franklin – Welshpool and Port Welshpool) Conversion Order 1997	**1,617**
Bulk Entitlement (Westernport) Conversion Order 1997	**2,911**
Bulk Entitlement (Westernport – Bass River) Order 2009	**3,000**
Bulk Entitlement (Wonthaggi – Inverloch) Conversion Order 1997	**5,600**
Bulk Entitlement (Desalinated Water – Melbourne Retailers (combined))[1]	
Bulk Entitlement (Desalinated Water – City West Water Limited) Order 2010	n/a
Bulk Entitlement (Desalinated Water – South East Water Limited) Order 2010	n/a
Bulk Entitlement (Desalinated Water – Yarra Valley Water Limited) Order 2010	n/a
Subtotal Bulk Entitlement (Desalinated Water – Melbourne Retailers (combined))	**150,000**
Take and use licences – unregulated surface water	**12,843**
Total volume of water entitlements in the South Gippsland basin	**181,658**

Note:

(1) Under this entitlement the authorities may take up to a total of 150,000 ML in any one year and up to 750,000 ML in any consecutive five-year period.

n/a: not applicable

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-93. As in previous years, the volume of water diverted from unregulated streams by take and use licence holders in the South Gippsland basin (Table 6-93) remains significantly lower than the total licence volume.

Table 6-93 Allocation account balance summary for the South Gippsland basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Devon North Alberton – Yarram and Port Albert	853	0	425	428
Dumbalk	100	0	20	80
Fish Creek	251	0	115	136
Foster	326	0	169	157
Korumburra	1,000	0	685	315
Leongatha	2,476	0	1,626	850
Loch, Poowong and Nyora	420	0	254	166
Meeniyan	200	0	59	141
Seaspray	61	0	32	29
Toora Port Franklin – Welshpool and Port Welshpool	1,617	0	537	1,080
Westernport	2,911	0	1,199	1,712
Westernport – Bass River	3,000	0	558	2,442
Wonthaggi – Inverloch	3,800	0	1,750	2,050
Desalinated water – Melbourne Retailers[1]	0	0	0	0
Take and use licences – unregulated surface water	12,843	0	2,708	10,135

Note:
(1) The Minister for Water made a zero desalinated water order for the 2013–14 year.

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the South Gippsland basin (Table 6-94).

Table 6-94 Estimated small catchment dam information for the South Gippsland basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	22,962	11,481	17,680
Registered commercial and irrigation	15,208	12,775	11,710
Total	**38,170**	**24,256**	**29,391**

6.15.3 Recycled water

South Gippsland Water is responsible for nine wastewater treatment plants within the basin, with all wastewater being recycled at the Waratah Bay, Welshpool and Yarram/Tarraville treatment plants. 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. Gippsland Water operates the Seaspray treatment plant and reuses all recycled water to irrigate pasture.

Across the basin, 7% of wastewater was reused in 2013–14, compared with 8% in 2012–13 (Table 6-95).

Table 6-95 Volume of recycled water in the South Gippsland basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Coronet Bay	211	203	96%	0	203	0	0	0	8
Cowes	1,348	69	4%	55	4	0	10	1,287	(8)
Foster	161	0	0%	0	0	0	0	161	0
Korumburra	732	0	0%	0	0	0	0	732	0
Leongatha Domestic	666	0	0%	0	0	0	0	666	0
Leongatha Trade Waste	931	0	0%	0	0	0	0	931	0
Meeniyan	34	8	22%	3	5	0	0	26	0
Seaspray	8	8	100%	0	8	0	0	0	0
Toora	52	4	7%	4	0	0	0	48	0
Waratah Bay	13	13	100%	0	13	0	0	0	0
Welshpool	9	9	100%	0	9	0	0	0	0
Wonthaggi/Cape Paterson/Inverloch	1,429	13	1%	0	13	0	0	1,416	0
Yarram/Tarraville	62	62	100%	0	62	0	0	0	0
Total 2013–14	**5,656**	**389**	**7%**	**62**	**317**	**0**	**10**	**5,267**	**0**
Total 2012–13	5,337	416	8%	73	331	0	12	4,994	(74)

Notes:
(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.16 Bunyip basin

The Bunyip basin (Figure 6-29) is located in south-east Victoria. The basin includes the Lang Lang and Bunyip rivers which flow into Westernport Bay, and the Patterson River which flows into Port Phillip Bay. The south-eastern suburbs of Melbourne are located within the Bunyip basin.

Figure 6-29 Map of the Bunyip basin

6.16.1 Water resources overview

In 2013–14, rainfall in much of the basin was between 100 to 125% of the long-term average, with small areas in the north and east experiencing slightly drier conditions (80 to 100% average rainfall). Inflows to the Bunyip basin in 2013–14 were 158% of the long-term average, compared with 119% in 2012–13. The amount of water flowing from the Bunyip basin into Port Phillip Bay, Westernport Bay and Bass Strait represented approximately 97% of the catchment inflows in the basin.

No urban water use restrictions applied in the Bunyip basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. Main Creek was subject to irrigation bans between February and May 2014, while all other unregulated waterways were unrestricted.

Table 6-96 shows the responsibilities of the authorities within the Bunyip basin.

Table 6-96 Responsibilities for water resources management in the Bunyip basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages surface water and 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
VEWH			Holds and manages environmental entitlements in the basin

Note:
(1) Metropolitan Melbourne is mostly supplied from the Yarra and Thomson basins.

Environmental Water Reserve

Westernport Bay is an important environmental asset that depends 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 function ecologically. Additionally, there is a nationally threatened population of dwarf galaxias and Australian grayling in the Tarago and Bunyip systems.

In 2013–14, the Bunyip basin EWR comprised:

- the *Tarago and Bunyip Rivers Environmental Entitlement 2009* comprising 10.3% of inflows (on average 3,000 ML per year) held by the VEWH
- water set aside for the environment through the operation of passing flows released as a condition of the consumptive bulk entitlement held by 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.

A total of 1,784 ML of environmental entitlement water was delivered in the Bunyip basin in 2013–14.

6.16.2 Surface water resources

6.16.2.1 Water balance

A surface water balance for the Bunyip basin is shown in Table 6-97.

Bunyip basin

Table 6-97 Balance of surface water in the Bunyip basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	31,355	22,434
Volume in storage at end of year	38,038	31,355
Change in storage	**6,683**	**8,921**
Inflows		
Catchment inflow(1)	854,730	645,007
Rainfall on major storages	3,365	2,290
Treated wastewater discharged back to river	9,631	8,524
Total inflows	**867,726**	**655,821**
Outflows		
Diversions		
Urban diversions	10,454	10,033
Licensed diversions from unregulated streams	4,485	4,577
Small catchment dams	15,525	15,525
Total diversions	***30,463***	***30,134***
Losses		
Evaporation losses from major storages	1,867	1,756
Losses from small catchment dams	556	556
In-stream infiltration to groundwater, flows to floodplain and evaporation	1,237	1,606
Total losses	***3,659***	***3,918***
Water passed at outlet of basin		
River outflows to the Bass Strait, Port Phillip Bay and Western Port	826,921	612,847
Total water passed at outlet of basin	***826,921***	***612,847***
Total outflows	**861,043**	**646,900**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.16.2.2 Storages and flows

The Tarago Reservoir is the only major on-stream storage in the Bunyip basin. It ended the year at 38,038 ML, or 101% of its capacity of 37,580 ML (Table 6-98). The volume reported in the 'catchment inflow less regulated releases' column in Table 6-98 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Cardinia Reservoir is an off-channel storage located within the Bunyip basin. It stores water harvested and transferred from the Yarra basin and is therefore not included in the Bunyip basin figures.

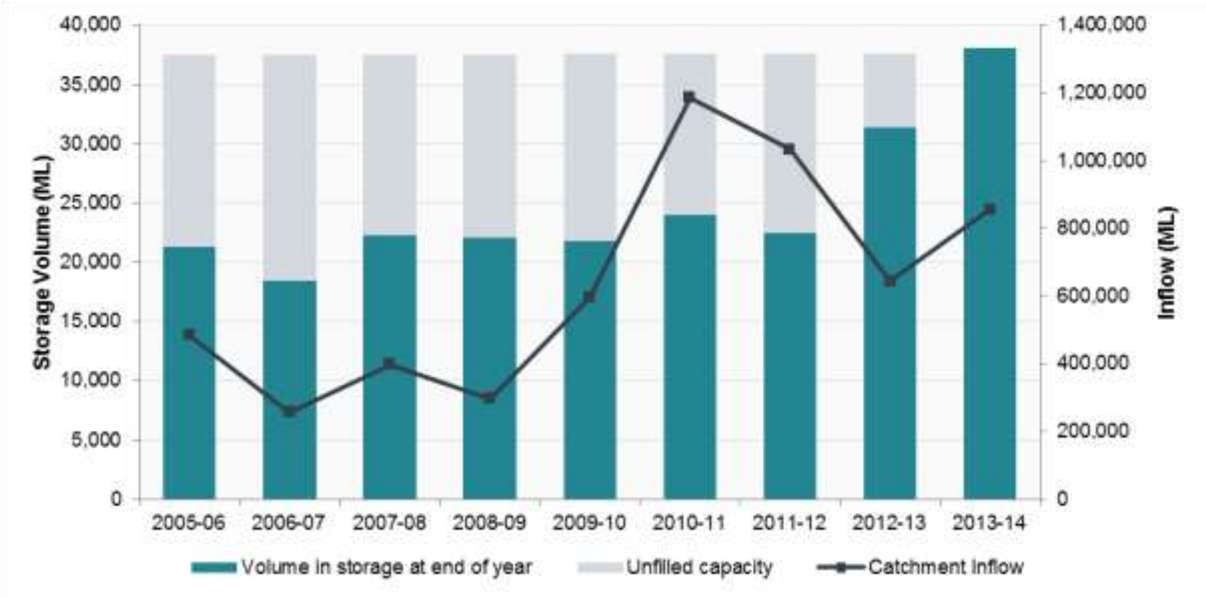
Table 6-98 Storage volumes in the Bunyip basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Tarago Reservoir	37,580	31,355	3,365	1,867	5,185	38,038
Total	**37,580**	**31,355**	**3,365**	**1,867**	**5,185**	**38,038**

Catchment inflows were 854,730 ML or 158% of the long-term average (of 541,000 ML), an increase from 119% of the long-term average in 2012–13 (Figure 6-30).

The amount of water flowing from the Bunyip basin into Port Phillip Bay, Westernport Bay and Bass Strait was 826,921 ML in 2013–14, compared with 612,847 ML in 2012–13. This represents 97% of the catchment inflows into the basin for 2013–14.

Figure 6-30 All major storages and catchment inflows in the Bunyip basin



6.16.2.3 Entitlement volumes and diversions

Melbourne metropolitan retailers (City West Water, South East Water, Western Water and Yarra Valley Water), Gippsland Water and Southern Rural Water hold bulk entitlements to divert surface water in the Bunyip basin. Surface water is also diverted by licence holders and is harvested in small catchment dams.

Entitlements to water in the Bunyip basin include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Bunyip basin are outlined in Table 6-99.

The VEWH also holds an environmental entitlement in the Bunyip basin, but the water available under the entitlement is used to support streamflows and the water is not diverted out of the waterway.

Table 6-99 Entitlement volumes in the Bunyip basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Tarago River – Gippsland Water) Conversion Order 2009[(1)]	**4,825**
Bulk Entitlement (Tarago River – Southern Rural Water) Conversion Order 2009[(2)]	**1,260**
Bulk Entitlement Tarago and Bunyip Rivers – Melbourne Retailers (combined)	
Bulk Entitlement (Tarago and Bunyip Rivers – Melbourne Water for City West Water Limited) Conversion Order 2009	n/a
Bulk Entitlement (Tarago and Bunyip Rivers – Melbourne Water for South East Water Limited) Conversion Order 2009	n/a
Bulk Entitlement (Tarago and Bunyip Rivers – Melbourne Water for Yarra Valley Water Limited) Conversion Order 2009	n/a
Tarago and Bunyip Rivers – Melbourne Retailers (combined)[(3)]	***30,510***
Tarago and Bunyip Rivers Environmental Entitlement 2009[(4)]	**n/a**
Take and use licences – unregulated surface water	**18,985**
Total volume of water entitlements in the Bunyip basin	**55,580**

Note:

(1) The maximum volume that can be taken each year is 285 ML plus 20,350 ML over any five-year period (4,550 ML annual average).

(2) The maximum volume that can be taken over any five-year period is 6,300 ML (1,260 ML annual average).

(3) The Melbourne retailers, combined, can take from the waterway an average annual amount of up to 30,510 ML over any consecutive five-year period

(4) The Tarago and Bunyip Rivers Environmental Entitlement consists of a 10.3% share of inflows into storage, with the actual volume available in any year varying depending on inflow conditions.

n/a: not applicable

The *Tarago and Bunyip Rivers Environmental Entitlement 2009* provides the VEWH with a 10.3% share of inflows to Tarago Reservoir. The water available under the entitlement is used to support streamflows and is not diverted out of the waterway.

Bunyip basin

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-100. The total volume of water diverted by bulk entitlement holders was similar in 2013–14 compared with the amount reported in the 2012–13 Victorian Water Accounts.

The volume of water diverted from unregulated streams by licence holders in the Bunyip basin in 2013–14 was similar to the amount of 4,577 ML reported in 2012–13 (Table 6-100).

Table 6-100 Allocation account balance summary for the Bunyip basin

Water entitlement	Allocation issued (ML)	Net trade (ML) in / (out)	Water use (ML)	End-of-season forfeitures (ML)
Tarago River – Gippsland Water	4,825	0	3,491	1,334
Tarago River – Southern Rural Water(1)	1,260	0	0	1,260
Tarago River – Melbourne Metropolitan Retailers	30,510	0	6,963	23,547
Tarago and Bunyip Rivers Environmental Entitlement(2)	4,784	0	1,784	3,000
Take and use licences – unregulated surface water	18,985	0	4,485	14,501

Notes:

(1) Southern Rural Water did not take any water under this entitlement for supply to licensed diverters downstream of Tarago Reservoir in 2013–14.

(2) Allocation represents the share of available water, net spills and opening carryover. Water use reported reflects environmental in-stream use, this amount is not reflected in the water balance in Table 6-97 as it does not reflect an actual diversion from the waterway. Unused water is available to carry over in this system. For details refer to Table 4-1.

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the Bunyip basin (Table 6-101).

Table 6-101 Estimated small catchment dam information for the Bunyip basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	8,026	4,013	5,939
Registered commercial and irrigation	13,704	11,512	10,141
Total	**21,730**	**15,525**	**16,080**

6.16.3 Recycled water

Gippsland Water, South East Water and Melbourne Water operate wastewater treatment plants within the Bunyip basin. Overall, 5% of wastewater was recycled for off-site purposes.

The largest treatment plant is the Eastern Treatment Plant operated by Melbourne Water, which recycled 4% of its total wastewater volume of 143,341 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 6-102 shows the volume of water recycled in the Bunyip basin in 2013–14.

Table 6-102 Volume of recycled water in the Bunyip basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)					Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				To retailers	Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Blind Bight	264	264	77%	0	204	0	0	60	0	0
Boneo	3,325	741	22%	0	741	0	0	0	2,584	0
Drouin	690	71	10%	0	0	71	0	0	619	0
Eastern Treatment Plant	143,341	17,886	4%	5,636	0	0	0	12,250	0	125,455
Kooweerup	189	54	29%	0	0	54	0	0	152	(17)
Lang Lang	81	54	67%	0	54	0	0	0	27	0
Longwarry	224	141	63%	0	0	141	0	0	102	(19)
Mt Martha	6,339	683	1%	0	47	0	0	636	5,656	0
Neerim South	43	0	0%	0	0	0	0	0	43	0
Pakenham	1,106	643	57%	0	167	458	0	18	0	463
Somers	884	387	41%	0	334	30	0	23	448	49
Total 2013–14	**156,486**	**20,924**	**5%**	**5,636**	**1,547**	**754**	**0**	**12,987**	**9,631**	**125,931**
Total 2012–13	158,399	24,524	6%	6973	1,798	607	0	15,146	8,524	125,351

Notes:

(1) ‘Beneficial allocation’ refers to the volume used to deliver specific environmental flow benefits.

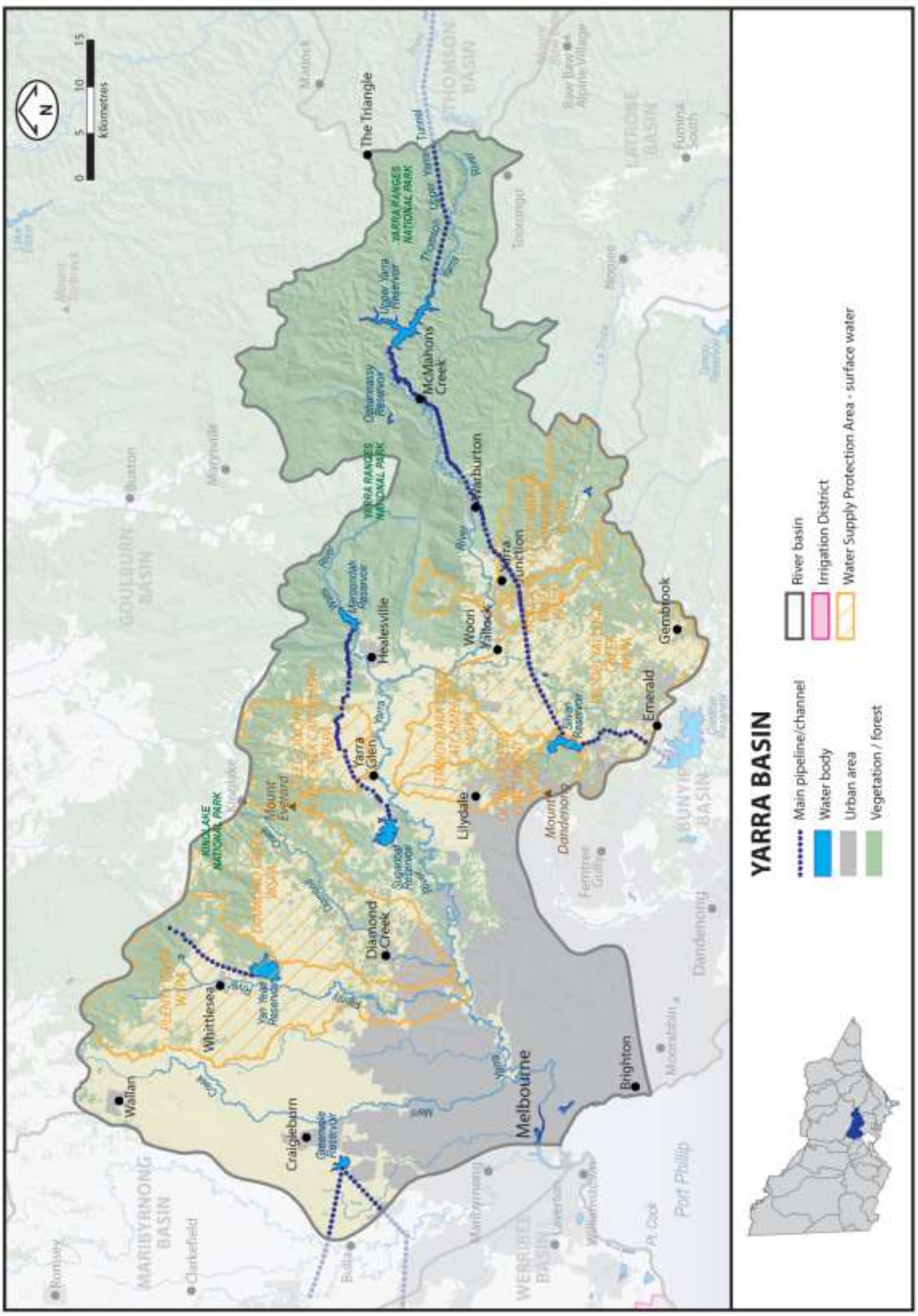
(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

(3) ‘Other’ refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.17 Yarra basin

The Yarra basin (Figure 6-31) is located in south-east Victoria. The Yarra River originates in the Yarra Ranges National Park and flows through the heart of Melbourne before reaching Port Phillip Bay.

Figure 6-31 Map of the Yarra basin



6.17.1 Water resources overview

In 2013–14, rainfall across the Yarra basin was 80 to 100% of the long-term average in much of the basin, although its south-west area received up to 100 to 125% of average rainfall. Catchment inflows were 66% of the long-term average. While this was a decrease from the previous year's inflows of 87%, it was the fourth consecutive year that inflows to the Yarra basin were more than 50% of the long-term average following five years of very low flows.

The volume of water in major storages in the Yarra basin finished the year similar to June 2013 at 66% capacity.

No urban water use restrictions applied in the Yarra basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. An irrigation ban was in place in Pauls Creek throughout the year, while other restrictions were applied to several private diversions in the Yarra basin over the summer months, including Yarra River Upper and Yarra River Lower.

Table 6-103 shows the responsibilities of the authorities within the Yarra basin.

Table 6-103 Responsibilities for water resources management in the Yarra basin

Authority	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	
VEWH			Holds and manages environmental entitlements in the basin

Note:
(1) Melbourne is also supplied from the Thomson and Bunyip basins.

Environmental Water Reserve

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 2013–14, the Yarra basin EWR comprised:

- the *Yarra River Environmental Entitlement 2006* comprising 17,000 ML of high reliability entitlement held by the VEWH and 55 ML of unregulated flows
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by the Melbourne metropolitan retailers
- water set aside for the environment through the operation of streamflow management plans
- 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.

A total of 16,835 ML of environmental entitlement water was delivered in the Yarra basin in 2013–14.

6.17.2 Surface water resources

6.17.2.1 Water balance

A surface water balance for the Yarra basin is shown in Table 6-104.

Table 6-104 Balance of surface water in the Yarra basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	133,113	196,989
Volume in storage at end of year	144,976	133,113
Change in storage	**11,863**	**(63,876)**
Inflows		
Catchment inflow(1)	699,325	914,537
Rainfall on major storages	11,078	10,743
Transfers from Thomson	132,197	25,148
Transfers from Goulburn (Sliver and Wallaby Creeks)	1,880	1,071
Transfers from Goulburn via North-South pipeline(2)	0	0
Treated effluent discharged back to river	0	0
Total inflows	**844,480**	**951,499**
Outflows		
Diversions		
Urban diversions	384,881	325,855
Licensed diversions from unregulated streams	8,624	9,137
Small catchment dams	15,824	15,824
Total diversions	**409,329**	**350,816**
Losses		
Evaporation losses from major storages	11,390	12,496
Evaporation from small catchment dams	1,268	1,268
In-stream infiltration to groundwater, flows to floodplain and evaporation(3)	n/a	n/a
Total losses	**12,658**	**13,765**
Water passed at outlet of basin		
River outflows to Port Phillip Bay	410,630	650,795
Total water passed at outlet of basin	**410,630**	**650,795**
Total outflows	**832,617**	**1,015,375**

Notes:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.
(2) There were no transfers from the Goulburn basin via the North-South pipeline in the 2013–14 water year.
(3) No suitable model is available to make an estimate of in-stream losses.
n/a: information not available

6.17.2.2 Storages and flows

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 and Yan Yean Reservoir are off-stream storages but have dual roles to harvest water and act as seasonal balancing reservoirs. Silvan 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 in the basin were 466,201 ML (66% of capacity) by the end of June 2014, compared with 463,871 ML in July 2013 (Table 6-105). The volume reported in the 'catchment inflow less regulated releases' column in Table 6-105 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

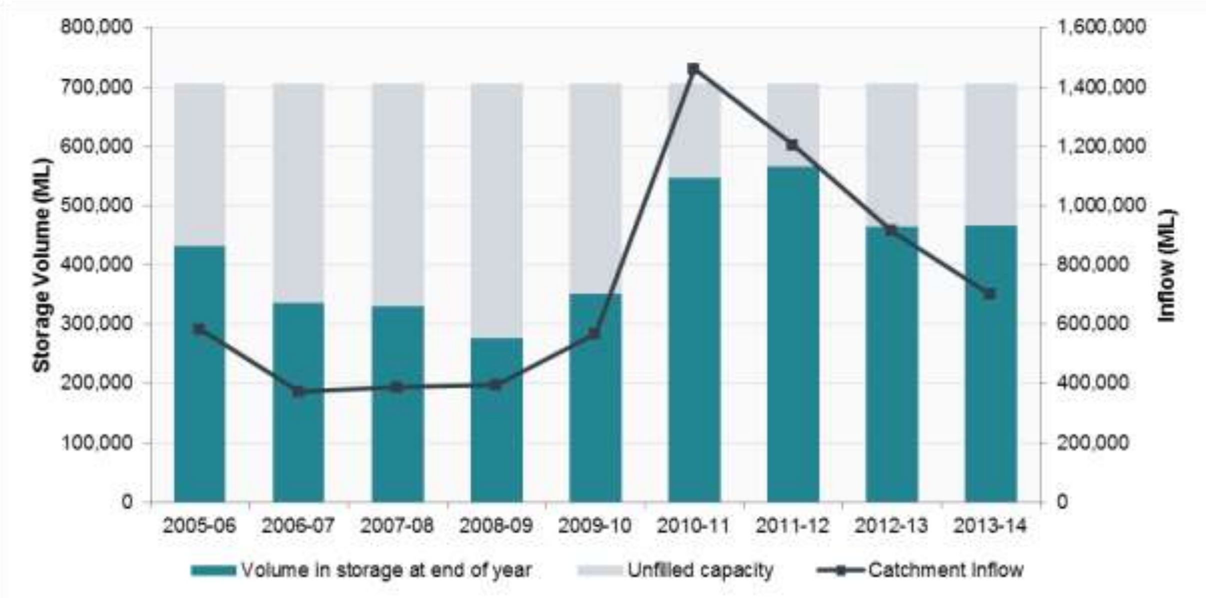
Table 6-105 Storage volumes in the Yarra basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Maroondah Reservoir	22,179	7,304	1,667	1,574	2,338	9,735
O'Shannassy Reservoir	3,123	2,339	414	238	725	3,240
Upper Yarra Reservoir	200,579	96,724	5,653	5,070	7,844	105,151
Yan Yean Reservoir	30,266	26,746	3,344	4,508	1,268	26,850
Total on-stream storages	**256,147**	**133,113**	**11,078**	**11,390**	**12,175**	**144,976**
Off-stream storages						
Cardinia Reservoir	286,911	208,916	9,984	7,643	(26,973)	184,284
Greenvale Reservoir	26,839	20,112	768	1,837	(1,571)	17,472
Silvan Reservoir	40,445	33,146	3,594	2,357	1,269	35,652
Sugarloaf Reservoir	96,253	68,584	2,956	4,192	16,469	83,817
Total off-stream storages	**450,448**	**330,758**	**17,302**	**16,029**	**(10,806)**	**321,225**
Total	**706,595**	**463,871**	**28,380**	**27,419**	**1,369**	**466,201**

Catchment inflows to the Yarra basin during 2013–14 were 699,325 ML, or 66% of the long-term average (of 1,054,000 ML). This is lower than 2012–13 when catchment inflows were 914,537 ML or 87% of the long-term average (Figure 6-32).

The amount of water flowing from the Yarra basin into Port Phillip Bay was 410,630 ML in 2013–14. This represents 59% of the catchment inflows to the basin, compared with 71% in 2012–13.

Figure 6-32 All major storages and catchment inflows in the Yarra basin



Only volumes for major on-stream storages have been included in the water balance: major off-stream storages such as Cardinia, Sugarloaf, Greenvale and Silvan reservoirs have not been included. The volume of water in the major on-stream storages was 144,976 ML in June 2014, compared with 133,113 ML in July 2013.

6.17.2.3 Entitlement volumes and diversions

The Melbourne metropolitan retailers (City West Water, South East Water, Western Water and Yarra Valley Water) hold bulk entitlements to divert surface water in the Yarra basin. Surface water is also diverted out of waterways by licence holders and harvested in small catchment dams.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Yarra basin are outlined in Table 6-106.

Table 6-106 Entitlement volumes in the Yarra basin

Water entitlements	Annual entitlement volume (ML)
Yarra River – Melbourne Retailers (combined)[1]	
Bulk Entitlement (Yarra River – Melbourne Water for City West Water Limited) Conversion Order 2006[1]	n/a
Bulk Entitlement (Yarra River – Melbourne Water for South East Water Limited) Conversion Order 2006[1]	n/a
Bulk Entitlement (Yarra River – Melbourne Water for Yarra Valley Water Limited) Conversion Order 2006[1]	n/a
Yarra River – Melbourne Retailers (combined)	**400,000**
Bulk Entitlement (Melbourne Headworks System – Barwon Water) Order 2010[2]	**16,000**
Bulk Entitlement (Melbourne Headworks System – South Gippsland Water) Order 2010[2]	**5,000**
Bulk Entitlement (Melbourne Headworks System – Western Water) Order 2010[2]	**18,250**
Bulk Entitlement (Melbourne Headworks System – Westernport Water) Order 2010[2]	**1,000**
Bulk Entitlement (Yarra Environment Entitlement) 2006	
High reliability entitlement	17,000
Unregulated surface water	55
Subtotal: Bulk Entitlement (Yarra Environment Entitlement) 2006	**17,055**
Take and use licences – unregulated surface water	**42,889**
Total volume of water entitlements in the Yarra basin	**459,944**

Notes:

(1) The Melbourne retailers hold the bulk entitlements on the Yarra River which are assessed against a 15-year annual volume of 400,000 ML.

(2) These bulk entitlements are not included in the totals for Annual entitlement volume as the entitlement volume represents the water authorities' right to take water from the Greater Yarra headworks system (which is supplied by the Yarra River Bulk Entitlement as well as other entitlements in the Thomson and Bunyip basins).

n/a: not applicable

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-107. The VEWH holds an environmental entitlement in the Yarra basin, but the water available under the entitlement is not diverted out of the waterway.

The total volume of water diverted from unregulated streams by licence holders in the Yarra basin was lower in 2013–14, compared with the volume reported in the 2012–13 Victorian Water Accounts.

Table 6-107 Allocation account balance summary for the Yarra basin

Water entitlement	Allocation issued	Net trade in / (out)	Water use	End-of-season forfeitures
Yarra River – Melbourne Retailers[1][2]	400,000	0	250,804	149,196
Melbourne Headworks System – Barwon Water[3]	16,000	0	0	16,000
Melbourne Headworks System – South Gippsland Water[3]	5,000	0	0	5,000
Melbourne Headworks System – Western Water[3]	18,250	0	3,316	14,934
Melbourne Headworks System – Westernport Water[3]	1,000	0	0	1,000
Yarra Environment Entitlement[4]	17,000	0	16,835	-
Take and use licences – unregulated surface water	42,986	0	8,624	34,362

Notes:

(1) The volume of water taken by the Melbourne metropolitan retailers under this bulk entitlement is assessed against a 15-year average annual volume of 400,000 ML. The corresponding average annual volume of diversions over the 15 years to 2013–14 was 292,385 ML.

(2) The combined volume of water taken by the Melbourne metropolitan retailers from the Thomson River basin, Yarra River basin and Silver and Wallaby creeks is assessed against a 15-year average annual volume of 555,000 ML. The corresponding average annual volume of diversions over the 15 years to 2013–14 was 403,910 ML.

(3) The volume of water use under these entitlements represents the amount taken from the Greater Yarra headworks system and is not recorded as a diversion from the waterway for the purposes of the water balance in Table 6-104.

(4) Water use reported reflects environmental in-stream use. This amount is not reflected in the water balance in Table 6-104 as it does not reflect an actual diversion from the waterway. Unused water is available to carry over in this system. Please refer to Table 4-1.

The estimated volume of water harvested from small catchment dams in the Yarra basin is provided in Table 6-108.

Table 6-108 Estimated small catchment dam information for the Yarra basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,524	5,262	n/a
Registered commercial and irrigation	12,574	10,562	n/a
Total	**23,098**	**15,824**	**17,092**

n/a: information not available

6.17.3 Recycled water

Yarra Valley Water operates nine wastewater treatment plants within the Yarra basin. A summary of the volume of recycled water is provided in Table 6-109.

Wastewater was reused at six of the plants in 2013–14. Compared with 2012–13, the volume of wastewater entering the treatment plants and the volume of water recycled increased during the year. Overall, 10% of wastewater was reused in the basin, a slight increase from the 9% recycled in 2012–13.

Table 6-109 shows the volumes of water recycled in the Yarra basin in 2013–14.

Table 6-109 Volume of recycled water in the Yarra basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Aurora	932	135	8%	0	77	0	58	0	797
Brushy Creek	3,928	810	1%	36	0	0	774	0	3,118
Craigieburn	824	465	6%	52	0	0	413	0	359
Healesville	453	83	0%	0	0	0	83	0	370
Lilydale	2,927	853	10%	279	0	0	574	0	2,074
Monbulk	23	0	0%	0	0	0	0	0	23
Upper Yarra	874	142	0%	0	0	0	142	0	732
Wallan	762	499	65%	1	498	0	0	0	263
Whittlesea	266	147	48%	91	37	0	19	0	119
Total 2013–14	**10,989**	**3,134**	**10%**	**459**	**612**	**0**	**2,063**	**0**	**7,855**
Total 2012–13	10,447	2,687	9%	453	449	0	1,785	0	7,760

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

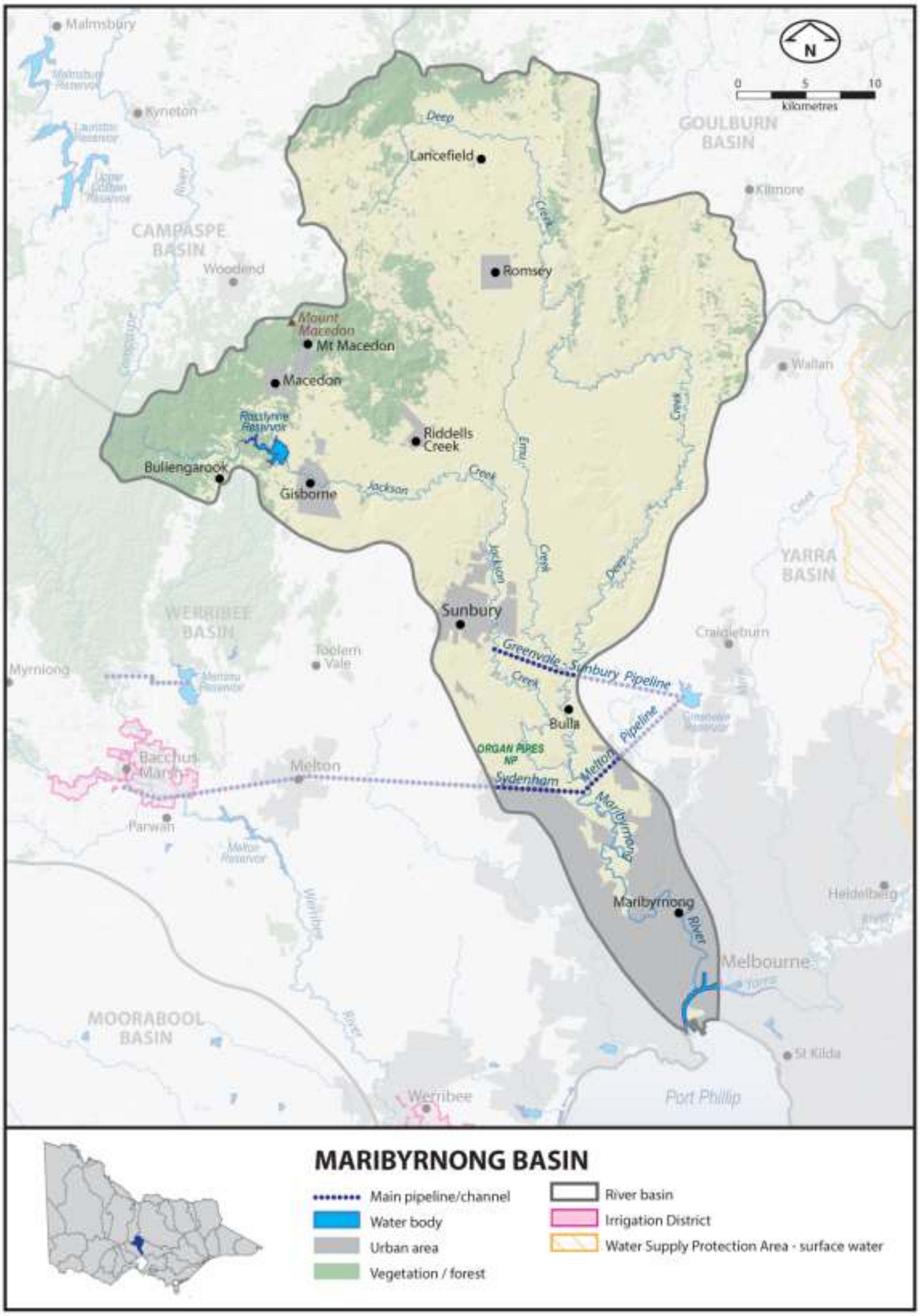
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.18 Maribyrnong basin

The Maribyrnong basin (Figure 6-33) is located north of Melbourne in central Victoria. The headwaters are located near Lancefield and Macedon, and the Maribyrnong River flows through Melbourne before joining the Yarra estuary just upstream of Port Phillip Bay.

Figure 6-33 Map of the Maribyrnong basin



6.18.1 Water resources overview

Rainfall across the Maribyrnong basin in 2013–14 was between 80 to 100% of the long-term average. Catchment inflows were 39% of the long-term average, significantly lower than in 2012–13 when inflows were 72% of the long-term average.

The storage volume in Rosslynne Reservoir started the year at 86% of capacity and held 75% at the end of June 2014.

No urban water use restrictions applied in the Maribyrnong basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. However, licensed surface water users in some areas of the Maribyrnong basin were subject to restrictions: this peaked with 11 irrigation bans during March and April 2014. By June all unregulated streams were again unrestricted.

Table 6-110 shows the responsibilities of the authorities within the Maribyrnong basin.

Table 6-110 Responsibilities for water resources management in the Maribyrnong basin

Authority	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 of 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

Note:
(1) Melbourne is mostly supplied from the Yarra and Thomson basins.

Environmental Water Reserve

Important environmental assets such as the Australian grayling and native grasslands depend on the Maribyrnong EWR.

In 2013–14, the Maribyrnong basin EWR comprised:

- 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 passing flow conditions on licensed diversions (regulated and unregulated waterways)
- all other water in the basin not allocated for consumptive use.

There is no permanent environmental entitlement in the Maribyrnong basin. However, a total of 200 ML of environmental water was delivered from purchased water allocations in the Maribyrnong basin in 2013–14.

6.18.2 Surface water resources

6.18.2.1 Water balance

A surface water balance for the Maribyrnong basin is shown in Table 6-111.

Table 6-111 Balance of surface water in the Maribyrnong basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	21,716	18,388
Volume in storage at end of year	19,092	21,716
Change in storage	**(2,624)**	**3,328**
Inflows		
Catchment inflow(1)	43,563	81,471
Rainfall on major storages	1,352	1,529
Treated effluent discharged back to river	1,732	2,121
Total inflows	**46,647**	**85,121**
Outflows		
Diversions		
Urban diversions	3,594	1,350
Licensed diversions from regulated streams	145	111
Licensed diversions from unregulated streams	329	441
Small catchment dams	7,782	7,782
Total diversions	***11,850***	***9,684***
Losses		
Evaporation losses from major storages	1,585	1,709
Evaporation from small catchment dams	4,861	4,861
In-stream infiltration to groundwater, flows to floodplain and evaporation	1,843	1,881
Total losses	***8,289***	***8,451***
Water passed at outlet of basin		
River outflows to Port Phillip Bay	29,131	63,658
Total water passed at outlet of basin	***29,131***	***63,658***
Total outflows	**49,271**	**81,793**

Note:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.18.2.2 Storages and flows

Rosslynne Reservoir, with a capacity of 25,368 ML, is the only major storage located within the basin. The storage volume was 19,092 ML (75% of capacity) at the end of June 2014, compared with 21,716 ML (86% of capacity) at the start of July 2013 (Table 6-112). The volume reported in the ‘catchment inflow less regulated releases’ column in Table 6-112 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

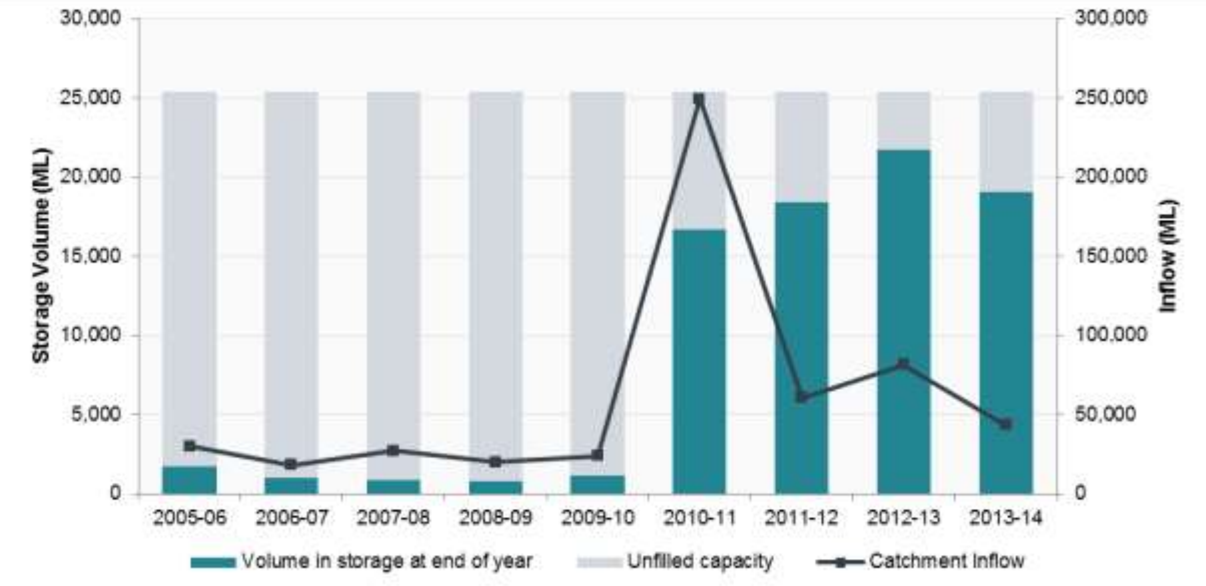
Table 6-112 Storage volumes in the Maribyrnong basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Rosslynne Reservoir	25,368	21,716	1,352	1,585	(2,391)	19,092
Total	**25,368**	**21,716**	**1,352**	**1,585**	**(2,391)**	**19,092**

Catchment inflows were 43,563 ML, or 39% of the long-term average of 113,000 ML. This was a decrease from 2012–13 when inflows were 72% of the long-term average (Figure 6-34).

The amount of water flowing into Port Phillip Bay in 2013–14 was 29,131 ML, compared with 63,658 ML in 2012–13. This represents 67% of the catchment inflows into the basin.

Figure 6-34 All major storages and catchment inflows in the Maribyrnong basin



6.18.2.3 Entitlement volumes and diversions

Melbourne Water, Western Water and Southern Rural Water hold bulk entitlements to divert surface water in the Maribyrnong basin. Surface water is also diverted out of waterways by licence holders and harvested in small catchment dams.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Yarra basin are outlined in Table 6-113.

Table 6-113 Entitlement volumes in the Maribyrnong basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Gisborne – Barringo Creek) Conversion Order 2004(1)	585
Bulk Entitlement (Lancefield) Conversion Order 2001	315
Bulk Entitlement (Macedon and Mount Macedon) Conversion Order 2004(2)	873
Bulk Entitlement (Maribyrnong – Melbourne Water) Conversion Order 2000 (3)	1,396
Bulk Entitlement (Maribyrnong – Southern Rural Water) Conversion Order 2000 (4)	682
Bulk Entitlement (Maribyrnong – Western Water) Conversion Order 2000(5)	6,100
Bulk Entitlement (Riddells Creek) Conversion Order 2001	300
Bulk Entitlement (Romsey) Conversion Order 2001	460
Take and use licences – unregulated surface water	2,093
Total volume of water entitlements in the Maribyrnong basin	**12,804**

Notes:

(1) This entitlement specifies that up to 585 ML can be diverted in any one year. The maximum volume that can be taken over any five-year period is 1,600 ML (320 ML annual average).

(2) This entitlement specifies that up to 873 ML can be diverted in any one year. The maximum volume that can be taken over any five-year period is 3,225 ML (645 ML annual average).

(3) This entitlement supplies water for take and use licences. 1,115.5 ML of entitlement was allocated for the 2013–14 year.

(4) This entitlement supplies water for take and use licences. 214 ML of entitlement was allocated for the 2013–14 year.

(5) This entitlement specifies that Western Water can take from the waterway up to an annual average of 6,100 ML over any period of five consecutive years.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-114. The volume of water diverted from unregulated streams by licence holders in the Maribyrnong basin was slightly lower in 2013–14 compared with the volume 441 ML reported in the 2012–13 Victorian Water Accounts (Table 6-114).

Maribyrnong basin

Table 6-114 Allocation account balance summary for the Maribyrnong basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Gisborne – Barringo Creek	585	0	0	585
Lancefield	315	0	102	213
Macedon and Mount Macedon	873	0	490	383
Maribyrnong – Melbourne Water	1,152	0	119	1,033
Maribyrnong – Southern Rural Water	214	0	26	188
Maribyrnong – Western Water	6,100	0	2,619	3,481
Riddells Creek	300	0	110	190
Romsey	460	0	273	187
Take and use licences – unregulated surface water	2,093	0	329	1,764

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the Maribyrnong basin (Table 6-115).

Table 6-115 Estimated small catchment dam information for the Maribyrnong basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	5,769	2,884	6,288
Registered commercial and irrigation	5,831	4,898	6,356
Total	**11,600**	**7,782**	**12,644**

n/a: information not available.

6.18.3 Recycled water

All wastewater treatment plants within the basin are operated by Western Water. Overall, 35% of wastewater was reused in 2013–14, an increase of 9% on the proportion reused in 2012–13. While the volume of wastewater produced decreased, the volume of water recycled increased in 2013–14 compared with 2012–13.

Table 6-116 shows the volume of recycled water in the Maribyrnong basin in 2013–14.

Table 6-116 Volume of recycled water in the Maribyrnong basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Gisborne	520	653	13%	61	6	0	586	442	(575)
Riddells Creek	186	51	27%	11	40	0	0	138	(3)
Romsey	455	261	57%	32	229	0	0	63	131
Sunbury	1,910	1,000	36%	313	370	0	317	1,089	(179)
Total 2013–14	**3,071**	**1,965**	**35%**	**417**	**645**	**0**	**903**	**1,732**	**(626)**
Total 2012–13	3,206	1,572	26%	335	499	0	739	2,121	(487)

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

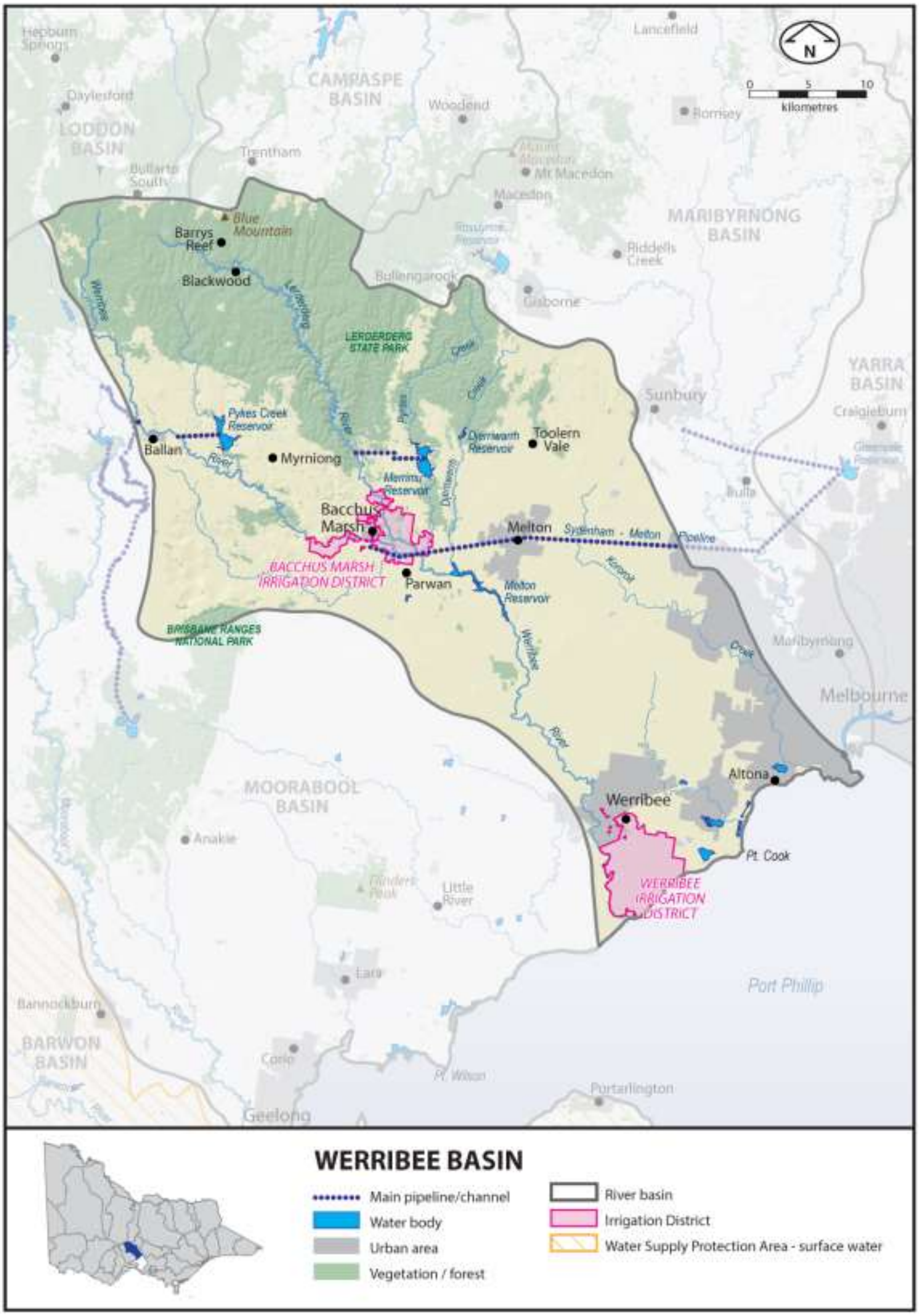
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.19 Werribee basin

The Werribee basin (Figure 6-35) is located west of Melbourne. The Werribee and Lerderderg rivers meet upstream of Melton Reservoir and flow through the township of Werribee before entering Port Phillip Bay.

Figure 6-35 Map of the Werribee basin



6.19.1 Water resources overview

Rainfall in the Werribee basin was between 80% and 100% of the long-term average in 2013–14. Catchment inflows were 41% of the long-term average, lower than 2012–13 when inflows were 78% of the long-term average. The amount of water flowing from the Werribee basin into Port Phillip Bay represented 18% of the catchment flows into the basin in 2013–14.

Major storages in the Werribee basin started the year at 68% of capacity and finished at 57% by the end of June 2014.

The year began with a 75% allocation for high reliability water shares for the Werribee system; 100% allocation was reached by October 2013. Low reliability water shares reached 15% by June.

No urban water use restrictions applied in the Werribee basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. Licensed diversions from unregulated streams in the Werribee basin were also largely unrestricted throughout the year, with the exception of the Lerderderg and Upper Werribee rivers which were subject to irrigation bans from February to May 2014.

Table 6-117 shows the responsibilities of the authorities within the Werribee basin.

Table 6-117 Responsibilities for water resources management in the Werribee basin

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 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
VEWH				Holds and manages environmental entitlements in the basin

Environmental Water Reserve

Important environmental assets – such as the Australian grayling, tupong and red gums – depend on the Werribee basin EWR.

In 2013–14, the Werribee basin EWR comprised:

- the *Werribee River Environmental Entitlement 2011* comprising 10% share of inflows (on average 1,500 ML per year) held by the VEWH
- 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.

A total of 461 ML of environmental entitlement water was delivered in the Werribee basin in 2013–14.

6.19.2 Surface water resources

6.19.2.1 Water balance

A surface water balance for the Werribee basin is shown in Table 6-118. Note that only on-stream storages greater than 1,000 ML capacity and the Djerriwarrh Reservoir have been included in the water balance. In the Werribee basin, major storages include the Melton, Merrimu and Pykes Creek reservoirs.

Table 6-118 Balance of surface water in the Werribee basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	47,683	61,588
Volume in storage at end of year	40,005	47,676
Change in storage	**(7,678)**	**(13,912)**
Inflows		
Catchment inflow(1)	41,588	79,770
Rainfall on major storages	3,850	3,396
Transfers from other basins	0	0
Return flow from irrigation	61	63
Treated effluent discharged back to river	4,878	4,507
Total inflows	**50,378**	**87,736**
Outflows		
Diversions		
Urban diversions	6,496	1,789
Irrigation district diversions and licensed diversions from regulated streams	16,994	20,070
Licensed diversions from unregulated streams	48	275
Small catchment dams	9,347	9,347
Total diversions	**32,885**	**31,481**
Losses		
Evaporation losses from major storages	8,699	8,226
Evaporation from small catchment dams	5,371	5,371
In-stream infiltration to groundwater, flows to floodplain and evaporation	3,741	6,607
Total losses	**17,811**	**20,204**
Water passed at outlet of basin		
River outflows to Port Phillip Bay	7,359	49,963
Total water passed at outlet of basin	**7,359**	**49,963**
Total outflows	**58,055**	**101,648**

Note:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.19.2.2 Storages and flows

Storage levels for all major storages in the basin were 40,005 ML (57% of capacity) in June 2014, compared with 47,676 ML in July 2013 (Table 6-119). The volume reported in the 'catchment inflow less regulated releases' column in Table 6-119 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

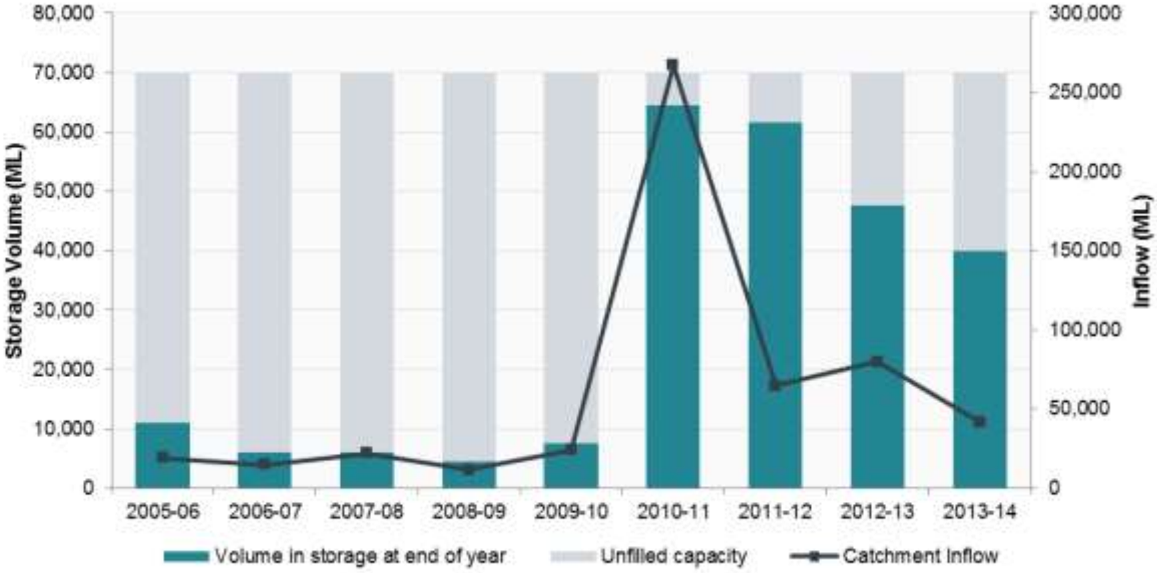
Table 6-119 Storage volumes in the Werribee basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Djerriwarrh Reservoir	1,014	825	68	95	(178)	619
Melton Reservoir	14,364	2,888	1,115	2,781	35	1,257
Merrimu Reservoir	32,516	26,877	1,404	3,519	(4,625)	20,137
Pykes Creek Reservoir	22,119	17,093	1,263	2,304	1,940	17,992
Total storages	**70,013**	**47,683**	**3,850**	**8,699**	**(2,828)**	**40,005**

Catchment inflows were 41,588 ML, or 41% of the long-term average of 102,000 ML. This was lower than the 2012–13 inflows of 79,770 ML (Figure 6-36).

In 2013–14, 7,359 ML of water flowed from the Werribee basin into Port Phillip Bay. This represented 18% of the catchment inflows into the basin. About 49,963 ML flowed into Port Phillip Bay in 2012–13.

Figure 6-36 All major storages and catchment inflows in the Werribee basin



6.19.2.3 Entitlement volumes and diversions

In the Werribee basin, surface water is diverted by Central Highlands Water, Western Water, Southern Rural Water and licensed diverters, and surface water is harvested in small catchment dams.

Entitlements include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Werribee basin are outlined in Table 6-120.

Table 6-120 Entitlement volumes in the Werribee basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Werribee system – Irrigation) Conversion Order 1997	
High reliability water shares	15,017
Low reliability water shares	7,026
Bulk Entitlement (Myrniong) Conversion Order 2004	58
Operating provision	4,939
Subtotal: Bulk Entitlement (Werribee system – Irrigation) Conversion Order 1997	**27,040**
Bulk Entitlement (Ballan) Conversion Order 1998	**451**
Bulk Entitlement (Blackwood and Barry's Reef) Conversion Order 1998	**140**
Bulk Entitlement (Werribee system – Western Water) Conversion Order 2004	**9,986**
Werribee River Environment Entitlement 2011(1)	**-**
Take and use licences – unregulated surface water	**1,021**
Total volume of water entitlements in the Werribee basin	**38,638**

Note:

(1) The Werribee River Environmental Entitlement consists of a 10% share of inflows into storage, with the actual volume available in any year varying depending on inflow conditions.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-121. From 1 July 2014 water shares in regulated systems in the Werribee basin provide for the right to carry over unused allocation to the next season. In the Werribee basin these entitlement holders can carry over unused water up to 50% of their entitlement volume; any unused water above this amount is written off (end-of-season forfeiture).

The VEWH holds an environmental entitlement in the Werribee basin, but the water available under the entitlement is used to provide environmental flows in the Werribee River and is not diverted out of the waterway.

Southern Rural Water diverted 17,034 ML to supply water share holders in the Werribee and Bacchus Marsh irrigation districts in 2013–14 (Table 6-121), compared with 20,110 ML in 2012–13.

The total volume of water (48 ML) diverted from unregulated streams by licence holders in the Werribee basin in 2013–14 was lower than the amount (275 ML) reported in the 2012–13 Victorian Water Accounts.

Table 6-121 Allocation account balance summary for the Werribee basin

Water entitlement	Opening carryover (ML)	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)	Carryover carried forward (ML)
Werribee system – Irrigation – SRW						
Water shares	-	16,071	0	9,814	1,423	4,834
Myrniong	-	58	0	39	20	-
Operating provision(1)	-	-	-	7,181	-	-
Diversion: Werribee system – Irrigation – SRW(2)				**17,034**		
Ballan	-	451	0	0	451	-
Blackwood and Barry's Reef	-	140	0	43	97	-
Werribee system – Western Water	-	9,986	0	6,414	3,572	-
Werribee River Environment Entitlement(3)	-	1,210	0	461	-	-
Take and use licences – unregulated surface water	-	1,021	0	48	973	-

Notes:

(1) This reflects use of water to manage the system. It includes any loss incurred in supplying the primary entitlements.

(2) The water use reported in this line item represents the bulk diversion to supply primary entitlements and fulfil other operating requirements under the Werribee system bulk entitlement.

(3) Allocation issued reflects the total available water for the year (including opening carryover). Water use reported reflects environmental in-stream use, this amount is not reflected in the water balance in Table 6-118 as it is not an actual diversion from the waterway. Unused water is available to carry over in this system. For details refer to Table 4-2.

Werribee basin

The estimated volume of water harvested from small catchment dams represents a significant portion of the total volume of surface water diverted in the Werribee basin (Table 6-122).

Table 6-122 Estimated small catchment dam information for the Werribee basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	5,868	2,934	6,397
Registered commercial and irrigation	7,634	6,413	8,321
Total	**13,502**	**9,347**	**14,718**

6.19.3 Recycled water

Five wastewater treatment plants operate within the Werribee basin. The volume of wastewater produced in 2013–14 was 177,704 ML, an increase of 8,855 ML compared with 2012–13. Around 20% of wastewater was reused in 2013–14.

Most water recycling in the basin occurs at Melbourne Water's Western Treatment Plant, which reused 19% of wastewater. This included 9,401 ML for on-site irrigation and environmental management and 19,835 ML for habitat management at Ramsar-listed wetlands.

Table 6-123 shows the volumes of water recycled in the Werribee basin in 2013–14.

Table 6-123 Volume of recycled water in the Werribee basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)					Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				To retailers	Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Altona	5,022	110	0%	0	0	0	0	110	4,866	46
Ballan	83	83	100%	0	0	83	0	0	0	0
Melton	3,723	3,227	76%	0	374	2,469	0	384	12	484
Parwan (Bacchus Marsh)	511	464	91%	0	0	464	0	0	0	47
Western Treatment Plant	168,365	31,837	19%	2,601	0	9,401	19,835	0	0	136,528
Total 2013–14	**177,704**	**35,721**	**20%**	**2,601**	**374**	**12,417**	**19,835**	**494**	**4,878**	**137,105**
Total 2012–13	168,849	31,017	18%	2,643	1,049	11,124	15,784	417	4,507	133,325

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

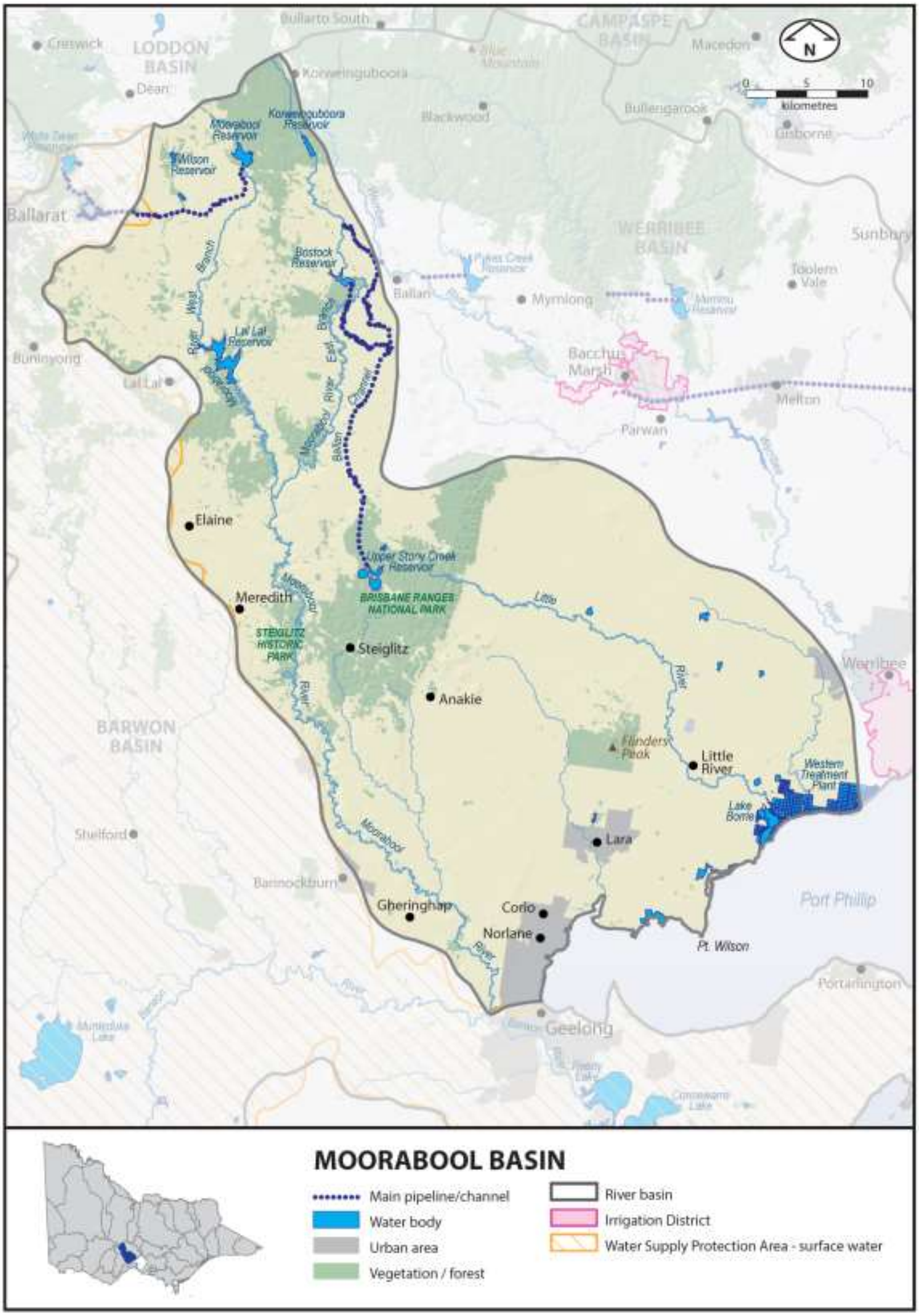
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.20 Moorabool basin

The Moorabool basin (Figure 6-37) is located west of Melbourne. The Moorabool River begins as two major tributaries on the southern slopes of the Great Dividing Range near Ballan and flows south-east to join the Barwon River near Geelong. The Moorabool basin also includes Little River, which flows into Port Phillip Bay.

Figure 6-37 Map of the Moorabool basin



6.20.1 Water resources overview

Rainfall in the Moorabool basin in 2013–14 was between 80% and 100% of the long-term average. Inflows were 54% of the long-term average, which was lower than 2012–13 when inflows were 97% of the long-term average.

Storage levels for the major storages in the basin started the year at 77% of capacity and held 66% at the end of June 2014. Diversion volumes were similar to 2012–13, with licensed diversions unrestricted for most of the year. Twelve restrictions on diversions were applied in the Moorabool basin in January 2014, and an irrigation ban on the Moorabool River applied January to May. No urban water use restrictions applied in the Moorabool basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year.

Table 6-124 shows the responsibilities of the authorities within the Moorabool basin.

Table 6-124 Responsibilities for water resources management in the Moorabool basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages licensed 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 two-thirds of the share of Lal Lal Reservoir Obliged to meet passing flow requirements
Corangamite CMA			Responsible for waterway management in Moorabool basin
VEWH			Holds and manages environmental entitlements in the basin

Notes:
(1) Geelong's water supply is mainly sourced from the Barwon basin.
(2) Ballarat's water supply is sourced from both the Barwon and Moorabool basins.

Environmental Water Reserve

Important environmental assets dependent on the Moorabool basin EWR include the river blackfish and Australian grayling between Lal Lal Reservoir and She Oakes Weir, and Hovells Creek Estuary, which is part of Port Phillip Bay and Bellarine Peninsula Ramsar site.

In 2013–14, the Moorabool basin EWR comprised:

- the *Moorabool River Environmental Entitlement 2010* comprising 11.9% of inflows (on average 2,500 ML per year) held by the VEWH
- 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.

A total of 2,500 ML of environmental entitlement water was delivered in the Moorabool basin in 2013–14.

6.20.2 Surface water resources

6.20.2.1 Water balance

A surface water balance for the Moorabool basin is shown in Table 6-125. Most water used for consumptive purposes in the basin was sourced from small catchment dams.

Table 6-125 Balance of surface water in the Moorabool basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	60,820	69,855
Volume in storage at end of year	49,661	60,820
Change in storage	**(11,159)**	**(9,035)**
Inflows		
Catchment inflow(1)	51,988	94,386
Rainfall on major storages	4,800	4,041
Treated effluent discharged back to river	0	0
Total inflows	**56,788**	**98,427**
Outflows		
Diversions		
Urban diversions(2)	9,386	8,662
Transfers to Barwon basin (White Swan Reservoir)(3)	3,808	5,187
Licensed diversions from unregulated streams	1,190	1,276
Small catchment dams	22,197	22,197
Total diversions	**36,581**	**37,322**
Losses		
Evaporation losses from major storages	6,860	7,864
Evaporation from small catchment dams	7,266	7,266
In-stream infiltration to groundwater, flows to floodplain and evaporation	6,426	4,231
Total losses	**20,552**	**19,362**
Water passed at outlet of basin		
River outflows to Port Phillip Bay (Little River) and other small coastal streams	3,720	16,186
River outflows to the Barwon River (Moorabool River)	7,094	34,593
Total water passed at outlet of basin	**10,814**	**50,779**
Total outflows	**67,947**	**107,462**

Notes:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.
(2) The urban diversions figure represents water diverted from waterways in the Moorabool basin to directly supply urban customers in both the Barwon and Moorabool basins.
(3) The 3,808 ML transfer represents water that is transferred to White Swan Reservoir in the Barwon basin before being supplied to urban customers in the Ballarat area (which is located within both the Barwon and Moorabool basins).

6.20.2.2 Storages and flows

The Moorabool basin has six main storages: the Bostock, Korweinguboora, Lal Lal, Moorabool, Upper Stony Creek and Wilson 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 were 56,298 ML (66% of capacity) at the end of June 2014, compared with 66,048 ML (77% of capacity) at the start of the year (Table 6-126).

Only volumes for major on-stream storages have been included in the water balance; Upper Stony Creek Reservoir has not been included. The volume of water in the basin's major on-stream storages started the year at 60,820 ML and ended at 49,661 ML in June 2014.

Moorabool basin

Table 6-126 Storage volumes in the Moorabool basin

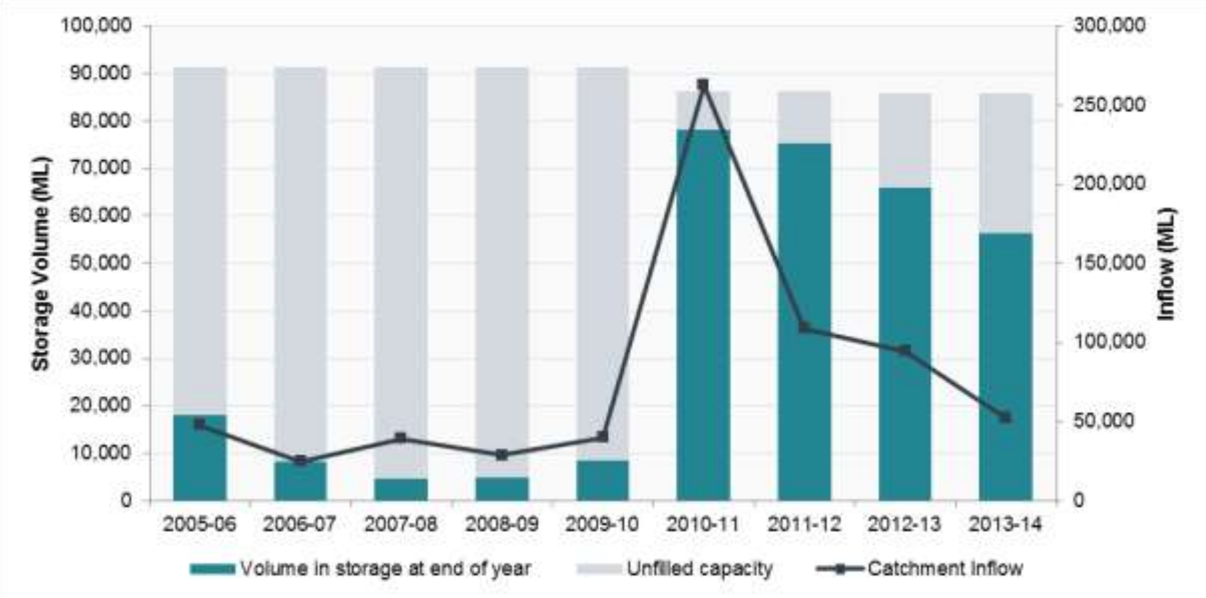
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Bostock Reservoir	7,455	6,112	896	919	(4,396)	1,693
Korweinguboora Reservoir	2,091	210	572	587	(7)	188
Lal Lal Reservoir	59,549	50,160	2,120	3,805	(3,924)	44,551
Moorabool Reservoir	6,192	4,040	1,113	1,404	(650)	3,099
Wilsons Reservoir	1,010	299	100	145	(122)	131
Subtotal	**76,297**	**60,820**	**4,800**	**6,860**	**(9,099)**	**49,661**
Off-stream storages						
Upper Stony Creek Reservoir	9,494	5,228	n/a	n/a	1,409	6,637
Subtotal	**9,494**	**5,228**	**n/a**	**n/a**	**1,409**	**6,637**
Total	**85,791**	**66,048**	**4,800**	**6,860**	**(7,690)**	**56,298**

n/a: information not available.

Catchment inflows were 51,988 ML or 54% of the long-term average of 97,000 ML. This was much lower than the 2012–13 inflows of 94,386 ML (Figure 6-38).

The amount of water flowing from the Moorabool basin into Port Phillip Bay and the Barwon River was 10,814 ML in 2013–14, or 21% of the catchment inflows.

Figure 6-38 All major storages and catchment inflows in the Moorabool basin



6.20.2.3 Entitlement volumes and diversions

In the Moorabool basin, surface water is diverted by Barwon Water, Central Highlands Water and licensed diverters. Surface water is also harvested in small catchment dams. The VEWH holds an environmental entitlement in the Moorabool basin, however the water available under the entitlement is used to support streamflows and is not diverted out of the waterway.

Entitlements in the Moorabool basin include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Moorabool basin are outlined in Table 6-127.

Table 6-127 Entitlement volumes in the Moorabool basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Lal Lal – Barwon) Conversion Order 1995(1)	5,925
Bulk Entitlement (Lal Lal – Central Highlands) Conversion Order 1995 (2)	12,575
Bulk Entitlement (Meredith) Conversion Order 1995	600
Bulk Entitlement (She Oaks) Conversion Order 1995(3)	2,000
Bulk Entitlement (Upper East Moorabool System) Conversion Order 1995	9,000
Bulk Entitlement (Upper West Moorabool System) Conversion Order 1995	10,500
Moorabool River Environment Entitlement 2010(4)	n/a
Take and use licences – unregulated surface water	3,571
Total volume of water entitlements in Moorabool basin	**44,171**

Notes:
(1) Under this entitlement the authority may take up to a total of 5,925 ML in any one year and up to 17,775 ML in any consecutive three-year period.
(2) Under this entitlement the authority may take up to a total of 12,575 ML in any one year and up to 37,725 ML in any consecutive three-year period.
(3) Under this entitlement the authority may take up to 6,000 ML in any three consecutive years.
(4) The Moorabool River Environmental Entitlement consists of an 11.9% share of inflows into storage, with the actual volume available in any year varying depending on inflow conditions.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-128. The total volume of water diverted by bulk entitlement holders was slightly less in 2013–14, compared with the volume reported in the 2012–13 Victorian Water Accounts.

The volume of water diverted from unregulated streams by licence holders in the Moorabool basin in 2013–14 was similar to the volume of 1,276 ML reported in the 2012–13 Victorian Water Accounts (Table 6-128).

Table 6-128 Allocation account balance summary for the Moorabool basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Lal Lal – Barwon	5,925	0	1,500	4,425
Lal Lal – Central Highlands	12,575	0	3,652	8,923
Meredith	600	0	0	600
She Oaks	2,000	0	0	2,000
Upper East Moorabool System	9,000	0	4,234	4,766
Upper West Moorabool System	10,500	0	3,808	6,692
Moorabool River Environment Entitlement(1)	4,708	0	2,500	2,208
Take and use licences – unregulated surface water	3,571	0	1,190	2,382

Note:
(1) Allocation issued reflects the total available water for the year (including opening carryover). Water use reported reflects environmental in-stream use, this amount is not included in the water balance in Table 6-125 as it is not an actual diversion from the waterway. Unused water is available to carry over under this entitlement and is not forfeited at the end of the season. For details refer to Table 4-2.

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the Moorabool basin (Table 6-129).

Table 6-129 Estimated small catchment dam information for the Moorabool basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	6,079	3,040	n/a
Registered commercial and irrigation	22,807	19,158	n/a
Total	**28,886**	**22,198**	**29,464**

n/a: information not available.

6.20.3 Recycled water

Barwon Water operates the Northern Water Recycling Plant within the Moorabool basin and the recycled water is mainly used by a refinery. Table 6-130 shows the volumes of water recycled in the Moorabool basin in 2013–14.

Moorabool basin

Table 6-130 Volume of recycled water in the Moorabool basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Northern Water Recycling Plant	1,242	1,242	100%	1,242	0	0	0	0	0
Total 2013–14	**1,242**	**1,242**	**100%**	**1,242**	**0**	**0**	**0**	**0**	**0**
Total 2012–13	204	204	100%	204	0	0	0	0	0

Notes:

(1) ‘Beneficial allocation’ refers to the volume used to deliver specific environmental flow benefits.

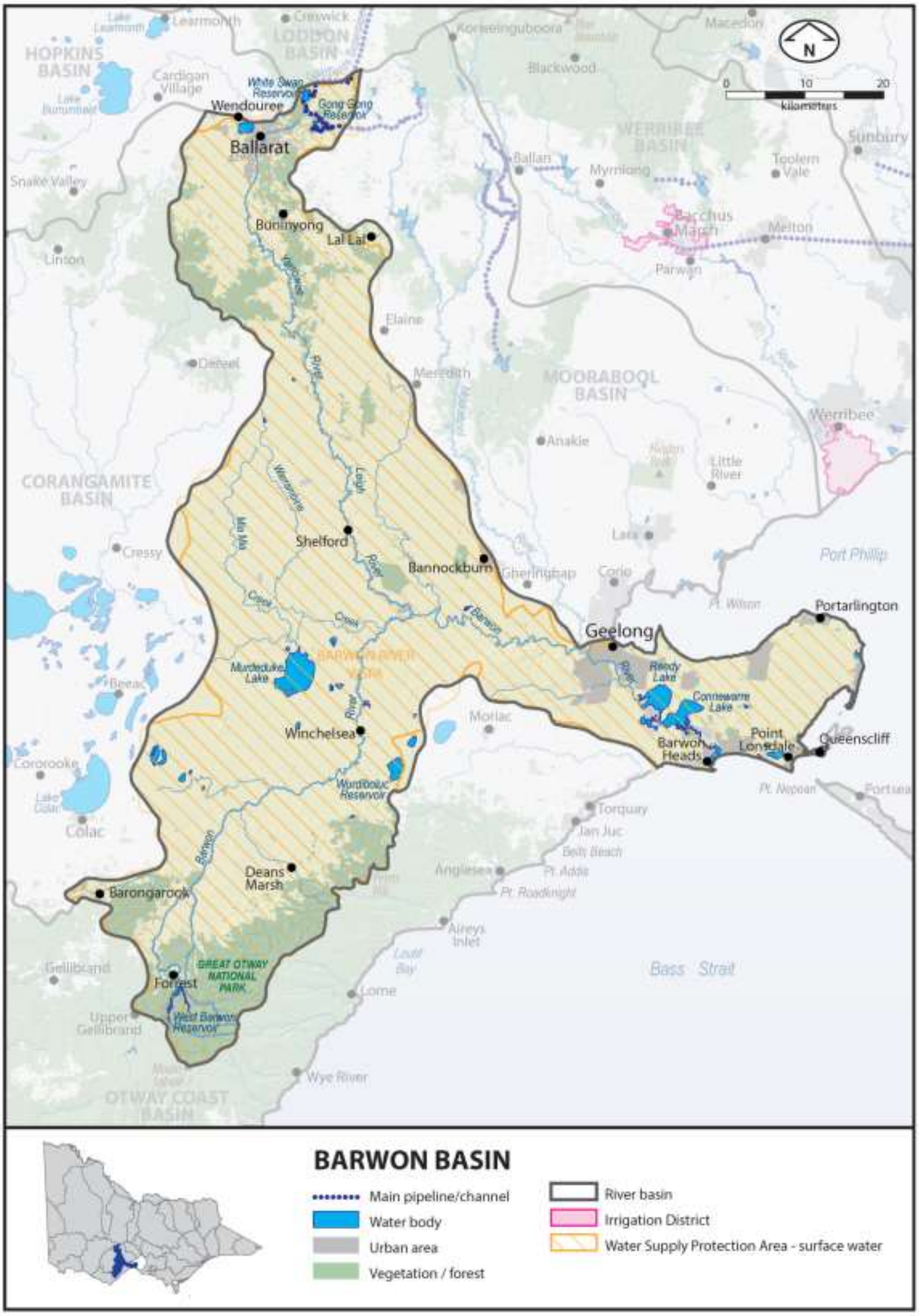
(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

(3) ‘Other’ refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.21 Barwon basin

The Barwon basin (Figure 6-39) is located in western Victoria. It originates in the Otway Ranges and receives inflows from the Leigh River and the Moorabool River before it flows into the ocean at Barwon Heads.

Figure 6-39 Map of the Barwon basin



6.21.1 Water resources overview

In 2013–14, rainfall in the Barwon basin generally ranged between 80% and 100% of the long-term average, with a small area in the south of the basin receiving 100 to 125% of average rainfall. Catchment inflows in the Barwon basin in 2013–14 were 55% of the long-term average, an increase from 43% in 2012–13.

Storage levels in the Barwon basin increased from 64% to 72% of total capacity during the year. No urban water use restrictions applied in the Barwon basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. There were no restrictions on diversions from the Barwon River between July 2013 and January 2014, however in February the river was subject to an irrigation ban which lasted until April.

Table 6-131 shows the responsibilities of the authorities within the Barwon basin.

Table 6-131 Responsibilities for water resources management in the Barwon basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages 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
VEWH			Holds and manages environmental entitlements in the basin
Corangamite CMA			Manages waterways for the whole of the Barwon basin

Notes:

(1) Geelong's water supply is also sourced from the Moorabool basin.

(2) Ballarat's water supply is mainly sourced from the Moorabool basin.

Environmental Water Reserve

The Bellarine Peninsula has internationally significant wetlands listed under the Ramsar Convention: these rely on freshwater inputs from the Barwon basin to function ecologically. Other important environmental assets include:

- Lake Connewarre complex, which is part of the Port Phillip Bay (western shoreline)
- the native fish community, particularly the Australian grayling and Yarra pygmy perch (which are listed in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*), Australian mudfish and tupong
- the native water bird population, particularly the greenshank, Eastern golden plover, curlew sandpiper and red-necked stint
- platypus.

In 2013–14, the Barwon basin EWR comprised:

- the *Barwon River Environmental Entitlement 2011* held by the VEWH which allows water to be diverted to the lower Barwon wetlands, including Reedy Lake and Hospital Swamp when river levels are above heights as specified in the environmental entitlement
- 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.

6.21.2 Surface water resources

6.21.2.1 Water balance

A surface water balance for the Barwon basin is shown in Table 6-132.

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 5,187 ML in 2012–13 to 3,808 ML in 2013–14. This water was transferred to White Swan Reservoir and used to supply the Ballarat system. The Goldfields Superpipe was used to transfer 207 ML from the Campaspe basin to White Swan Reservoir to augment supplies to Ballarat. 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 6-132 Balance of surface water in the Barwon basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	25,519	32,611
Volume in storage at end of year	27,458	25,519
Change in storage	**1,939**	**(7,092)**
Inflows		
Catchment inflow(1)	198,475	155,726
Rainfall on major storages	3,144	2,514
Inflows from the Moorabool River	7,094	34,593
Transfers from the Corangamite basin via Woady Yaloak Channel	0	0
Transfers from Moorabool basin to White Swan Reservoir(2)	3,808	5,187
Transfers from Campaspe basin to White Swan Reservoir	207	43
Treated wastewater discharged back to river	28,091	26,975
Total inflows	**240,820**	**225,038**
Outflows		
Diversions		
Urban diversions	38,767	33,260
Licensed diversions from unregulated streams	1,173	1,370
Small catchment dams	30,898	30,898
Total diversions	**70,839**	**65,528**
Losses		
Evaporation losses from major storages	3,168	3,710
Evaporation from small catchment dams	12,543	12,543
In-stream infiltration to groundwater, flows to floodplain and evaporation	10,458	8,229
Total losses	**26,169**	**24,482**
Water passed at outlet of basin		
River outflows to the ocean	141,873	142,120
Total water passed at outlet of basin	**141,873**	**142,120**
Total outflows	**238,881**	**232,130**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

(2) The 3,808 ML transfer represents water that is transferred to White Swan Reservoir from the Moorabool basin before being supplied to urban customers in the Ballarat area (which is located within both the Barwon and Moorabool basins).

6.21.2.2 Storages and flows

Storage levels for all major storages in the basin started the year at 50,079 ML in July 2013 and were 56,155 ML (72% of capacity) at the end of June 2014. Only volumes for on-stream storages have been included in the water balance, therefore Wurdee Boluc Reservoir has not been included. The volume reported in the 'catchment inflow less regulated releases' column of Table 6-133 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Barwon basin

Table 6-133 Storage volumes in the Barwon basin

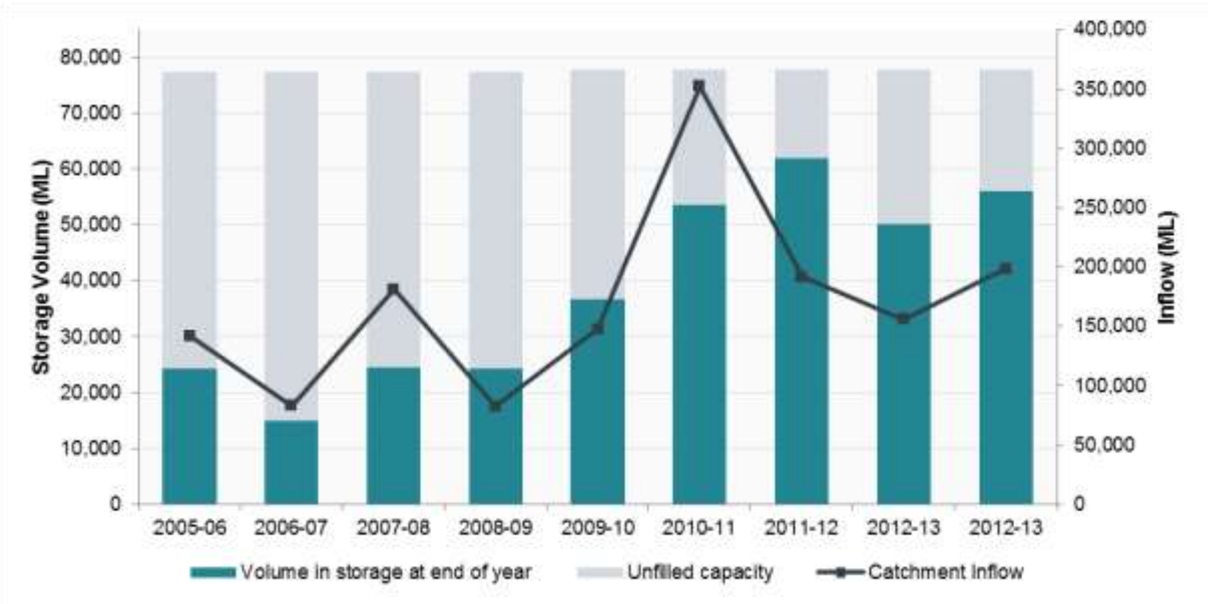
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Gong Gong Reservoir	1,902	1,767	123	152	(1,225)	513
West Barwon Dam	21,504	14,290	2,150	1,933	3,897	18,405
White Swan Reservoir	14,107	9,462	871	1,083	(710)	8,540
Subtotal	**37,513**	**25,519**	**3,144**	**3,168**	**1,963**	**27,458**
Off-stream storages						
Wurdee Boluc Reservoir	40,431	24,560	n/a	n/a	4,137	28,697
Subtotal	**40,431**	**24,560**	**n/a**	**n/a**	**4,137**	**28,697**
Total	**77,944**	**50,079**	**3,144**	**3,168**	**6,100**	**56,155**

n/a: information not available

Catchment inflows to the Barwon basin amounted to 198,475 ML in 2013–14, which is 55% of the long-term average (of 360,000 ML). This is an increase from inflows of 43% of the long-term average in 2012–13 (Figure 6-40).

The amount of water flowing from the Barwon basin into Corio Bay and Bass Strait was 141,873 ML in 2013–14. This represented 72% of the catchment inflows to the basin.

Figure 6-40 All major storages and catchment inflows in the Barwon basin



6.21.2.3 Entitlement volumes and diversions

In the Barwon basin, surface water is diverted by Barwon Water, Central Highlands Water and licensed diverters, and water is harvested in small catchment dams.

Entitlements in the Barwon basin include rights granted to individuals (e.g. water shares and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Barwon basin are outlined in Table 6-134.

Table 6-134 Entitlement volumes in the Barwon basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlements (Upper Barwon System) Conversion Order 2002[(1)]	43,467
Bulk Entitlement (Yarrowee – White Swan System) Conversion Order 2002[(2)]	12,267
Barwon River Environmental Entitlement 2011[(3)]	n/a
Take and use licences – unregulated surface water	5,581
Total volume of water entitlements in the Barwon basin	**61,315**

Notes:

(1) This entitlement specifies that the authority may take up to 130,400 in any successive three-year period.

(2) This entitlement specifies that the authority may take up to 36,800 in any successive three-year period. This bulk entitlement includes up to 10,500 ML extracted from the Upper West Moorabool system under Central Highlands Water's Upper West Moorabool bulk entitlement in the Moorabool basin.

(3) Use of this entitlement is dependent on suitable river heights as specified in the entitlement.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-135. The total volume of water diverted by bulk entitlement holders was greater in 2013–14 compared with the volume reported in the 2012–13 Victorian Water Accounts.

The *Barwon River Environmental Entitlement 2011* provides for unregulated flows to be diverted to floodplain wetlands. The volume of unregulated flow available for diversion varies depending on seasonal conditions. No use was recorded against this entitlement in 2013–14.

Table 6-135 Allocation account balance summary for the Barwon basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Upper Barwon system	43,467	0	31,002	12,465
Yarrowee – White Swan system	12,267	0	7,765	4,502
Barwon River Environmental Entitlement[(1)]	-	-	-	-
Take and use licences – unregulated surface water	5,581	0	1,173	4,408

Note:

(1) Use under this entitlement is dependent on suitable river heights. No water was available under it during 2013–14.

The estimated volume of water harvested from small catchment dams represents a significant portion of the total surface water diversions in the Barwon basin (Table 6-136).

Table 6-136 Estimated small catchment dam information for the Barwon basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,374	5,187	n/a
Registered commercial and irrigation	30,609	25,711	n/a
Total	**40,983**	**30,898**	**43,442**

n/a: information not available.

6.21.3 Recycled water

Both Barwon Water and Central Highlands Water operate wastewater treatment plants within the Barwon basin.

In 2013–14, 8% of wastewater in the Barwon basin was recycled. This is a decrease from 11% in 2012–13.

Table 6-137 shows the volumes of water recycled in the Barwon basin in 2013–14.

Barwon basin

Table 6-137 Volume of recycled water in the Barwon basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Ballarat North	2,762	748	16%	0	0	432	316	2,014	0
Ballarat South	7,091	78	0%	0	0	0	78	7,013	0
Bannockburn	90	90	44%	0	40	0	50	0	0
Black Rock	22,320	3,071	9%	807	1,154	0	1,110	19,063	186
Portarlington	392	392	39%	0	155	0	237	0	0
Winchelsea	59	59	9%	0	5	0	54	0	0
Total 2013–14	**32,714**	**4,438**	**8%**	**807**	**1,354**	**432**	**1,845**	**28,090**	**186**
Total 2012–13	31,873	5,843	11%	1,109	1,823	564	2,348	26,975	(945)

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

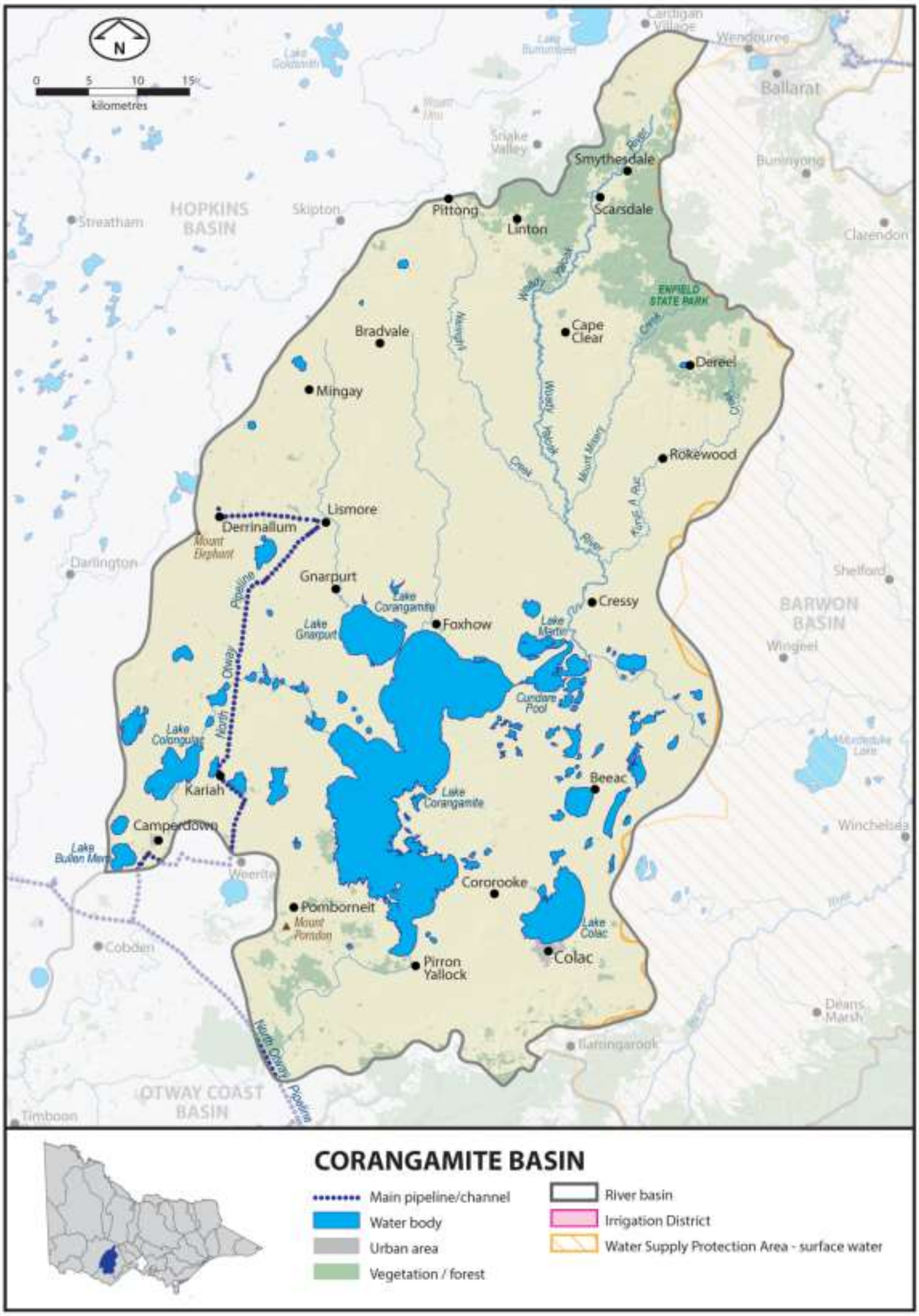
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.22 Corangamite basin

The Corangamite basin (Figure 6-41) is located in western Victoria. Rivers and streams within the basin terminate in a series of inland lakes, the largest of which is Lake Corangamite.

Figure 6-41 Map of the Corangamite basin



6.22.1 Water resources overview

In 2013–14, rainfall in the Corangamite basin was between 80 and 125% of the long-term average, with the north of the basin experiencing rainfall slightly below average, and the south slightly above average. Inflows across the basin were 97% of the long-term average, significantly higher than 2012–13 when inflows were 46% of the long-term average. The amount of water flowing from the Corangamite basin into the Ramsar-listed Western District Lakes represented 94% of the catchment inflows in the basin in 2013–14.

No urban water use restrictions applied in the Corangamite basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. No restrictions were applied to unregulated streams in the Corangamite basin.

Table 6-138 shows the responsibilities of the authorities within the Corangamite basin.

Table 6-138 Responsibilities for water resources management in the Corangamite basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages 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 CMA			Manages waterways for the whole of the Corangamite basin

Note:
(1) Ballarat's water supply is mainly sourced from the Barwon and Moorabool basins.

Environmental Water Reserve

The Western District Lakes are internationally significant wetlands listed under the Ramsar Convention and rely on freshwater inputs from the Corangamite basin to function ecologically. These lakes include Corangamite, Gnarpurt, Milangil, Terangpom, Beeac, Colongulac and Cundare. Wetlands of national importance include the Kooraweera Lakes, Lough Calvert, Lake Thurrumbong and Cundare Pool. The native fish community and the Corangamite water skink also rely on the EWR.

In 2013–14, the Corangamite basin EWR comprised:

- the component of water in the basin not allocated for consumptive use
- water set aside for the environment through the operation of passing flow conditions on licensed diversions.

6.22.2 Surface water resources

6.22.2.1 Water balance

A surface water balance for the Corangamite basin is shown in Table 6-139. Urban water use within the Corangamite basin is supplied from the Otway Coast basin due to the better quality water available. No storage information is recorded in the water balance as there are no major on-stream storages in the Corangamite basin.

Table 6-139 Balance of surface water in the Corangamite basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	-	-
Inflows		
Catchment inflow[(1)]	307,353	145,591
Rainfall on major storages	0	0
Treated effluent discharged back to river	1,836	1,691
Total inflows	**309,189**	**147,282**
Outflows		
Diversions		
Urban diversions	0	0
Licensed diversions from unregulated streams	108	142
Small catchment dams	12,366	12,366
Total diversions	**12,474**	**12,508**
Losses		
Evaporation losses from major storages	0	0
Evaporation from small catchment dams	6,534	6,534
In-stream infiltration to groundwater, flows to floodplain and evaporation[(2)]	n/a	n/a
Total losses	**6,534**	**6,534**
Water passed at outlet of basin		
River outflows to the Corangamite lakes	290,180	128,241
River outflows to Barwon Basin via Woady Yaloak Channel	0	0
Total water passed at outlet of basin	**290,180**	**128,241**
Total outflows	**309,189**	**147,282**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.

(2) No suitable model is available to make an estimate of in-stream losses.

n/a: information not available

6.22.2.2 Storages and flows

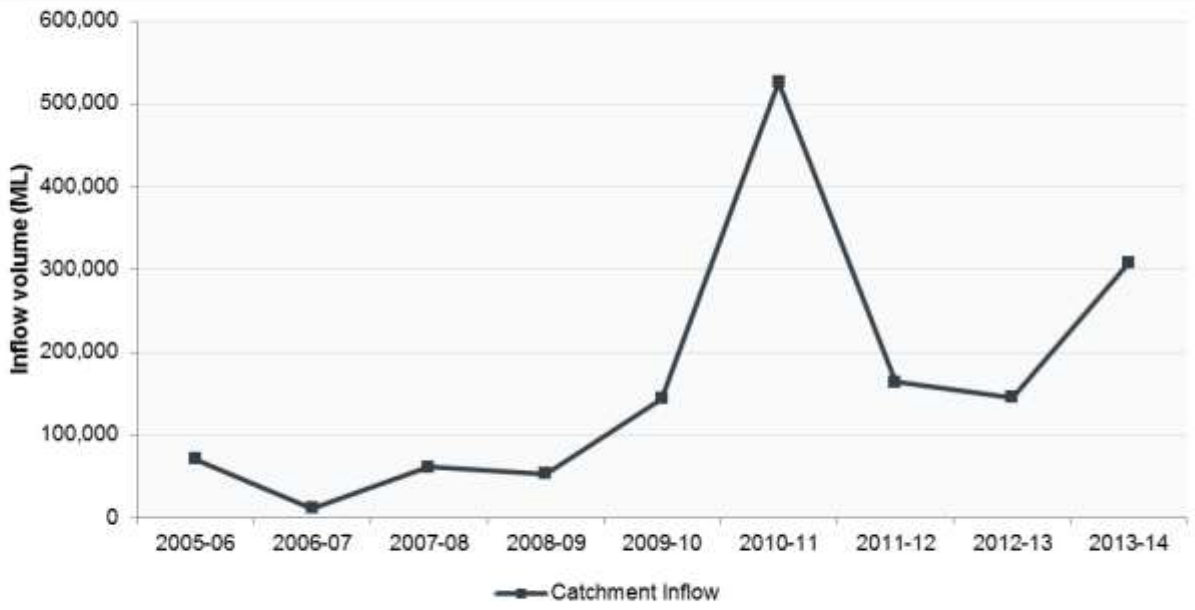
Inflows across the basin were 97% of the long-term average of 316,000 ML, which is significantly higher than 2012–13 when inflows were 46% of the long-term average (Figure 6-42).

Outflows from the Corangamite basin into the Western District Lakes were 290,180 ML in 2013–14, or 94% of the catchment inflows.

There are no major water supply storages in the Corangamite basin.

Corangamite basin

Figure 6-42 Catchment inflows in the Corangamite basin



6.22.2.3 Entitlement volumes and diversions

In the Corangamite basin, surface water is diverted from unregulated streams by licence holders and surface water is harvested in small catchment dams. No water corporations divert surface water in this basin.

The total licensed volume and the estimated volume of water diverted by licence holders in the basin was similar in 2013–14 compared with the volume reported in the 2012–13 Victorian Water Accounts (Table 6-140).

Table 6-140 Entitlement volumes in the Corangamite basin

Water entitlements	Annual entitlement volume (ML)
Take and use licences – unregulated surface water	1,177
Total volume of water entitlements in the Corangamite basin	**1,177**

Allocation available under take and use licences in the Corangamite basin for 2013–14 is presented in Table 6-141.

Table 6-141 Allocation account balance summary for the Corangamite basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Take and use licences – unregulated surface water	1,177	0	108	1,069

The estimated volume of water harvested from small catchment dams represents the largest diversion of surface water in the Corangamite basin (Table 6-142).

Table 6-142 Estimated small catchment dam information for the Corangamite basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	8,100	4,050	n/a
Registered commercial and irrigation	9,900	8,316	n/a
Total	**18,000**	**12,366**	**18,900**

n/a: information not available.

6.22.3 Recycled water

Wastewater treatment plants in the Corangamite basin are at Colac, operated by Barwon Water, and Camperdown, operated by Wannon Water. Recycled water was primarily used for agricultural purposes. The proportion of wastewater recycled in 2013–14 decreased to 18/%, compared with 20% in 2012–13.

Table 6-143 shows the volumes of water recycled in the Corangamite basin in 2012–13.

Table 6-143 Volume of recycled water in the Corangamite basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[(2)]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[(3)] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[(1)]	Within process[(2)]		
Camperdown Industrial	7	1	15%	0	1	0	0	0	6
Camperdown Municipal	507	431	85%	8	423	0	0	0	76
Colac	1,836	32	0%	0	0	0	32	1,836	(32)
Total 2013–14	**2,350**	**464**	**18%**	**8**	**424**	**0**	**32**	**1,836**	**50**
Total 2012–13	2,048	464	20%	15	392	0	58	1,691	(108)

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

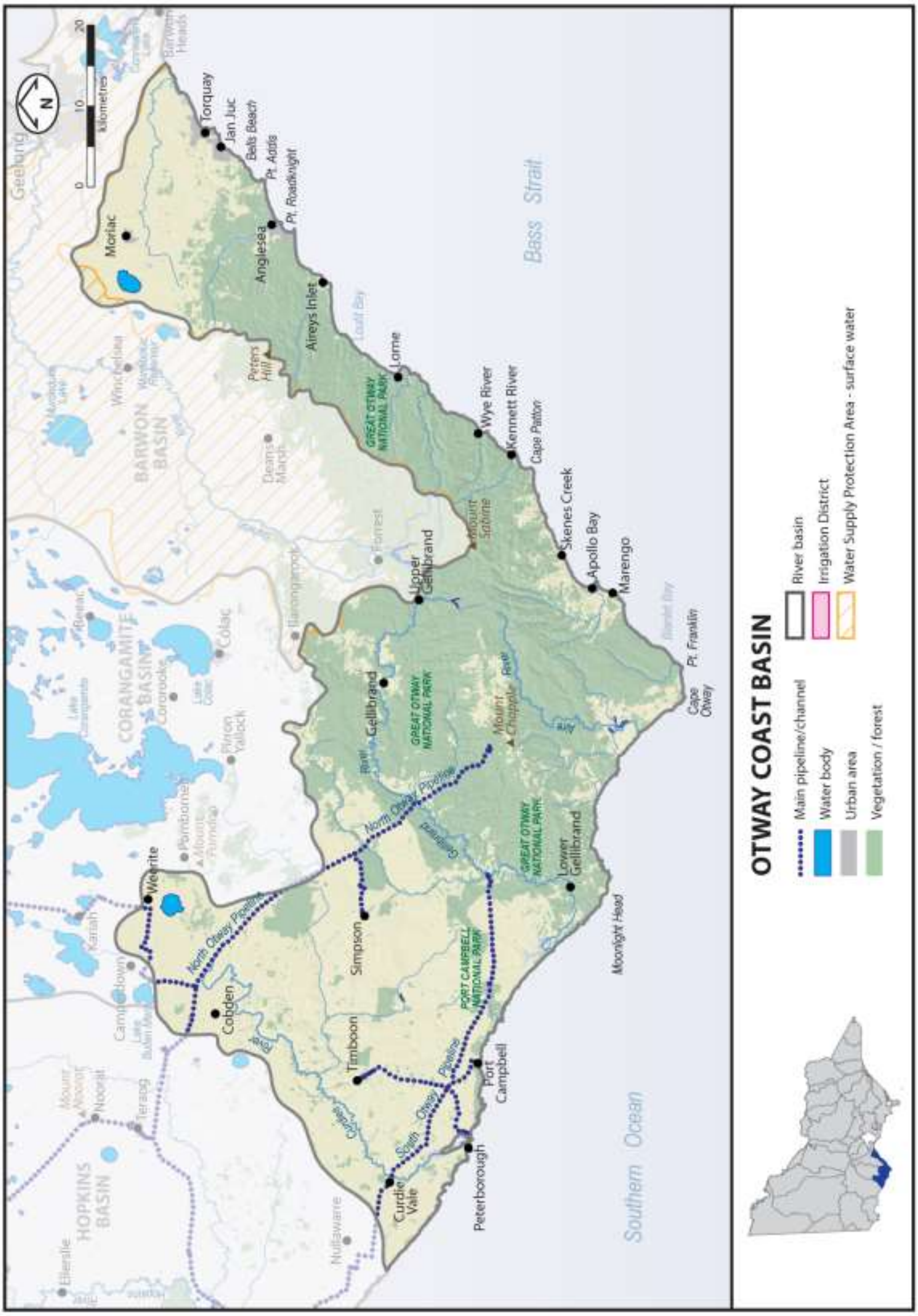
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.23 Otway Coast basin

The Otway Coast basin (Figure 6-43) is located in south-western Victoria. It encompasses the numerous small creeks and rivers that flow to the coast from the Otway Ranges between Torquay and Peterborough.

Figure 6-43 Map of the Otway Coast basin



6.23.1 Water resources overview

In 2013–14, rainfall in the Otway Coast basin was above average, with much of the basin receiving 100 to 125% of the long-term average and an area in its south receiving 125 to 150% of average rainfall. Inflows in the Otway Coast basin in 2013–14 were 109% of the long-term average, compared with 76% in 2012–13. The amount of water flowing into Bass Strait represented 97% of the catchment inflows in the basin in 2013–14.

The storage level in West Gellibrand Reservoir began and ended the year at full capacity. Urban water supplies in Apollo Bay, Skenes Creek and Marengo were subject to mandatory summer restrictions, with Stage 2 restrictions imposed between November 2013 and May 2014. Permanent water saving rules applied in all other towns throughout the year. No restrictions on diversions were applied.

Table 6-144 shows the responsibilities of the authorities within the Otway Coast basin.

Table 6-144 Responsibilities for water resources management in the Otway Coast basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages licensed diversions		
Wannon Water			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 CMA			Manages waterways for the whole of the Otway Coast basin

Environmental Water Reserve

Several important environmental assets in the Otway basin depend on the EWR, including:

- Aire River (a heritage river) and, more specifically, the Lower Aire wetlands which are of national significance
- the Aire River estuary, which is of state significance
- the Upper Aire River, which is a representative river
- Elliot River, Parker River, Grey River, Carisbrook Creek and Smythes Creek, which are ecologically healthy
- the native fish community (e.g. the river blackfish and Australian grayling) and its habitat, such as remnant riparian vegetation
- lakes Costin and Craven
- endangered flow-dependent ecological vegetation classes including estuarine wetland and swamp scrub
- the native bird population including the great egret (a Victorian rare or threatened species), Cape Barren goose and Australasian bittern
- native mammals including platypus and swamp antechinus
- macroinvertebrate communities in areas such as Elliot River, St Georges River and Wye River.

In 2013–14, the Otway Coast basin EWR comprised:

- 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.

6.23.2 Surface water resources

6.23.2.1 Water balance

A surface water balance for the Otway Coast basin is shown in Table 6-145.

Otway Coast basin

Table 6-145 Balance of surface water in the Otway Coast basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	1,856	1,856
Volume in storage at end of year	1,856	1,856
Change in storage	**0**	**0**
Inflows		
Catchment inflow(1)	962,890	668,930
Rainfall on major storages	236	164
Treated effluent discharged back to river	1,130	991
Total inflows	**964,255**	**670,085**
Outflows		
Diversions		
Urban diversions	12,681	13,395
Licensed diversions from unregulated streams	751	845
Small catchment dams	12,728	12,728
Total diversions	***26,159***	***26,967***
Losses		
Evaporation losses from major storages	224	242
Evaporation from small catchment dams	3,455	3,455
In-stream infiltration to groundwater, flows to floodplain and evaporation(2)	n/a	n/a
Total losses	***3,679***	***3,697***
Water passed at outlet of basin		
River outflows to the ocean	934,417	639,420
Total water passed at outlet of basin	***934,417***	***639,420***
Total outflows	**964,255**	**670,085**

Notes:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.
(2) No suitable model is available to make an estimate of in-stream losses.
n/a: information not available.

6.23.2.2 Storages and inflows

The only major storage in the basin is the West Gellibrand Reservoir, which began and ended the year at full capacity (Table 6-146).The volume reported in the 'catchment inflow less regulated releases' column of Table 6-146 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

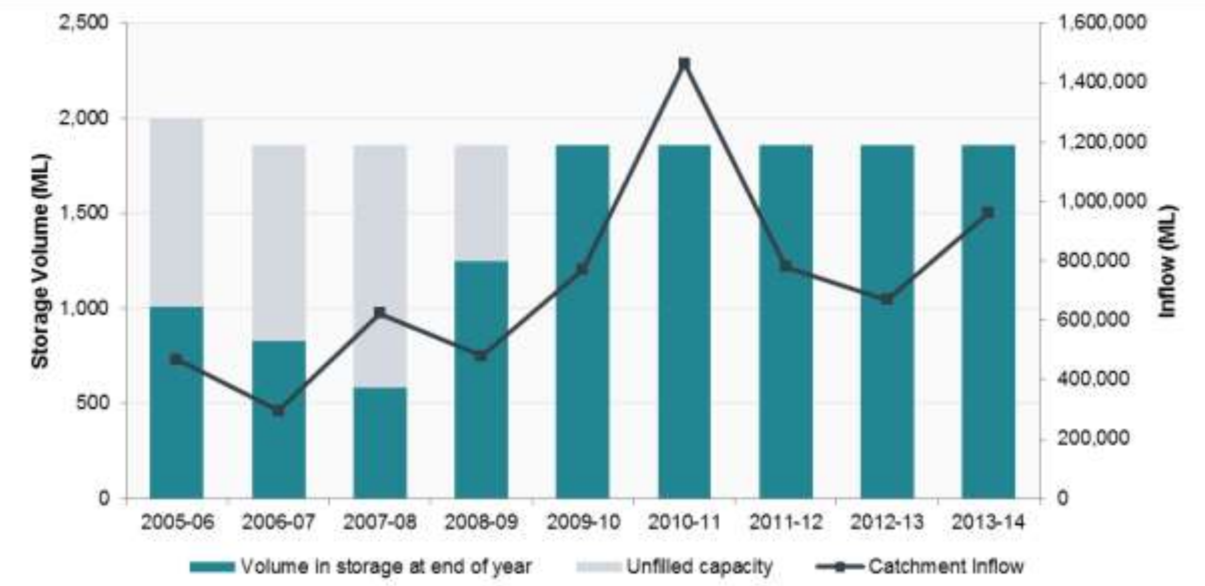
Table 6-146 Storage volumes in the Otway Coast basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
West Gellibrand Reservoir	1,856	1,856	236	224	(12)	1,856
Total	**1,856**	**1,856**	**236**	**224**	**(12)**	**1,856**

Catchment inflows in 2013–14 were 109% of the long-term average of 884,000 ML, compared with 76% in 2012–13 (Figure 6-44).

The amount of water flowing from the Otway Coast basin into Bass Strait increased to 934,417 ML in 2013–14. This represented 97% of the catchment inflows into the basin, compared with 95% in 2012–13.

Figure 6-44 All major storages and catchment inflows in the Barwon basin



6.23.2.3 Entitlement volumes and diversions

In the Otway Coast basin, surface water is diverted by Barwon Water, Wannon Water and licensed diverters, and surface water is also harvested in small catchment dams.

Entitlements in the Otway Coast basin include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Otway Coast basin are outlined in Table 6-147.

Table 6-147 Entitlement volumes in the Otway Coast basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Aireys Inlet) Conversion Order 1997	317
Bulk Entitlement (Apollo Bay) Order 2010	800
Bulk Entitlement (Colac) Amendment Order 2003	5,400
Bulk Entitlement (Gellibrand) Conversion Order 1997	60
Bulk Entitlement (Lorne) Conversion Order 1997	510
Bulk Entitlement (Otway Coast) Conversion Order 1998	12,580
Take and use licences – unregulated surface water	6,701
Total volume of water entitlements in Otway Coast basin	**26,368**

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-148. The volume of water diverted from unregulated streams by licence holders in the Otway Coast basin was less in 2013–14 compared with the volume of 845 ML reported in the 2012–13 Victorian Water Accounts.

Table 6-148 Allocation account balance summary for the Otway Coast basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Aireys Inlet	317	0	198	119
Apollo Bay	800	0	364	436
Colac	5,400	0	3,573	1,827
Gellibrand	60	0	20	40
Lorne	510	0	450	60
Otway System	12,580	0	8,075	4,505
Take and use licences – unregulated surface water	6,701	0	751	5,951

The estimated volume of water harvested from small catchment dams represents a significant portion of the total diversions in the Otway Coast basin (Table 6-149).

Table 6-149 Estimated small catchment dam information for the Otway Coast basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,736	5,368	n/a
Registered commercial and irrigation	8,762	7,360	n/a
Total	**19,498**	**12,728**	**16,183**

n/a: information not available.

6.23.3 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. Across the basin, 13% of wastewater was reused, similar to 2012–13 (Table 6-150).

Table 6-150 Volume of recycled water in the Otway Coast basin

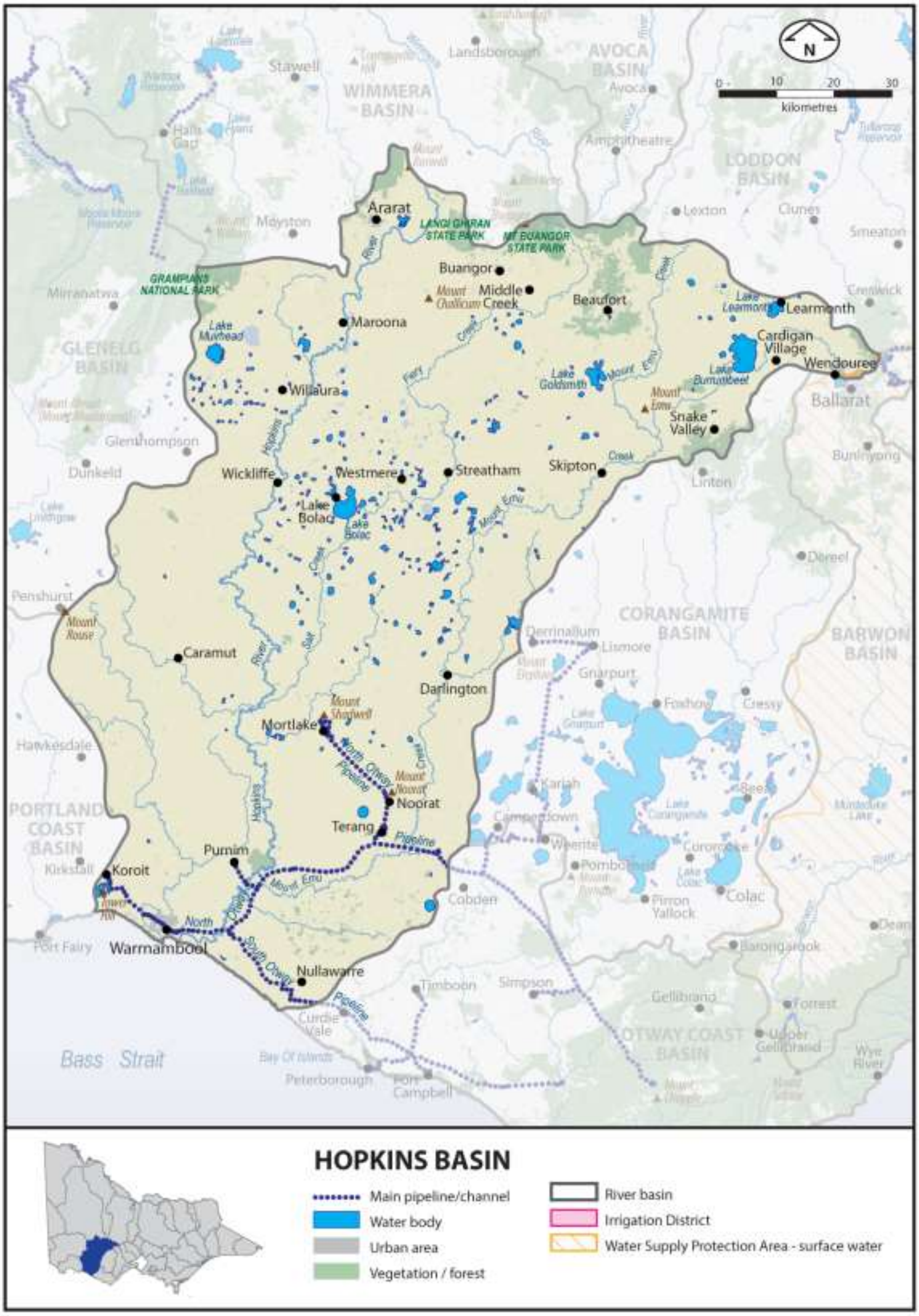
Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Aireys Inlet	47	47	0%	0	0	0	47	0	0
Anglesea	307	51	14%	0	42	0	9	265	(9)
Apollo Bay	450	18	1%	0	3	0	15	447	(15)
Cobden	198	42	21%	0	42	0	0	63	93
Lorne	321	6	0%	0	0	0	6	321	(6)
Peterborough	23	0	0%	0	0	0	0	0	23
Port Campbell	55	43	78%	0	43	0	0	0	12
Simpson	31	0	0%	0	0	0	0	33	(2)
Timboon [4]	50	65	130%	0	65	0	0	0	(15)
Total 2013–14	**1,482**	**272**	**13%**	**0**	**195**	**0**	**77**	**1,129**	**81**
Total 2012–13	1,322	281	12%	0	163	0	118	991	50

Notes:
(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.
(4) Volume recycled greater than volume produced due to water stored on-site carried over from previous year.

6.24 Hopkins basin

The Hopkins basin (Figure 6-45) is located in south-western Victoria. The two major rivers within the basin are the Merri River and Hopkins River.

Figure 6-45 Map of the Hopkins basin



6.24.1 Water resources overview

Rainfall in the Hopkins basin in 2013–14 ranged from 80 to 150% of the long-term average. The north of the basin experienced slightly drier conditions and an average of 80 to 100% rainfall, while a very small area in the south-east of the basin received 125 to 150%. Catchment inflows in 2013–14 were 44% of the long-term average, more than 2012–13 which saw inflow volumes at 37% of the long-term average. The volume of water flowing from the Hopkins basin into Bass Strait represented 66% of the catchment inflows, compared with 58% in 2012–13.

No urban water use restrictions applied in the Hopkins basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. Irrigation restrictions were applied to the Hopkins and Merri rivers and the Brucknell and Mount Emu creeks in October 2013 and were lifted in June 2014.

Table 6-151 shows the responsibilities of the authorities within the Hopkins basin.

Table 6-151 Responsibilities for water resources management in the Hopkins basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages groundwater and surface water licensed diversions (except Loddon Highlands WSPA, which is managed by Goulburn–Murray Water)		
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 CMA			Manages waterways in the whole of the Hopkins basin

Environmental Water Reserve

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 2013–14, the EWR for the Hopkins basin comprised:

- 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 Grampians Wimmera Mallee Water
- water set aside for the environment through the operation of licensed diversions in passing flow conditions, particularly for Cudgee and Mt Emu creeks
- all other water in the basin not allocated for consumptive use.

6.24.2 Surface water resources

6.24.2.1 Water balance

A water balance for the Hopkins basin is shown in Table 6-152. No storage information is recorded in the water balance as there are no major on-stream storages in the basin. Small catchment dams harvest most of the water used for consumptive purposes.

Table 6-152 Balance of surface water in the Hopkins basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	**-**	**-**
Inflows		
Catchment inflow[(1)]	280,650	235,182
Rainfall on major storages	-	-
Treated effluent discharged back to river	25	91
Total inflows	**280,674**	**235,274**
Outflows		
Diversions		
Urban diversions	155	179
Licensed diversions from unregulated streams	1,924	3,484
Small catchment dams	64,538	64,538
Total diversions	***66,617***	***68,201***
Losses		
Evaporation losses from major storages	-	-
Evaporation from small catchment dams	30,166	30,166
In-stream infiltration to groundwater, flows to floodplain and evaporation[(2)]	n/a	n/a
Total losses	***30,166***	***30,166***
Water passed at outlet of basin		
River outflows to the ocean	183,891	136,907
Total water passed at outlet of basin	***183,891***	***136,907***
Total outflows	**280,674**	**235,274**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.

(2) No suitable model is available to make an estimate of in-stream losses.

n/a: information not available.

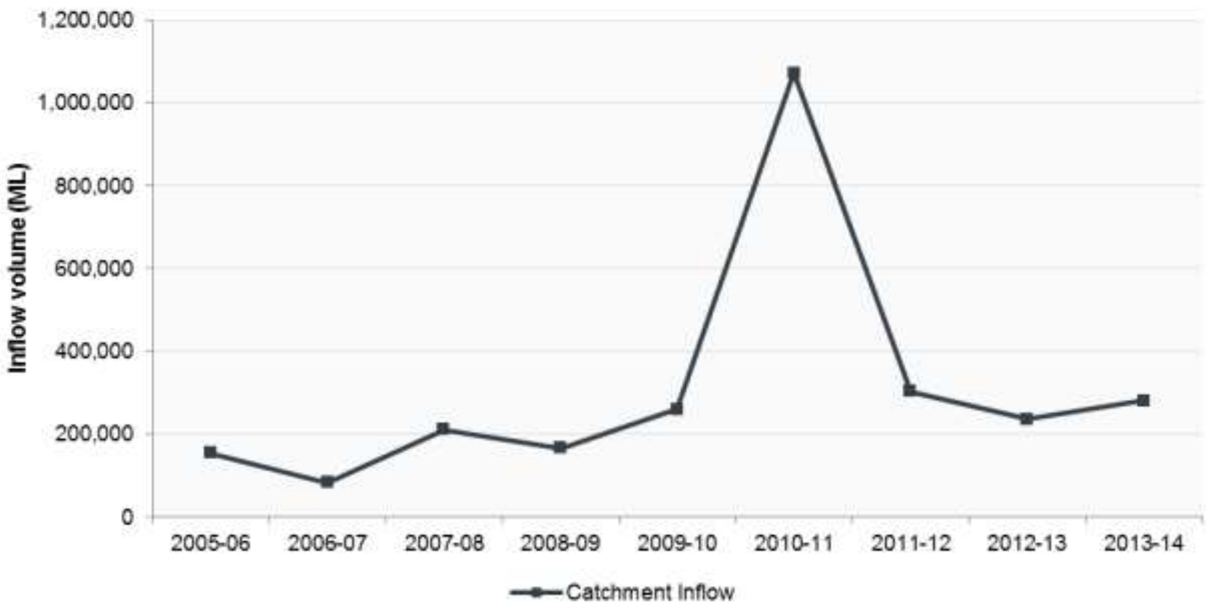
6.24.2.2 Storages and flows

Catchment inflows in 2013–14 were 44% of the long-term average (of 635,000 ML), compared with 37% in 2012–13 (Figure 6-46).

The volume of water flowing from the Hopkins basin into Bass Strait was 183,891 ML in 2013–14, which represented 66% of the catchment inflows. This is an increase from 136,907 ML in 2012–13, which represented 58% of catchment inflows.

There are no major storages in the Hopkins basin.

Figure 6-46 Catchment inflows in the Hopkins basin



6.24.2.3 Entitlement volumes and diversions

In the Hopkins basin, bulk entitlements to surface water are held by Central Highlands Water and licensed diverters. Surface water is diverted by licensed diverters and is also harvested into small catchment dams.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Hopkins basin are outlined in Table 6-153.

The Hopkins basin (Masons Creek) also supplies the Willaura, Elmhurst and Buangor systems bulk entitlement. This entitlement and its use is reported in the Wimmera basin given most of the water for this entitlement is sourced from the Wimmera basin.

Table 6-153 Entitlement volumes in the Hopkins basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Beaufort) Conversion Order 2005	419
Bulk Entitlement (Skipton) Conversion Order 2005(1)	210
Take and use licences – unregulated surface water	11,417
Total volume of water entitlements in the Hopkins basin	**12,046**

Note:
(1) Central Highlands Water has not diverted any water under its Skipton bulk entitlement for a number of years. The town is now supplied from the Ballarat system.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-154. The total volume of water diverted by bulk entitlement holders was similar to the volume reported in the 2012–13 Victorian Water Accounts.

The volume of water diverted from unregulated streams by licence holders in the Hopkins basin was 1,924 ML, which was lower than the 2012–13 volume of 3,484 ML (Table 6-154).

Table 6-154 Allocation account balance summary for the Hopkins basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Beaufort	419	0	155	264
Skipton	210	0	0	210
Take and use licences – unregulated surface water	11,417	0	1,924	9,493

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the Hopkins basin (Table 6-155).

Table 6-155 Estimated small catchment dam information for the Hopkins basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	30,913	15,456	n/a
Registered commercial and irrigation	58,430	49,082	n/a
Total	**89,343**	**64,538**	**94,704**

n/a: information not available.

6.24.3 Recycled water

Three water authorities operate wastewater treatment plants in the Hopkins basin. The largest volume of water is from the Warrnambool Treatment Plant. The percentage of water recycled in 2013–14 reduced slightly compared with 2012–13.

Table 6-156 shows the volumes of water recycled in the Hopkins basin in 2013–14.

Table 6-156 Volume of recycled water in the Hopkins basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Ararat	470	309	64%	176	126	0	7	0	161
Beaufort	41	41	100%	0	41	0	0	0	0
Cardigan Village	0	0	0%	0	0	0	0	0	0
Mortlake	96	44	45%	3	40	0	0	25	28
Skipton	0	0	0%	0	0	0	0	0	0
Terang (4)	153	196	128%	0	196	0	0	0	(43)
Warrnambool	5,404	0	0%	0	0	0	0	0	5,404
Willaura	14	9	64%	9	0	0	0	0	5
Total 2013–14	**6,178**	**598**	**10%**	**188**	**403**	**0**	**7**	**25**	**5,555**
Total 2012–13	5,470	672	12%	204	461	0	7	91	4,707

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

(4) Volume recycled greater than volume produced due to water stored on-site carried over from previous year.

6.25 Portland Coast basin

The Portland Coast basin (Figure 6-47) is located in south-western Victoria. Major rivers within the basin include the Moyne River, Eumeralla River, Fitzroy River and the Surrey River.

Figure 6-47 Map of the Portland Coast basin

6.25.1 Water resources overview

In 2013–14, the Portland Coast basin experienced wetter conditions than usual, receiving 100 to 150% of the long-term average rainfall. Inflows in 2013–14 were 158% of the long-term average, compared with 94% in 2012–13. The amount of water flowing from the Portland Coast basin into Bass Strait represented 96% of the catchment inflows in the basin in 2013–14.

Irrigation bans were in place for licensed diversions from early 2014 on the Moyne, Surrey, Fitzroy and Eumeralla rivers, which comprise most of the major waterways in the basin. These restrictions were all lifted by June. No urban water use restrictions applied in the Portland Coast basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year.

Table 6-157 shows the responsibilities of the authorities within the Portland Coast basin.

Table 6-157 Responsibilities for water resources management in the Portland Coast basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages licensed diversions		
Wannon Water		Supplies groundwater to Koroit, Port Fairy, Heywood and Portland	
Glenelg Hopkins CMA			Manages waterways in the whole Portland Coast basin

Environmental Water Reserve

In 2013–14, the Portland Coast basin EWR comprised:

- water in the basin not otherwise allocated for consumptive use
- water set aside for the environment through the operation of passing flow conditions on licensed diversions, particularly for the Condah Drain, Darlot Creek and the Fitzroy, Moyne and Surrey rivers.

6.25.2 Surface water resources

6.25.2.1 Water balance

A water balance for the Portland Coast basin is shown in Table 6-158. Of the total inflows, approximately 3% were diverted for consumptive use, mainly by small catchment dams. All towns serviced by Wannon Water in this basin are either supplied by groundwater or directly from other river basins. No storage information is recorded in the water balance as there are no major on-stream storages in the Portland Coast basin.

Table 6-158 Balance of surface water in the Portland Coast basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	**-**	**-**
Inflows		
Catchment inflow(1)	571,317	338,902
Rainfall on major storages	-	-
Treated effluent discharged back to river	238	177
Total inflows	**571,555**	**339,079**
Outflows		
Diversions		
Licensed diversions from unregulated streams	2	73
Small catchment dams	16,135	16,135
Total diversions	***16,137***	***16,208***
Losses		
Evaporation losses from major storages	-	-
Evaporation from small catchment dams	4,484	4,484
In-stream infiltration to groundwater, flows to floodplain and evaporation(2)	n/a	n/a
Total losses	***4,484***	***4,484***
Water passed at outlet of basin		
River outflows to the ocean	550,934	318,387
Total water passed at outlet of basin	***550,934***	***318,387***
Total outflows	**571,555**	**339,079**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.

(2) No suitable model is available to make an estimate of in-stream losses.

n/a: information not available.

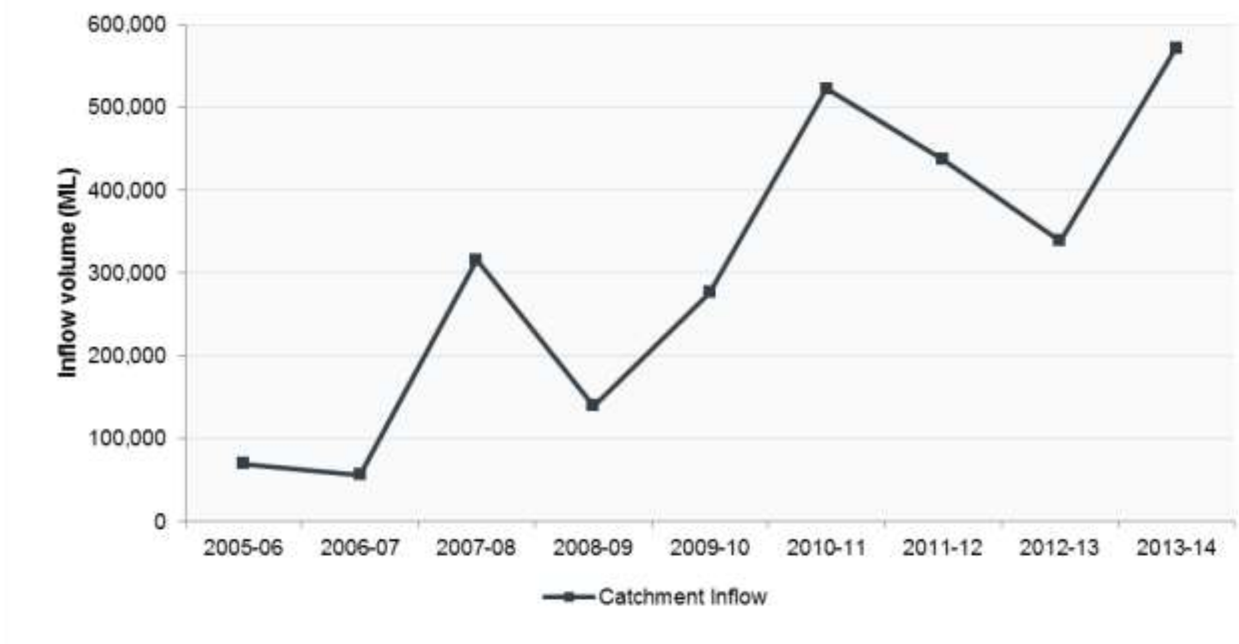
6.25.2.2 Storages and flows

There are no major storages in the Portland Coast basin.

Catchment inflows in 2013–14 were 158% of the long-term average of 361,000 ML, compared with 94% in 2012–13 (Figure 6-48).

The amount of water flowing from the Portland Coast basin into Bass Strait was 550,934 ML in 2013–14, a significant increase from the previous year. This represents 96% of catchment inflows.

Figure 6-48 Catchment inflows in the Portland Coast basin



6.25.2.3 Entitlement volumes and diversions

In the Portland Coast basin, surface water is diverted from unregulated streams by licence holders and surface water is harvested in small catchment dams. No water corporations divert surface water in this basin.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Portland Coast basin are outlined in Table 6-159.

Table 6-159 Entitlement volumes in the Portland Coast basin

Water entitlements	Annual entitlement volume (ML)
Take and use licences – unregulated surface water	1,079
Total volume of water entitlements in the Portland Coast basin	**1,079**

Allocation available under licences for 2013–14 is presented in Table 6-160. In 2013–14, out of a total licence volume of 1,079 ML, about 2 ML was diverted for use in the basin, an amount much lower compared with the 73 ML reported in the 2012–13 Victorian Water Accounts.

Table 6-160 Allocation account balance summary for the Portland Coast basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Take and use licences – unregulated surface water	1,079	0	2	1,077

The estimated volume of water harvested from small catchment dams represents the largest diversion of surface water in the Portland Coast basin (Table 6-161).

Table 6-161 Estimated small catchment dam information for the Portland Coast basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	4,524	2,262	n/a
Registered commercial and irrigation	16,516	13,873	n/a
Total	**21,040**	**16,135**	**20,619**

n/a: information not available.

6.25.3 Recycled water

Wannon Water operates all treatment plants within the Portland Coast basin. In 2013–14, 4% of the total wastewater produced in the basin was reused, including 22% of the total wastewater at the Heywood treatment plant which was used for wood lot irrigation (a decrease from 43% in 2012–13).

Table 6-162 shows the volumes of water recycled in the Portland Coast basin in 2013–14.

Table 6-162 Volume of recycled water in the Portland Coast basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Heywood	467	101	22%	0	101	0	0	238	128
Port Fairy	1,158	0	0%	0	0	0	0	0	1,158
Portland	1,154	0	0%	0	0	0	0	0	1,154
Total 2013–14	**2,779**	**101**	**4%**	**0**	**101**	**0**	**0**	**238**	**2,440**
Total 2012–13	2,412	158	7%	0	158	0	0	177	2,077

Notes:

(1) ‘Beneficial allocation’ refers to the volume used to deliver specific environmental flow benefits.

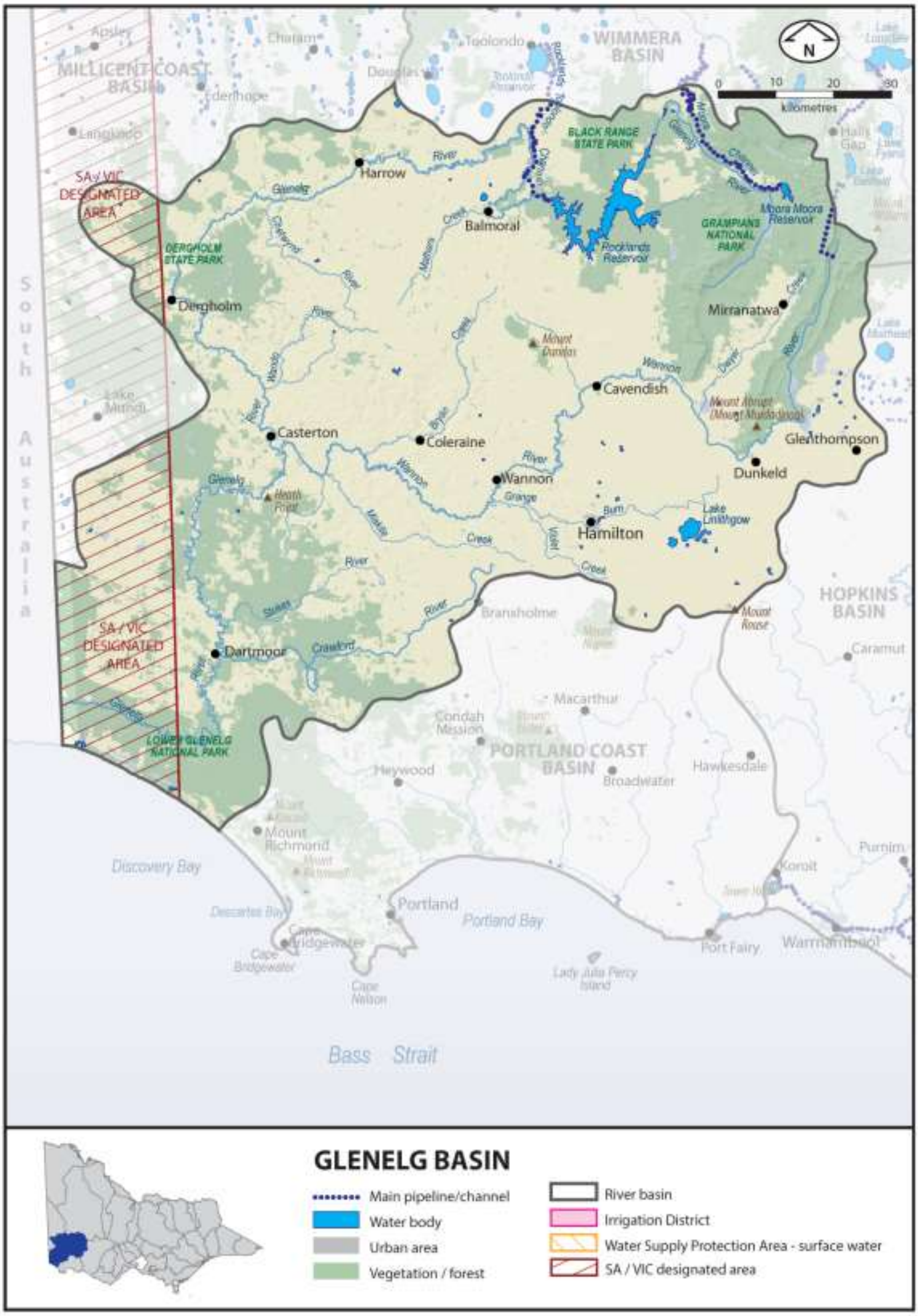
(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

(3) ‘Other’ refers to a change in on-site wastewater storage or items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.26 Glenelg basin

The Glenelg basin (Figure 6-49) is located in the far west of Victoria. It has four on-stream storages, the largest of which is Rocklands Reservoir.

Figure 6-49 Map of the Glenelg basin



6.26.1 Water resources overview

In 2013–14, most of the Glenelg basin received rainfall of 100 to 150% of the long-term average, however the north of the basin experienced slightly drier conditions, receiving 80 to 100% of average rainfall. Catchment inflows in the Glenelg basin in 2013–14 were approximately 17% higher than in 2012–13. The basin's largest water storage, Rocklands Reservoir, started the year at 23% of capacity and finished at 24%.

Stage 1 restrictions for urban water use in the town of Harrow continued throughout 2013–14 due to the capacity constraints of the existing groundwater bore. All other towns remained on permanent water saving rules throughout the year. The Glenelg and Crawford rivers were subject to irrigation bans from February until April and May respectively, while the Wannon and Grange Burn rivers also had restrictions applied for short periods in the late summer months.

Table 6-163 shows the responsibilities of the authorities within the Glenelg basin.

Table 6-163 Responsibilities for water resources management in the Glenelg basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Southern Rural Water	Manages licensed diversions for the entire basin except the Glenelg River north of the bridge on the Casterton–Harrow Road		
Grampians Wimmera Mallee Water	Manages licensed diversions for the Glenelg River north of the bridge on the 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 system Obliged to meet passing flow requirements
VEWH			Holds and manages environmental entitlements in the basin
Glenelg–Hopkins CMA			Manages waterways in the whole of the Glenelg basin

Environmental Water Reserve

The Lower Glenelg River is a heritage river and depends on the Glenelg basin EWR to function ecologically. Other important environmental assets that also rely on the EWR of this basin are:

- Glenelg spiny crayfish (threatened under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and only found in the Glenelg River basin).
- Yarra and Ewens pygmy perch (vulnerable under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (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*) 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 critically endangered under the EPBC Act.

In 2013–14, the Glenelg basin EWR comprised:

- the *Wimmera and Glenelg Rivers Environmental Entitlement 2010* comprising 41,560 ML of high reliability entitlement, which includes 1,000 ML of Wimmera–Mallee wetlands entitlement, held by the VEWH
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Grampians Wimmera Mallee Water and Wannon Water
- water set aside for the environment through the operation of passing flow conditions on licensed diversions, particularly in the Crawford, Glenelg, Grange Burn and Wannon rivers
- all other water in the basin not allocated for consumptive use.

A total of 10,207 ML of environmental entitlement water was delivered in the Glenelg basin in 2013–14.

6.26.2 Surface water resources

6.26.2.1 Water balance

A water balance for the Glenelg basin is shown in Table 6-164. A volume of 11,878 ML was diverted to the Wimmera–Mallee system in 2013–14.

Table 6-164 Balance of surface water in the Glenelg basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	84,841	113,903
Volume in storage at end of year	92,041	84,841
Change in storage	**7,200**	**(29,062)**
Inflows		
Catchment inflow(1)	599,750	426,508
Rainfall on major storages	15,678	10,603
Treated effluent discharged back to river	271	295
Total inflows	**615,699**	**437,406**
Outflows		
Diversions		
Urban diversions	2,246	1,361
Transfers to the Wimmera basin(2)	11,878	652
Licensed diversions from unregulated streams	215	348
Small catchment dams	55,483	55,483
Total diversions	***69,822***	***57,843***
Losses		
Evaporation losses from major storages	31,244	38,819
Evaporation from small catchment dams	24,622	24,622
In-stream infiltration to groundwater, flows to floodplain and evaporation	54,991	54,674
Total losses	***110,857***	***118,115***
Water passed at outlet of basin		
River outflows to the ocean	427,820	290,509
Total water passed at outlet of basin	***427,820***	***290,509***
Total outflows	**608,499**	**466,467**

Notes:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

(2) Transfers from the Glenelg basin to the Brimpaen storages in the Wimmera basin, via the Moora Channel.

6.26.2.2 Storages and flows

Four major storages are located within the basin. Rocklands Reservoir, which accounts for 97% of the total capacity of Glenelg basin storages, was holding 24% of capacity at the end of 2013–14. The volume reported in the 'catchment inflow less regulated releases' column of Table 6-165 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Glenelg basin

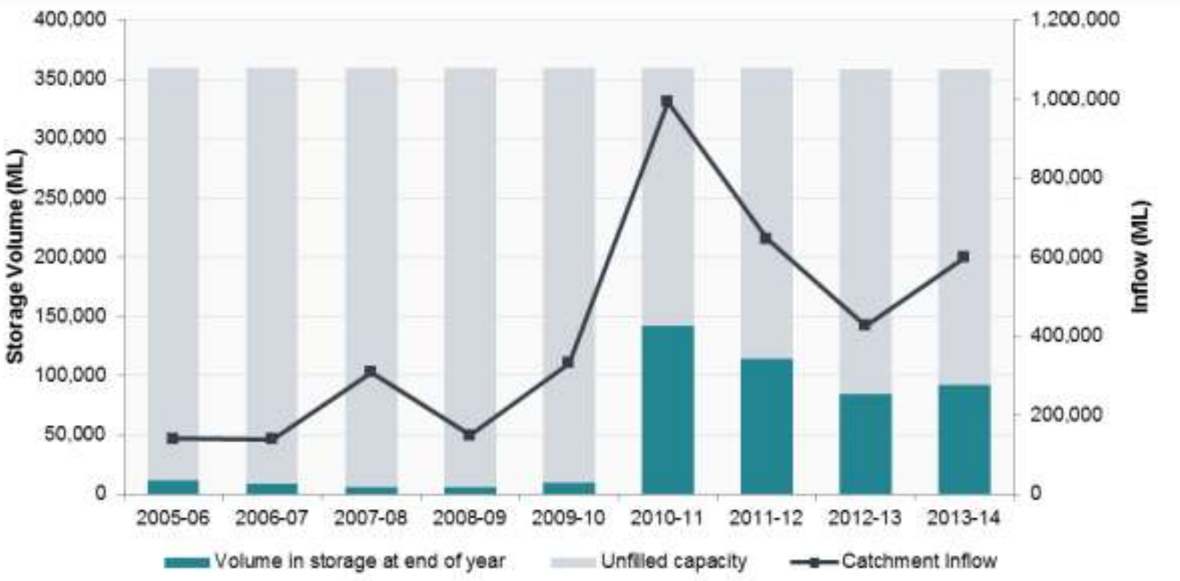
Table 6-165 Storage volumes in the Glenelg basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Hamilton System Reservoirs	2,654	1,697	284	361	771	2,390
Konongwootong Reservoir	1,920	623	522	594	793	1,344
Moora Moora Reservoir	6,300	1,960	2,414	3,970	3,486	3,890
Rocklands Reservoir	348,300	80,561	12,459	26,318	17,716	84,417
total	**359,174**	**84,841**	**15,678**	**31,244**	**22,766**	**92,041**

Catchment inflows across the basin were 599,750 ML. This was 62% of the long-term average, significantly higher than the volume of inflow in 2012–13 (Figure 6-50).

The volume of water flowing from the Glenelg basin into Bass Strait was 427,820 ML in 2013–14, a decrease from the previous year (Figure 6-50). This represented 72% of the catchment inflows into the basin, compared with 68% in 2012–13.

Figure 6-50 All major storages and catchment inflows in the Glenelg basin



6.26.2.3 Entitlement volumes and diversions

In the Glenelg basin, bulk entitlements to surface water are held by Grampians Wimmera Mallee Water, Central Highlands Water, Coliban Water and Wannon Water. Surface water is also diverted by licensed diverters, and surface water is harvested in small catchment dams.

Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Glenelg basin are outlined in Table 6-166.

Under Grampians Wimmera Mallee Water's Wimmera and Glenelg Rivers bulk entitlement, the water corporation operates the Wimmera–Mallee system headworks to supply water to towns and customers connected to the Wimmera–Mallee Pipeline, and also to supply entitlements held by Coliban Water and Wannon Water, and the VEWH.

The Wimmera–Mallee system headworks harvests water from both the Glenelg and Wimmera river systems and the volumes supplied to entitlement holders cannot be disaggregated between the two basins. The entitlement volumes and diversions are presented in the Wimmera basin chapter in Table 6-175.

Wannon Water also holds four other bulk entitlements for supply to towns within the Glenelg basin.

Table 6-166 Entitlement volumes in the Glenelg basin

Water entitlements	Annual entitlement volume (ML)

Bulk Entitlement (Coleraine, Casterton, Sandford) Conversion Order 1997	855
Bulk Entitlement (Dunkeld System) Conversion Order 1997	170
Bulk Entitlement (Glenthompson) Conversion Order 1997	94
Bulk Entitlement (Hamilton) Conversion Order 1997	3,435
Take and use licences – unregulated surface water	1,066
Total volume of water entitlements in Glenelg basin	**5,620**

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-167

The volume of water diverted from unregulated streams by licence holders in the Glenelg basin in 2013–14 was lower compared with the volume 348 ML reported in the 2012–13 Victorian Water Accounts.

The Wimmera and Glenelg Rivers Environmental Entitlement 2010 provides the VEWH with water from the Wimmera Mallee system headworks to provide environmental benefits in both the Wimmera and Glenelg basins. In the Glenelg basin, water available under the environmental entitlement supports streamflows and is not diverted out of waterways. The allocation available for use in 2013–14 under this entitlement is shown in Table 6-176 (Wimmera basin section).

Table 6-167 Allocation account balance summary for the Glenelg basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Coleraine, Casterton, Sandford	855	0	104	751
Dunkeld System	170	0	27	143
Glenthompson	94	0	10	84
Hamilton	3,435	0	2,105	1,330
Take and use licences – unregulated surface water	1,066	0	215	851

The estimated volume of water harvested from small catchment dams makes up a significant portion of total surface water diversions in the Glenelg basin (Table 6-168).

Table 6-168 Estimated small catchment dam information for the Glenelg basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	27,109	13,555	n/a
Registered commercial and irrigation	49,915	41,928	n/a
Total	**77,024**	**55,483**	**80,105**

n/a: information not available.

6.26.3 Recycled water

Wannon Water operates four wastewater treatment plants in the Glenelg basin. The volume of wastewater produced in 2013–14 increased compared with 2012–13, but less was recycled. In 2013–14, 29% of wastewater was recycled, compared with 74% in 2012–13.

Table 6-169 shows the volumes of water recycled in the Glenelg basin in 2013–14.

Glenelg basin

Table 6-169 Volume of recycled water in the Glenelg basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Casterton	80	30	37%	0	30	0	0	62	(12)
Coleraine	43	15	35%	0	15	0	0	0	28
Dunkeld	31	19	62%	19	0	0	0	0	12
Hamilton	991	264	27%	31	233	0	0	209	518
Total 2013–14	**1,145**	**328**	**29%**	**50**	**278**	**0**	**0**	**271**	**546**
Total 2012–13	880	653	74%	153	500	0	0	295	(68)

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

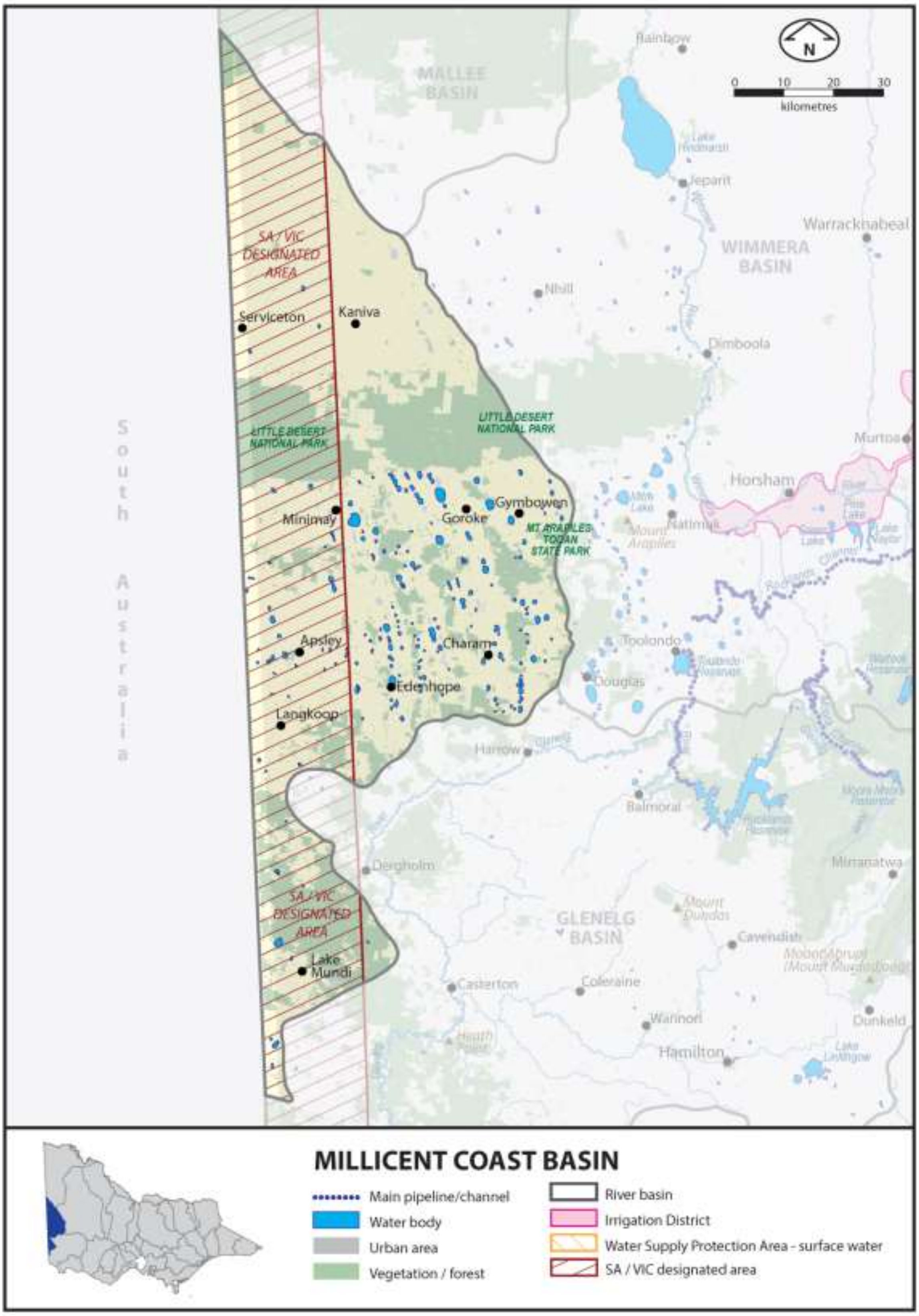
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(3) 'Other' refers to a change in on-site wastewater storage or items affecting the annual water balance for recycled water that are not otherwise accounted for, such as Wannon Water holding wastewater in storage for the next year.

6.27 Millicent Coast basin

The Millicent Coast basin (Figure 6-51) spans parts of both Victoria and South Australia. The Victorian section of the basin comprises numerous internally draining inter-dune wetlands located mainly in the south, and several minor waterways which flow intermittently and continue into South Australia. Groundwater is the most significant resource in the basin.

Figure 6-51 Map of the Millicent Coast basin



6.27.1 Water resources overview

In 2013–14, rainfall across the Millicent Coast was higher than the preceding year and ranged from 80 of 150% of the long-term average, with slightly drier conditions in the north and wetter in the south.

Groundwater is the main source of water supply in the Millicent Coast basin and this is covered by the West Wimmera GMA. Information about groundwater licences and use in this area can be found in section 7.25, West Wimmera groundwater catchment.

No urban water use restrictions applied in the Millicent Coast basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year. Licensed diversions from unregulated streams were also unrestricted throughout the year.

Table 6-170 shows the responsibilities of the authorities within the Millicent Coast basin.

Table 6-170 Responsibilities for water resources management in the Millicent Coast basin

Authority	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Grampians Wimmera Mallee Water	Manages licensed diversions within the Millicent Coast basin	Supplies all towns including Kaniva and Edenhope	
Wimmera CMA			Manages waterways in the whole of the Millicent Coast basin

Environmental Water Reserve

The Millicent Coast basin contains numerous wetlands dependent on the basin's EWR. The largest waterway in the basin, the ephemeral Mosquito Creek, provides streamflows to support Ramsar-listed wetlands in South Australia, including Bool and Hacks lagoons.

In 2013–14, the Millicent Coast basin EWR comprised all water in the basin not allocated for consumptive use.

6.27.2 Surface water resources

6.27.2.1 Water balance

Limited information is currently available for surface water availability and use, so a water balance has not been included for the Millicent Coast basin.

6.27.2.2 Storages and flows

No reliable streamflow 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.

6.27.2.3 Entitlement volume and diversions

There are no bulk entitlements to surface water in the Millicent Coast basin. All water is diverted from unregulated streams under licences. At the end of 2013–14, the licensed volume totalled 4.4 ML and use was estimated to be 4.4 ML.

6.27.2.4 Small catchment dams

No information regarding small catchment dams is readily available within the Millicent Coast basin.

6.27.3 Recycled water

Grampians Wimmera Mallee Water 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 the Kaniva and Serviceton treatment plants was evaporated on-site and is not included in Table 6-171.

Table 6-171 Volume of recycled water in the Millicent Coast basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Edenhope	88	57	65%	57	0	0	0	0	31
Kaniva North	0	0	0%	0	0	0	0	0	0
Kaniva South	0	0	0%	0	0	0	0	0	0
Serviceton	0	0	0%	0	0	0	0	0	0
Total 2013–14	**88**	**57**	**65%**	**57**	**0**	**0**	**0**	**0**	**31**
Total 2012–13	37	11	30%	11	0	0	0	0	26

Notes:

(1) ‘Beneficial allocation’ refers to the volume used to deliver specific environmental flow benefits.

(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

6.28 Wimmera basin

The Wimmera basin (Figure 6-52) is the largest landlocked river basin in Victoria. The Wimmera River's headwaters are near Mt Cole in the Pyrenees Ranges. It flows westwards across the foothills of the Grampians and at Horsham it turns north and flows for about 150 km, terminating at Lake Hindmarsh.

Figure 6-52 Map of the Wimmera basin

6.28.1 Water resources overview

In 2013–14, rainfall across the Wimmera was again below the long-term average. Across most of the basin average rainfall of 80 to 100% was recorded, and a significant area in the basin's north-east experienced the driest conditions in the state with 60–80% of long-term average rainfall. In 2013–14, catchment inflows in the Wimmera basin were 29% of the long-term average, higher than the previous year, when they were 23% of the long-term average.

After starting the year at 33% of capacity, storages in the Wimmera basin finished the year similarly at 33% of capacity at the end of June 2014. While storage levels were still significantly lower than total capacity, there were no restrictions to urban water supplies or licensed diversions from streams. Grampians Wimmera Mallee Water has not delivered irrigation supplies for about 10 years.

Table 6-172 shows the responsibilities of the authorities within the Wimmera basin.

Table 6-172 Responsibilities for water resources management in the Wimmera basin

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Grampians Wimmera Mallee Water	Manages the Wimmera–Mallee supply system which delivers water to farms in the Wimmera basin(1)	Manages licensed diversions	Supplies most towns in the Wimmera basin(1) Provides bulk supply to some of Coliban Water's towns in the Loddon basin	Operates the Wimmera–Mallee water supply system
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 Grampians Wimmera Mallee Water with bulk supplies for domestic and stock use from the Goulburn system via the Waranga Main Channel			
VEWH				Holds and manages environmental entitlements in the basin
Wimmera CMA				Manages waterways in the Wimmera River catchment
North Central CMA				Manages waterways in the Avon and Richardson river catchments

Note:
(1) Also supplies farms and towns located in the Avoca and Mallee basins.

Environmental Water Reserve

The Wimmera River is a heritage river that depends on the EWR. Important environmental assets in the Wimmera basin include platypus, freshwater catfish and river blackfish. Several priority river reaches have been identified and include:

- MacKenzie River Reach 2, which contains regionally threatened populations of native fish (river blackfish, southern pygmy perch, mountain galaxias) and platypus (of which there are believed to be less than 10, with this the only population in the catchment).
- MacKenzie River Reach 3, which contains the only known population of the Wimmera bottlebrush (*Callistemon wimmerensis*) which has recently been listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*. This species depends on flows in the MacKenzie River for its survival and recruitment.
- Lower Wimmera River, which is listed under the Victorian *Heritage Rivers Act 1992* and which flows into Lake Hindmarsh (listed as a nationally significant wetland) and Lake Albacutya (a Ramsar wetland). It contains Victoria's only self-sustaining population of freshwater catfish (which is an 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 2013–14, the EWR in the Wimmera basin had the following components:

- the *Wimmera and Glenelg Rivers Environmental Entitlement 2010* comprising 41,560 ML of high reliability entitlement, which includes 1,000 ML of Wimmera–Mallee wetlands entitlement, held by the VEWH
- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Grampians Wimmera Mallee Water and conditions on licensed diversions
- all other water in the basin not allocated for consumptive use.

A total of 19,532 ML of environmental entitlement water was delivered in the Wimmera system in 2013–14. In addition, 265 ML of environmental entitlement water held by the VEWH and 16 ML of environmental water accounted for against Grampians Wimmera Mallee Water accounts was delivered to Wimmera–Mallee wetlands in 2013–14.

6.28.2 Surface water resources

6.28.2.1 Water balance

A surface water balance for the Wimmera basin is shown in Table 6-173.

Table 6-173 Balance of surface water in the Wimmera basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	128,902	177,776
Volume in storage at end of year	126,040	128,902
Change in storage	**(2,862)**	**(48,874)**
Inflows		
Catchment inflow(1)	92,907	71,509
Rainfall on major storages	22,231	16,762
Transfer from Glenelg basin	11,878	652
Treated effluent discharged back to river	0	0
Total inflows	**127,016**	**88,923**
Outflows		
Diversions		
Urban diversions and domestic and stock use	19,723	16,509
Diversions for irrigation	0	0
Licensed diversions from unregulated streams	186	454
Environmental water diversions to wetlands	265	161
Small catchment dams	14,337	14,337
Total diversions	***34,511***	***31,462***
Losses		
Evaporation losses from major storages	49,141	46,897
Evaporation from small catchment dams	8,642	8,642
In-stream infiltration to groundwater, flows to floodplain and evaporation	20,372	21,962
Total losses	***78,155***	***77,501***
Water passed at outlet of basin		
River outflows to Lake Buloke	14	63
River outflows to Lake Hindmarsh (measured at Tarranyurk)	17,197	28,770
Total water passed at outlet of basin	***17,212***	***28,834***
Total outflows	**129,878**	**137,797**

Note:

(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows, and the known inflows and net change in storage volume.

6.28.2.2 Storages and flows

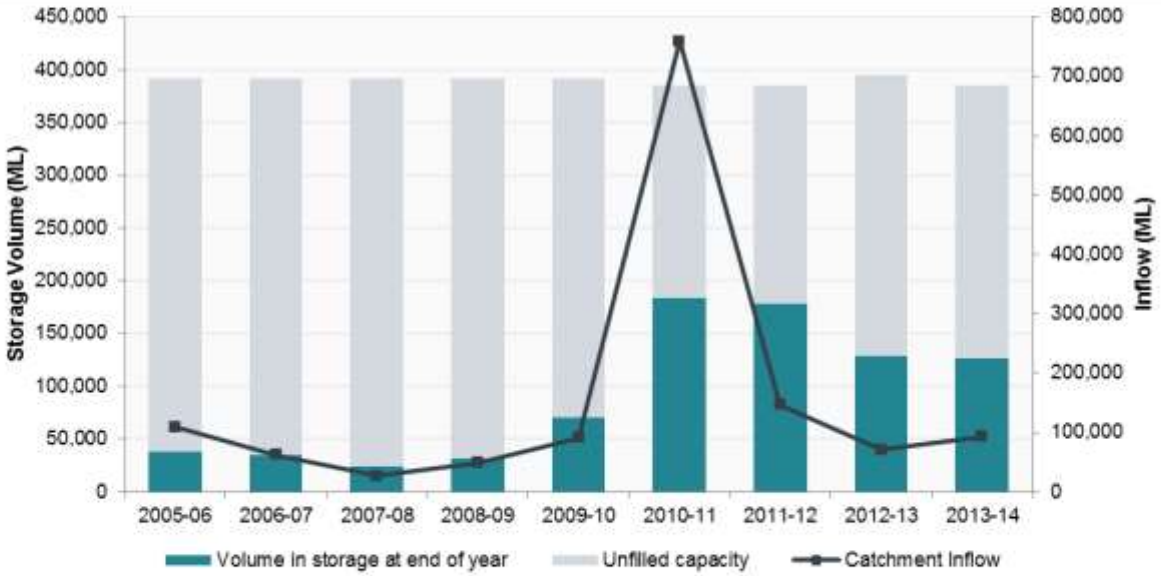
Levels for all major storages in the basin started the year at 128,902 ML and finished at 126,040 ML (33% of capacity) at the end of June 2014 (Table 6-174). Only volumes for major on-stream storages have been included in the water balance. The volume reported in the 'catchment inflow less regulated releases' column in Table 6-174 is the balancing item for each storage. It represents the flow of water in or out of the storage that is not shown as rainfall or evaporation, and may include other minor components influencing the change in storage during the year.

Table 6-174 Storage volumes in the Wimmera basin

Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Batyo Lake	2,250	20	356	1,203	827	0
Dock Lake	4,420	0	0	0	0	0
Fyans Lake	18,460	12,455	1,871	5,708	7,094	15,712
Green Lake	5,350	2,750	599	1,578	1,239	3,010
Lake Bellfield	78,560	61,224	3,536	4,447	(2,060)	58,252
Lake Lonsdale	65,480	5,910	4,873	16,476	13,063	7,370
Pine Lake	62,000	4,030	0	0	(4,030)	0
Taylors Lake	27,060	10,103	1,410	3,882	2,059	9,690
Toolondo Reservoir	92,430	17,320	3,340	8,464	3,359	15,556
Wartook Reservoir	29,300	15,090	6,246	7,384	2,498	16,450
Total storages	**385,310**	**128,902**	**22,231**	**49,141**	**24,048**	**126,040**

Catchment inflows were 29% of the long-term average of 316,400 ML. This was higher compared with 2012–13, when inflows were 23% of the long-term average (Figure 6-53). The volume of water flowing from the Wimmera basin into the terminal lakes in 2013–14 was 17,212 ML.

Figure 6-53 All major storages and catchment inflows in the Wimmera basin



6.28.2.3 Entitlement volumes and diversions

In the Wimmera basin, surface water is diverted by Central Highlands Water, Coliban Water, Grampians Wimmera Mallee Water, Wannon Water and licensed diverters, and also harvested in small catchment dams. Entitlements in the Wimmera basin include rights granted to individuals (e.g. water allowances and take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or VEWH). Rights to water in the Wimmera basin are outlined in Table 6-175.

Under Grampians Wimmera Mallee Water's Wimmera and Glenelg Rivers bulk entitlement, the water corporation operates the Wimmera–Mallee system headworks system to supply water to towns and customers connected to the Wimmera–Mallee Pipeline, and also to supply entitlements held by Coliban Water and Wannon Water, and the VEWH.

Under Grampians Wimmera Mallee Water's Willaura system bulk entitlement, the water corporation operates the Mt William system in the Wimmera basin to supply water to the township of Willaura and also to supply water to Wannon Water for Glenthompson.

Table 6-175 Entitlement volumes in the Wimmera basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Landsborough – Navarre) Conversion Order 2003	**60**
Bulk Entitlement (Willaura, Elmhurst and Buangor systems Grampians Wimmera Mallee Water) Conversion Order 2012(1)	
Urban commitments – Grampians Wimmera Mallee Water	408
Bulk Entitlement (Willaura system – Wannon Water) Conversion Order 2012	58
Subtotal: Bulk Entitlement (Willaura, Elmhurst and Buangor systems – Grampians Wimmera Mallee Water) Conversion Order 2012	**466**
Bulk Entitlement (Wimmera and Glenelg Rivers – Grampians Wimmera Mallee Water) Conversion Order 2010(2)	
Water allowances	5,747
Urban commitments – Grampians Wimmera Mallee Water	26,973
Supply by agreements – Pipeline	12,000
Supply by agreement – CEWH	28,000
Glenelg compensation flow	3,300
Recreation	2,590
Loss provision	2,960
Bulk Entitlement (Wimmera and Glenelg Rivers – Coliban Water) Conversion Order 2010	300
Bulk Entitlement (Wimmera and Glenelg Rivers – Wannon Water) Conversion Order 2010	2,120
Wimmera and Glenelg Rivers Environmental Entitlement 2010	41,560
Subtotal: Bulk Entitlement (Wimmera and Glenelg Rivers – Grampians Wimmera Mallee Water) Conversion Order 2010	**125,550**
Take and use licences – unregulated surface water	**2,177**
Total volume of water entitlements in the Wimmera basin	**128,253**

Notes:

(1) Under Grampians Wimmera Mallee Water's Willaura system bulk entitlement, the water corporation operates the Mt William system in the Wimmera basin to supply water to the township of Willaura and also to supply water to Wannon Water for Glenthompson. This bulk entitlement also includes the Elmhurst and Buangor systems which are physically located in the Hopkins basin.

(2) Under Grampians Wimmera Mallee Water's Wimmera and Glenelg Rivers bulk entitlement, the water corporation operates the Wimmera–Mallee system headworks to supply its own customers, and also Coliban Water, Wannon Water and the VEWH and CEWH.

The *Wimmera and Glenelg Rivers Environmental Entitlement 2010* provides the VEWH with up to 1,000 ML for wetlands from the Wimmera–Mallee Pipeline each year. It supplies wetlands throughout the region that once received water from the channel system before it was decommissioned. In 2013–14, 265 ML of water was delivered to Roselyn Wetland and Barbers Swamp, which were the first two wetlands to be connected to the pipeline system. Other water available under the environmental entitlement is used to support streamflows and is not diverted out of waterways.

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-176. The total volume of licences in the Wimmera basin includes licences for irrigation as well as for domestic and stock purposes. There were no irrigation diversions from unregulated streams in 2013–14; the diversion reported is an estimate of licensed domestic and stock use.

Table 6-176 Allocation account balance summary for the Wimmera basin

Water entitlement	Opening carryover (ML)	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)	Carryover carried forward (ML)
Landsborough – Navarre	-	60	0	0	60	-
Willaura, Elmhurst and Buangor systems – Grampians Wimmera Mallee Water						
Urban commitments – Grampians Wimmera Mallee Water	-	408	0	321	87	-
Willaura system – Wannon Water	-	58	0	19	39	-
Diversion: Willaura, Elmhurst and Buangor systems – Grampians Wimmera Mallee Water				**340**		
Wimmera and Glenelg Rivers – Grampians Wimmera Mallee Water						
Water allowances	0	5,747	0	1,510	4,237	0
Urban commitments – Grampians Wimmera Mallee Water	83,548	26,515	0	12,551	15,910	81,602
Supply by agreements – Pipeline	18,823	9,744	0	30	4,281	24,257
Supply by agreement – CEWH	0	0	0	0	0	
Glenelg compensation flow	1,448	825	0	2,145	19	109
Recreation	1,559	648	0	1,938	40	229
Loss provision	4,664	0	0	933	(1,956)	5,687
Wimmera and Glenelg Rivers – Coliban Water	277	244	0	171	52	297
Wimmera and Glenelg Rivers – Wannon Water	4,116	1,721	0	106	854	4,878
Wimmera and Glenelg Rivers Environmental Entitlement(1)	27,216	33,185	0	30,004	4,560	25,838
Diversion: Wimmera and Glenelg Rivers(2)				**19,648**		
Take and use licences – unregulated surface water	-	447	0	186	260	-

Notes:

(1) Water use of 29,739 ML reported reflects environmental in-stream use, 265 ML of the use reported here was diverted to off-stream wetlands. 29,739 ML is not included in the water balance in Table 6-173 as it does not reflect an actual diversion from the waterway.

(2) The water use reported in this line item represents the bulk diversion to supply primary entitlements under the Wimmera and Glenelg Rivers system source bulk entitlement.

The estimated volume of water harvested from small catchment dams makes up a significant portion of total surface water diversions in the Wimmera basin (Table 6-177).

Table 6-177 Estimated small catchment dam information for the Wimmera basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	12,950	6,475	n/a
Registered commercial and irrigation	9,360	7,863	n/a
Total	**22,310**	**14,338**	**22,979**

n/a: information not available.

6.28.3 Recycled water

Grampians Wimmera Mallee Water operates 16 wastewater treatment plants in the Wimmera basin and reuses all wastewater at nine of these plants for purposes that include irrigation of pasture, horticulture and vineyards and for urban and industrial uses.

Table 6-178 shows the volumes of water recycled in the Wimmera basin in 2013–14.

Table 6-178 Volume of recycled water in the Wimmera basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Birchip	31	31	100%	0	31	0	0	0	0
Dimboola	118	0	0%	0	0	0	0	0	118
Donald	94	94	100%	0	94	0	0	0	0
Halls Gap	152	5	3%	5	0	0	0	0	147
Hopetoun	63	0	0%	0	0	0	0	0	63
Horsham	963	947	98%	195	752	0	0	0	16
Jeparit	50	0	0%	0	0	0	0	0	50
Minyip	10	0	0%	0	0	0	0	0	10
Murtoa	31	31	100%	0	31	0	0	0	0
Natimuk	0	0	0%	0	0	0	0	0	0
Nhill[4]	67	102	154%	0	102	0	0	0	(35)
Ouyen	34	0	0%	0	0	0	0	0	34
Rainbow	0	0	0%	0	0	0	0	0	0
Stawell[4]	322	471	146%	179	292	0	0	0	(149)
Warracknabeal	97	97	100%	97	0	0	0	0	0
Wycheproof	22	22	100%	0	22	0	0	0	0
Total 2013–14	**2,054**	**1,800**	**88%**	**476**	**1,324**	**0**	**0**	**0**	**254**
Total 2012–13	1,678	1,680	100%	482	1,198	0	0	0	(2)

Notes:

(1) ‘Beneficial allocation’ refers to the volume used to deliver specific environmental flow benefits.

(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

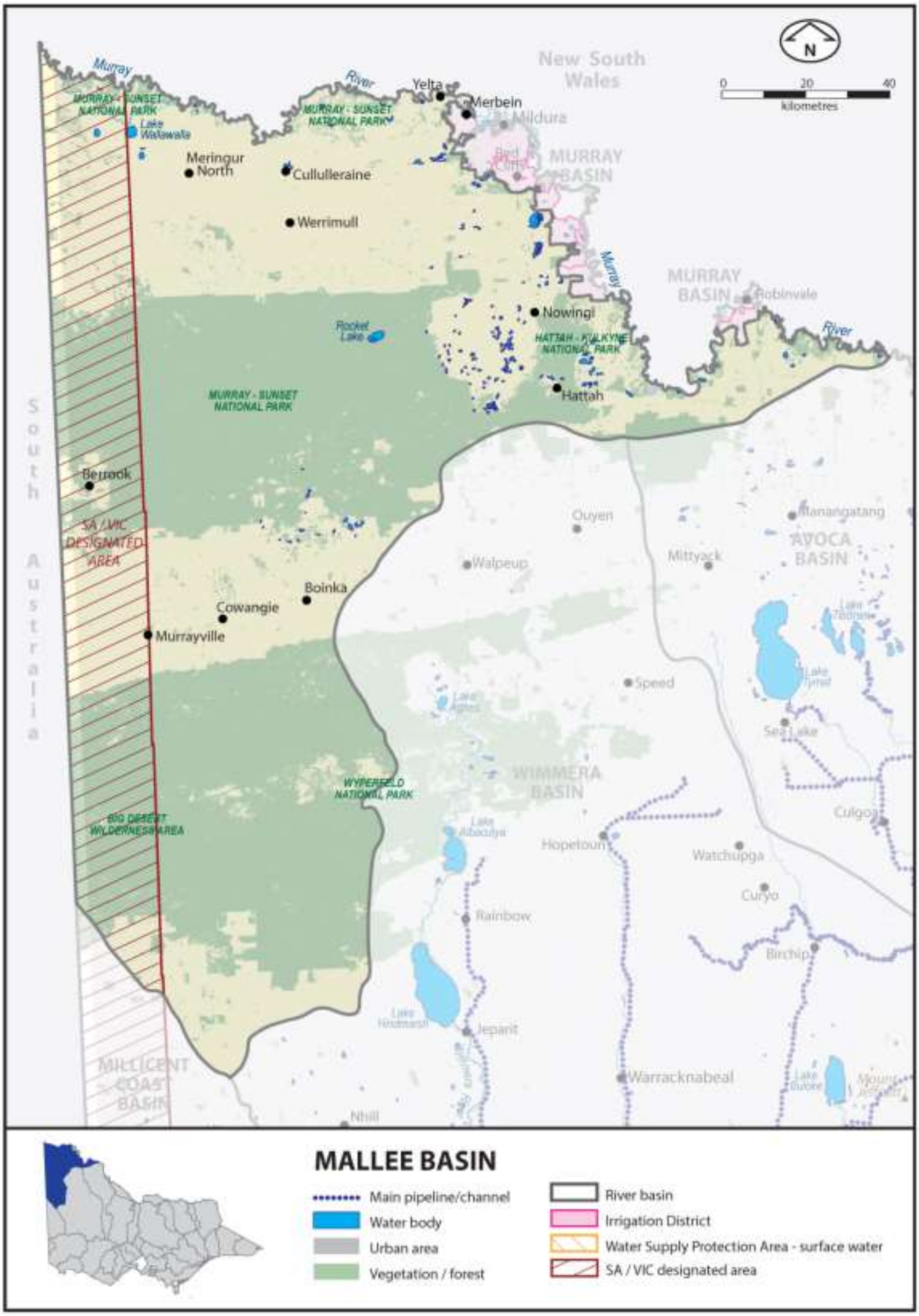
(3) ‘Other’ refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

(4) The volume of water recycled exceeded the volume produced as water stored on-site carried over from the previous year.

6.29 Mallee basin

The Mallee basin (Figure 6-54) has few well-defined waterways. While the Murray River runs along the northern boundary of the basin, for water accounting purposes it is only included in the water balance of the Murray basin (Section 6.2).

Figure 6-54 Map of the Mallee basin



6.29.1 Water resources overview

In 2013–14 the Mallee received 80 to 125% of the long-term average rainfall, compared with the previous year when parts of the basin received just 40 to 60% average rainfall.

Almost all surface water used in the Mallee basin is sourced from other basins.

No urban water use restrictions applied in the Mallee basin in 2013–14, with all towns remaining on permanent water saving rules throughout the year.

Table 6-179 shows the responsibilities of the authorities within the Mallee basin.

Table 6-179 Responsibilities for water resources management in the Mallee basin

Authority	Irrigation and rural water supply	Licensing	Urban water supply	Storage management; waterway management; environmental obligations
Grampians Wimmera Mallee Water			Supplies water to Murrayville and Cowangie	
Lower Murray Water	Supplies water from the Murray River to the Millewa Waterworks District, Carwarp and Yelta			
Mallee CMA				Manages waterways in the whole of the Mallee basin

Environmental Water Reserve

In 2013–14 the Mallee basin EWR comprised all water in the basin not allocated for consumptive use.

Environmental water for wetlands in the Mallee basin, including Living Murray icon sites, is delivered through River Murray environmental entitlements and the Wimmera–Mallee wetlands entitlement.

6.29.2 Surface water resources

6.29.2.1 Water balance

A water balance for the Mallee basin has not been presented. All surface water supplies are sourced from outside the basin.

6.29.2.2 Storages and flows

The Mallee basin has no well-defined streams other than the Murray River, 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 6.2, there is no surface water resource information presented for the Mallee basin.

There is no reliable estimate of surface flows in the Mallee basin to estimate the volume of water leaving the basin.

6.29.2.3 Small catchment dams

While there are some small catchment dams in the Mallee basin, no information on them is available 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.

6.29.2.4 Entitlement volumes and diversions

No bulk entitlements are 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.

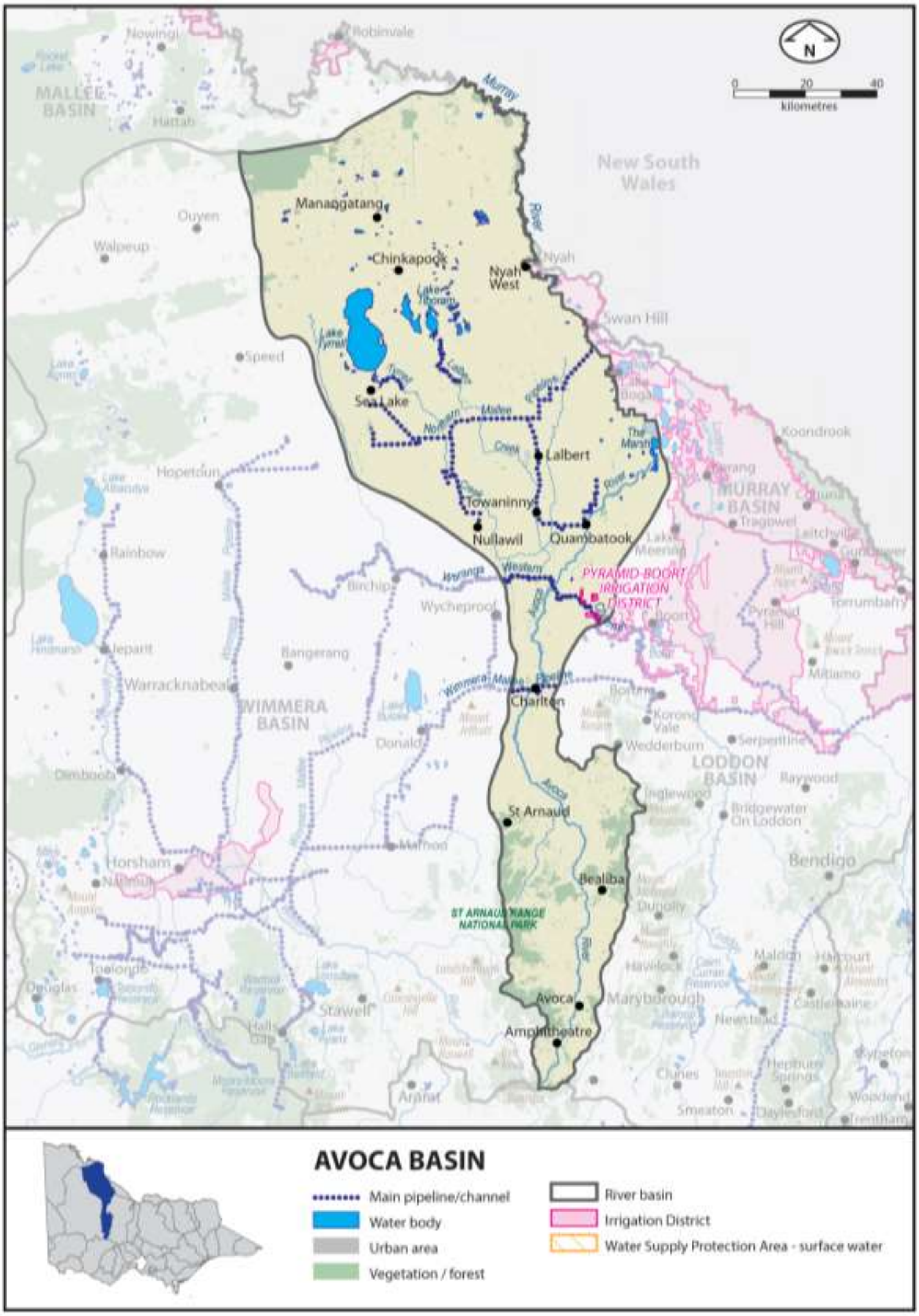
6.29.3 Recycled water

There are no wastewater treatment plants within the Mallee basin.

6.30 Avoca basin

The Avoca basin (Figure 6-55) includes the Avoca River plus a number of small tributaries such as Strathfillan Creek and Cherry Tree Creek. The Avoca River flows into the Kerang Lakes at Lake Bael Bael.

Figure 6-55 Map of the Avoca basin



6.30.1 Water resources overview

Rainfall across the Avoca basin in 2013–14 was generally 80 to 100% of the long-term average, with a small area in the north experiencing slightly wetter conditions (100 to 125% average rainfall) and a small central area receiving slightly less rainfall (60 to 80%). Catchment inflows were 18% of the long-term average, similar to the previous year. The associated outflows into the terminal lakes in the basin's north were similar in comparison to the previous year.

Towns in the Avoca basin are predominantly supplied by groundwater or by surface water from the Wimmera, Glenelg and Murray basins. Hence only a limited volume of surface water from within the basin is used for urban supply. For the first time in 20 years, water restrictions were removed in the Redbank water supply in March 2014 and replaced with permanent water saving rules. All other towns in the basin remained on permanent water saving rules throughout the year. Licensed surface water users were unrestricted during the year.

Surface water use was a similar volume to that used in 2013–14.

Table 6-180 shows the responsibilities of the authorities within the Avoca basin.

Table 6-180 Responsibilities for water resources management in the Avoca basin

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
Grampians Wimmera Mallee Water	Provides domestic and stock supplies to farms via the Wimmera–Mallee Channel system, the Northern Mallee pipeline, the western end of the Waranga Western Channel and diversions from rivers	Manages 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 Grampians Wimmera Mallee Water for domestic and stock use via the Waranga Main Channel		Supplies water from the Goulburn basin in bulk to Grampians Wimmera Mallee Water for towns via the Waranga Main Channel and to Quambatook via the Normanville supply system	
North Central CMA				Manages waterways in the Avoca basin

Note:
(1) Water for these towns is sourced from outside the Avoca basin.

Environmental Water Reserve

In 2013–14 the EWR for the Avoca basin comprised:

- 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.

6.30.2 Surface water resources

6.30.2.1 Water balance

A surface water balance for the Avoca basin is shown in Table 6-181. No storage information is recorded in the water balance as there are no major on-stream storages in the Avoca basin.

There are no known inflows into the Avoca basin; the total inflow reported is an assumed amount equal to the sum of known and estimated outflows. Volumes recorded for surface water availability and usage in 2013–14 remained similar to 2012–13 (Table 6-181).

Table 6-181 Balance of surface water in the Avoca basin

Water account component	2013–14 (ML)	2012–13 (ML)
Major on-stream storage		
Volume in storage at start of year	-	-
Volume in storage at end of year	-	-
Change in storage	**-**	**-**
Inflows		
Catchment inflow(1)	24,253	23,942
Rainfall on major storages	-	-
Treated wastewater discharged back to river	-	-
Total inflows	**24,253**	**23,942**
Outflows		
Diversions		
Urban diversions	94	97
Licensed diversions from unregulated streams	18	35
Small catchment dams	12,693	12,693
Total diversions	***12,804***	***12,825***
Losses		
Evaporation losses from major storages	-	-
Losses from small catchment dams	9,772	9,772
In-stream infiltration to groundwater, flows to floodplain and evaporation	1,655	1,317
Total losses	***11,427***	***11,089***
Water passed at outlet of basin		
Avoca River flow at Sandhill Lake Road (outflow to terminal lakes)	22	28
Avoca River overflow from the terminal lakes to the Kerang Lakes	0	0
Total water passed at outlet of basin	***22***	***28***
Total outflows	**24,253**	**23,942**

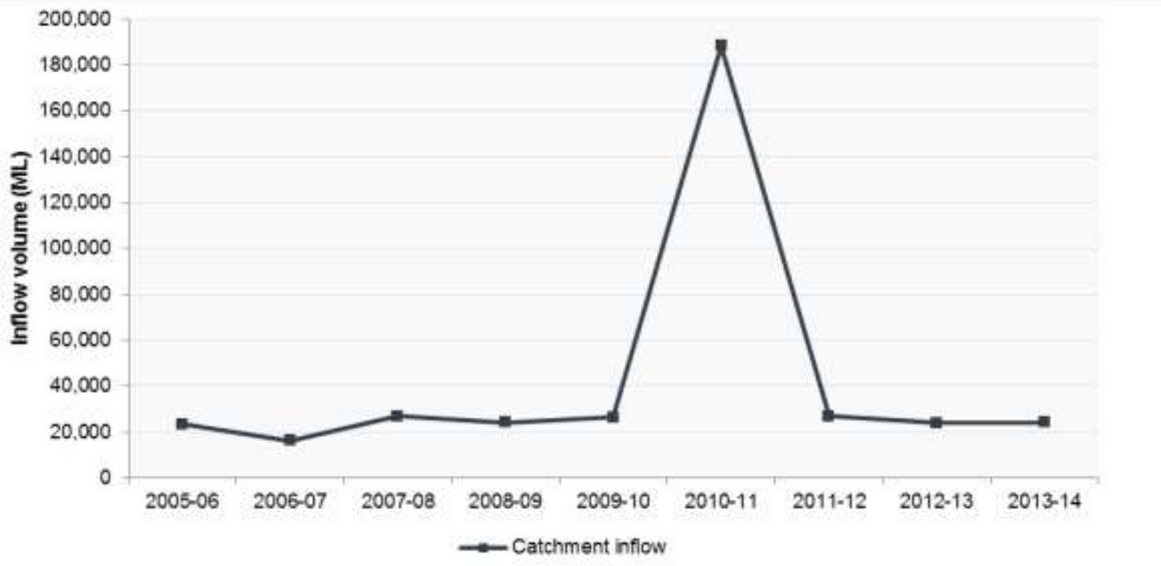
Note:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.

6.30.2.2 Storages and flows

In 2013–14, the catchment inflows were 18% of the long-term average of 136,200 ML. This is similar to the previous year's inflow (Figure 6-56). The volume of water that flowed into the terminal lakes (Lake Bael Bael and The Marsh) was 22 ML compared with 28 ML in 2012–13. There are no major storages in the Avoca basin.

Avoca basin

Figure 6-56 Catchment inflows in the Avoca basin



6.30.2.3 Entitlement volumes and diversions

In the Avoca basin, water is diverted by Central Highlands Water and licensed diverters, and harvested in small catchment dams. The total volume of take and use licences in the Avoca basin includes licences for irrigation as well as for domestic and stock purposes. Entitlements include rights granted to individuals (take and use licences) and rights granted to authorities (e.g. bulk entitlements granted to water authorities or the VEWH). Rights to water in the Avoca basin are outlined in Table 6-182.

Table 6-182 Entitlement volumes in the Avoca basin

Water entitlements	Annual entitlement volume (ML)
Bulk Entitlement (Amphitheatre) Conversion Order 2003	25
Bulk Entitlement (Avoca) Conversion Order 2003	233
Bulk Entitlement (Redbank) Conversion Order 2003	20
Take and use licences – unregulated surface water	3,029
Total volume of water entitlements in the Avoca basin	**3,307**

Allocation available under bulk entitlements and licences for 2013–14 is presented in Table 6-183. There were no diversions for irrigation in 2013–14; the water use reported for take and use licences is an estimate of licensed domestic and stock use (Table 6-183).

Table 6-183 Allocation account balance summary for the Avoca basin

Water entitlement	Allocation issued (ML)	Net trade in / (out) (ML)	Water use (ML)	End-of-season forfeitures (ML)
Amphitheatre	25	0	11	14
Avoca	233	0	78	155
Redbank	20	0	4	16
Take and use licences – unregulated surface water	3,029	0	18	3,012

The estimated volume of water harvested from small catchment dams represents the largest diversion of water in the Avoca basin (Table 6-184).

Table 6-184 Estimated small catchment dam information for the Avoca basin

Type of small catchment dam	Capacity (ML)	Usage (ML)	Total water harvested (ML)
Domestic and stock (not licensed)	10,514	5,257	n/a
Registered commercial and irrigation	8,852	7,436	n/a
Total	**19,366**	**12,693**	**22,465**

n/a: information not available.

6.30.3 Recycled water

Grampians Wimmera Mallee Water operates most wastewater treatment plants in the Avoca basin with the exception of the Avoca plant, which is operated by Central Highlands Water.

The volume of wastewater produced in 2013–14 was slightly higher than that produced in 2012–13. The proportion of wastewater recycled in the Avoca basin treatment plants decreased to 82% in 2013–14. The recycled water was used for urban, industrial and agricultural purposes.

Table 6-185 shows the volumes of water recycled in the Avoca basin in 2013–14.

Table 6-185 Volume of recycled water in the Avoca basin

Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Avoca	33	33	100%	0	33	0	0	0	0
Charlton	33	0	0%	0	0	0	0	0	33
Sea Lake	0	0	0%	0	0	0	0	0	0
St Arnaud	128	126	98%	43	83	0	0	0	2
Total 2013–14	**194**	**159**	**82%**	**43**	**116**	**0**	**0**	**0**	**35**
Total 2012–13	158	224	142%	59	165	0	0	0	(66)

Notes:

(1) 'Beneficial allocation' refers to the volume used to deliver specific environmental flow benefits.

(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing 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 items affecting the annual water balance for recycled water that are not otherwise accounted for.

7 Groundwater catchment accounts

7.1 Overview of methodology

7.1.1 Introduction

This section outlines the basis for the information presented in the groundwater catchment accounts. As it explains some assumptions and limitations of the data in the accounts, it should be read in conjunction with the information in the catchment accounts.

In 2012, the Victorian Government developed a new framework for the management and reporting of groundwater resources. The framework comprises the groundwater basins and catchments that cover all groundwater resources in Victoria. Aligning groundwater management boundaries with groundwater catchments, its focus is to manage connected groundwater resources and reflect the geology beneath the ground. The framework was developed in collaboration with rural water corporations and stakeholders to enable consistent management of groundwater resources across the state.

Historically, information on groundwater resources in the Victorian Water Accounts has been presented together with surface water resources according to river basin boundaries. In most cases these boundaries did not properly align with Groundwater Management Unit (GMU) boundaries or the underlying groundwater systems, which presented a number of reporting difficulties. Groundwater volumes were apportioned according to the surface area of the GMU within a given basin. The concentration of bores and groundwater use varies considerably within each GMU, meaning that apportioning groundwater entitlements and use by surface area is unlikely to be an accurate reflection of groundwater availability and use in Victoria’s regions. Under the new framework, the boundaries for groundwater catchments, GMUs and groundwater systems are aligned with catchment boundaries, which allows the entitlements and use of groundwater within each GMU to be more accurately managed and reported.

The *Victorian Water Accounts 2013–2014* presents the groundwater accounts by these catchment boundaries to reflect Victoria’s new approach to groundwater management.

The groundwater catchment accounts are compiled from information obtained from:

- responses to requests for data to water businesses, catchment management authorities, DELWP and major users of water
- hydrogeologic information from selected groundwater monitoring sites
- estimated relationships between water use and hydrologic data, which is produced by water supply system modelling
- water businesses’ groundwater catchment statements, annual reports and related documents.

7.2 Victoria’s groundwater management framework

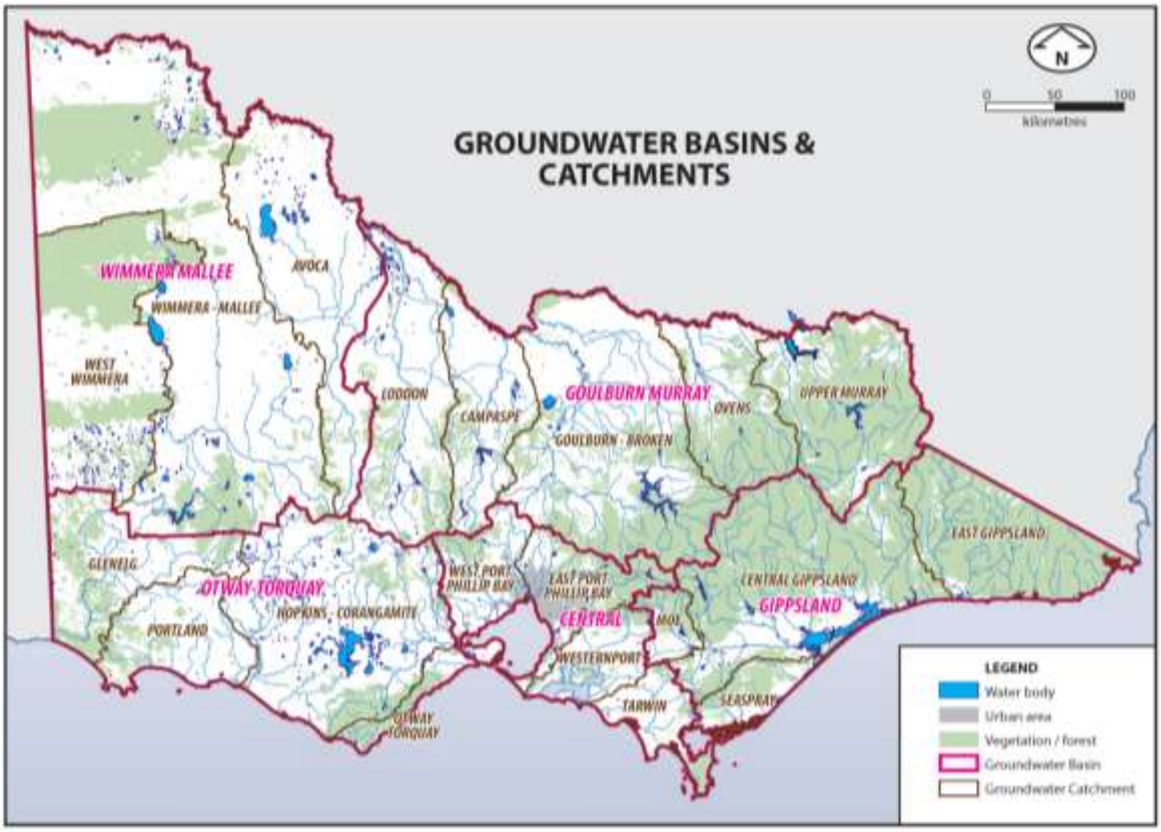
Victoria’s groundwater resources are contained in five major groundwater management basins and each groundwater basin has several groundwater catchments (Figure 7-1):

- **Goulburn-Murray basin**: covers the Loddon, Campaspe, Goulburn–Broken, Ovens and Upper Murray groundwater catchments
- **Wimmera–Mallee basin**: covers the Wimmera–Mallee, West Wimmera and Avoca groundwater catchments
- **Otway–Torquay basin**: covers the Glenelg, Portland and Hopkins–Corangamite and Otway Torquay groundwater catchments
- **Central basin**: covers the West Port Phillip Bay, East Port Phillip Bay, Westernport and Tarwin groundwater catchments
- **Gippsland basin**: covers the East Gippsland, Central Gippsland, Moe and Seaspray groundwater catchments.

Groundwater in Victoria is managed through GMUs. A GMU may be classified as either as a Water Supply Protection Area (WSPA) or a Groundwater Management Area (GMA). Areas that do not fall into these units are referred to as unincorporated areas (UAs).

Licensing is the fundamental basis for allocating groundwater, and the total volume of groundwater that may be taken from a GMU is referred to as the Permissible Consumptive Volume (PCV). PCVs are declared by the Minister for Water through an order published in the government gazette. Adaptive management is achieved through a series of groundwater management instruments, which include statutory groundwater management plans, local management plans, groundwater strategies, single source urban water bulk entitlements and groundwater licences. All management instruments are developed in consultation with local stakeholders including customer groups, environmental representatives and relevant government departments.

Figure 7-1 Map of Victorian groundwater basins and catchments



A comprehensive summary of the groundwater management framework in Victoria can be found online at <www.delwp.vic.gov.au >.

7.2.1 Licensed groundwater volumes and use table

This table reports the total volume of take and use licences held by individual customers in the catchment, which represents the total volume of water that could be extracted for the water year, plus all licensed use including urban use. It also includes domestic and stock use where such use is included in a groundwater licence.

7.2.2 Number of domestic and stock bores and estimated use table

This table presents the number of bores used for domestic and stock purposes in each GMU, together with the estimated groundwater use for this purpose. Where domestic and stock use forms part of a groundwater licence, the estimated use is not presented in this table; it has been accounted for in the total licensed groundwater use (see section 7.2.1).

Estimated use has been calculated based on the assumption of 2 ML per bore per year in groundwater areas managed by Goulburn–Murray Water and GWMWater, and 1.5 ML per bore per year in groundwater areas managed by Southern Rural Water (except for the Nepean GMA, which was estimated at 1 ML per bore per year).

The number of domestic and stock bores recorded for each GMU includes 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 domestic and stock bores are assigned appropriately where GMUs overlap. To better account for domestic and stock bores in UAs, bores that are located spatially within a GMU, but do not have a constructed depth within the GMU's depth range, are allocated to an unincorporated area.

7.2.3 Urban groundwater use table

This table reports on take and use licences held by urban water corporations to supply townships within their service area. The volumes reported in this table reflect the portion of total groundwater use (see section 7.2.1) that is attributable to urban supply; they are not an additional resource in the catchment.

7.3 Goulburn–Murray groundwater basin

The Goulburn–Murray basin is located in north-east Victoria. It borders the Gippsland basin to the south and the Wimmera Mallee basin to the west. The basin also forms part of the Murray river basin in Victoria.

The hydrogeology of the region can be broadly subdivided into two distinct geological regions: southern highlands of bedrock with sedimentary valleys and the northern plains with layers of sedimentary aquifers.

In the south the highlands feature exposed bedrock and eroded material that form the Quaternary Aquifer. This thin, shallow aquifer is comprised of sand, colluvium, fluvial sands, gravels, clay and silts. It is found in upland valleys such as Alexandra, Yea and Flowerdale. Water is also held in the Mesozoic and Palaeozoic basement rock, which is comprised of sedimentary fractured rock. Basement rock is close to the surface near Jamieson, Mansfield, Marysville, Kilmore and Seymour and is increasingly buried deeper to the east.

In the north, the plain of the Goulburn–Murray basin gradually thickens into several geological layers:

- The Upper Tertiary Quaternary Aquifer (UTQA) of the Shepparton formation is made of layered clay, sands and silt. It appears north of Seymour, and runs to Nathalia, Barmah and Numurkah. Along the Murray, the UTQA is accompanied by the Calvil formation Upper Tertiary Aquifer fluvial, containing fluvial sand, gravel and clay.
- The Lower Tertiary aquifers of the Renmark formation appear in pockets of the north, near Nathalia and Barmah. They comprise sand, gravel, clay and silt, minor coal.
- Cretaceous Permian sediments made of fractured rock, sand and minor coal. They appear from Shepparton to parts of the north near Nathalia and Numurkah.
- Mesozoic and Palaeozoic basement rock, which comprises sedimentary fractured rock.

7.4 Upper Murray groundwater catchment

The Upper Murray groundwater catchment is located in north-east Victoria (Figure 7-2) and contains part of the Murray river basin. The Upper Murray catchment extends from the Victorian Alps to the Murray River. Major rural centres within the boundary include Omeo, Tallangatta and Corryong.

Figure 7-2 Map of the Upper Murray groundwater catchment

7.4.1 Groundwater resources overview

Groundwater resources in the Upper Murray catchment are managed by Goulburn–Murray Water, which carries out the development and implementation of groundwater management plans. Goulburn–Murray Water also issues licences for groundwater use and bore construction. The Upper Murray catchment is part of the Murray–Darling basin, and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan.

The Upper Murray catchment contains the Mullindolingong GMA, a small part of Upper Ovens WSPA (which also extends into the Ovens catchment) and UAs. Groundwater resources supply licences, domestic and stock use and also the town of Dinner Plain. Goulburn–Murray Water is developing a new management plan to establish the Upper Murray GMA, which will cover most of the catchment.

The groundwater level trends in this catchment are generally categorised as increasing or stable.

7.4.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-1.

Table 7-1 Licensed groundwater volumes and use in the Upper Murray groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits (m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Mullindolingong GMA	All depths	1,604	0	35
Upper Ovens WSPA	All depths	12	0	0
Unincorporated area	-	4,717	39	339
Total		**6,333**	**39**	**374**

An estimate of domestic and stock groundwater use is provided in Table 7-2. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-1.

Table 7-2 Number of domestic and stock bores and estimated use in the Upper Murray groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Mullindolingong GMA	53	106
Unincorporated area	459	918
Total	512	1,024

Groundwater is used to provide urban water supply to the township of Dinner Plain. The licensed entitlements and metered use for these supplies are presented in Table 7-3.

Table 7-3 Urban groundwater use in the Upper Murray groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Dinner Plain	120	39	42
Total	**120**	**39**	**42**

7.5 Ovens groundwater catchment

The Ovens groundwater catchment is located in northern Victoria (Figure 7-3), extending from the Murray River in the north to the Great Dividing Range in the south, and contains the Kiewa and Ovens river basins.

Figure 7-3 Map of the Ovens groundwater catchment

7.5.1 Groundwater resources overview

Groundwater resources in the Ovens catchment are managed by Goulburn–Murray Water, which is responsible for the development and implementation of groundwater management plans. Goulburn–Murray Water also issues licences for groundwater use and bore construction. The Ovens catchment is part of the Murray–Darling basin, and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan.

The Ovens catchment contains the Barnawartha GMA, Lower Ovens GMA, Upper Ovens WSPA and UAs. The Upper Ovens WSPA Management Plan manages groundwater in the unconsolidated sedimentary aquifer as a connected system with surface water. Groundwater resources supply licences and domestic and stock usage through private bores. Groundwater is also used to supply Wangaratta, and is available as back-up supply for six further towns in the area.

Goulburn–Murray Water manages groundwater licensed diversions for the Ovens catchment. Groundwater supply to the towns of Wangaratta, Bright, Myrtleford and Chiltern is managed by North East Water.

The groundwater level trend in the Lower Ovens GMA and Upper Ovens WSPA are both categorised as stable. Insufficient observation bores were available to determine a trend for Barnawartha GMA.

7.5.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-4. Groundwater use was higher in 2013–14 compared with 2012–13, largely due to increased extraction in the Upper Ovens GMA.

Table 7-4 Licensed groundwater volumes and use in the Ovens groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Barnawartha GMA	All depths	375	39	22
Lower Ovens GMA	All depths	20,042	5,104	5,343
Upper Ovens WSPA	All depths	3,660	743	667
Unincorporated area	-	2,576	998	706
Total		**26,653**	**6,884**	**6,738**

An estimate of domestic and stock groundwater use is provided in Table 7-5. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-4.

Table 7-5 Number of domestic and stock bores and estimated use in the Ovens groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Barnawartha GMA	23	46
Lower Ovens GMA	1745	3490
Shepparton Irrigation WSPA	1	2
Upper Ovens WSPA	283	566
Unincorporated area	125	250
Total	2,177	4,354

Groundwater in the Ovens catchment is available for urban water supply for Barnawartha and as a back-up urban water supply for the townships of Bright, Chiltern, Moyhu, Myrtleford and Springhurst and the city of Wangaratta. North East Water has a licence with a permanent volume of zero, which enables emergency supplies to be traded into Bright when required. During 2013–14, a temporary trade of 75 ML was made from the Myrtleford entitlement for use in Bright. The volume of licensed entitlements and metered use for these groundwater supplies are provided in Table 7-6.

In 2013–14, no groundwater was supplied to the towns of Barnawartha, Chiltern, Moyhu, Myrtleford and Springhurst. Urban groundwater supply to Wangaratta decreased slightly in 2013–14 compared with 2012–13.

Table 7-6 Urban groundwater use in the Ovens groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Barnawartha	293	0	0
Bright (1)	0	75	46
Chiltern	25	0	0
Moyhu	15	0	0
Myrtleford (1)	75	0	0
Springhurst	20	0	0
Wangaratta	665	100	136
Total	**1,093**	**175**	**182**

Notes:

(1) A temporary trade of 75 ML was made from the Myrtleford take and use licence to the Bright take and use licence in 2013–14 to account for the use in Bright.

7.6 Goulburn–Broken groundwater catchment

The Goulburn–Broken groundwater catchment is located in northern Victoria (Figure 7-4) and contains the Goulburn and Broken river basins. The hydrogeology of this groundwater catchment includes two distinct geological regions – the highlands of bedrock with sedimentary valleys in the south, and the plains with layers of sedimentary aquifers in the north.

Figure 7-4 Map of the Goulburn–Broken groundwater catchment

7.6.1 Groundwater resources overview

Groundwater resources in the Goulburn–Broken catchment are managed by Goulburn–Murray Water, which has delegated responsibility for licensing groundwater use and bore construction, and leads the development and implementation of groundwater management plans. The Goulburn–Broken catchment is part of the Murray–Darling basin and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan.

The Goulburn–Broken groundwater catchment contains the Mid Goulburn GMA, most of the Shepparton Irrigation Region GMA (which also extends into the Campaspe catchment), Strathbogie GMA, Upper Goulburn GMA, Katunga WSPA and UAs. During the year, Alexandra GMA and Kinglake GMA amalgamated with the Upper Goulburn GMA and were therefore revoked. Strathbogie GMA and Upper Goulburn GMA groundwater management plans were approved in February 2014.

Shepparton Irrigation WSPA was abolished by the Minister of Water and the existing groundwater management plan revoked. Interim management arrangements are in place until a new plan is completed and approved in 2015.

Groundwater resources supply licences, and domestic and stock use, and are also available to supply the three townships in the area: Goorambat, Katunga and Strathmerton.

The groundwater level trends in this catchment are generally categorised as increasing, similar to 2012–13 when levels were categorised as increasing or stable.

7.6.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-7. Extractions from the Katunga WSPA were limited to 70% of the licensed entitlement volume in 2013–14.

Groundwater use was slightly lower in 2013–14 compared with 2012–13, largely due to decreased extraction in the Mid Goulburn GMA and Shepparton Irrigation GMA.

Table 7-7 Licensed groundwater volumes and use in the Goulburn–Broken groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits (m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Alexandra GMA(1)	All depths	n/a	n/a	253
Kinglake GMA(1)	All depths	n/a	n/a	231
Mid Goulburn GMA	Zone 1070: >25 Zone 1071: All depths	12,470	2,989	3,477
Shepparton Irrigation GMA(2)	to 25	179,303	34,581	37,250
Strathbogie GMA(3)	200 m or 50 m below the base of the Tertiary sediments	1,539	135	n/a
Upper Goulburn GMA(3)	200 m or 50 m below the base of the Tertiary sediments	6,084	699	n/a
Katunga WSPA	>25	60,446	25,123	23,708
Unincorporated areas(4)	-	5,814	873	1,440
Total		**265,656**	**64,400**	**66,359**

Notes:

(1) Alexandra GMA and Kinglake GMA were revoked during the year. The licences in these areas are now in the new Upper Goulburn GMA.

(2) The Minister for Water abolished the Shepparton Irrigation WSPA and revoked the Groundwater Management Plan in February 2014. interim management arrangements are in place until the new plan is completed and approved (in 2015).

(3) Strathbogie GMA and Upper Goulburn GMA groundwater management plans were approved in August 2014.

(4) Some licences reported in 2012–13 as unincorporated have now been incorporated into the new Strathbogie GMA and the new Upper Goulburn GMA. The 2012–13 usage volume represents the usage recorded against all licences classified as unincorporated at the time.

n/a: information not available

An estimate of domestic and stock groundwater use is provided in Table 7-8. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-7.

Goulburn–Broken groundwater catchment

Table 7-8 Number of domestic and stock bores and estimated use in the Goulburn–Broken groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Alexandra GMA	n/a	n/a
Kinglake GMA	n/a	n/a
Mid Goulburn GMA	145	290
Shepparton Irrigation GMA	1,226	2,452
Strathbogie GMA	274	548
Upper Goulburn GMA	531	1,062
Katunga WSPA	734	1,468
Unincorporated areas	1,272	2,544
Total	4,182	8,364

n/a: information not available

The licensed entitlements and metered use for these supplies are presented in Table 7-9. Groundwater use for Goorambat and Katunga reduced slightly in 2013–14 compared with 2012–13.

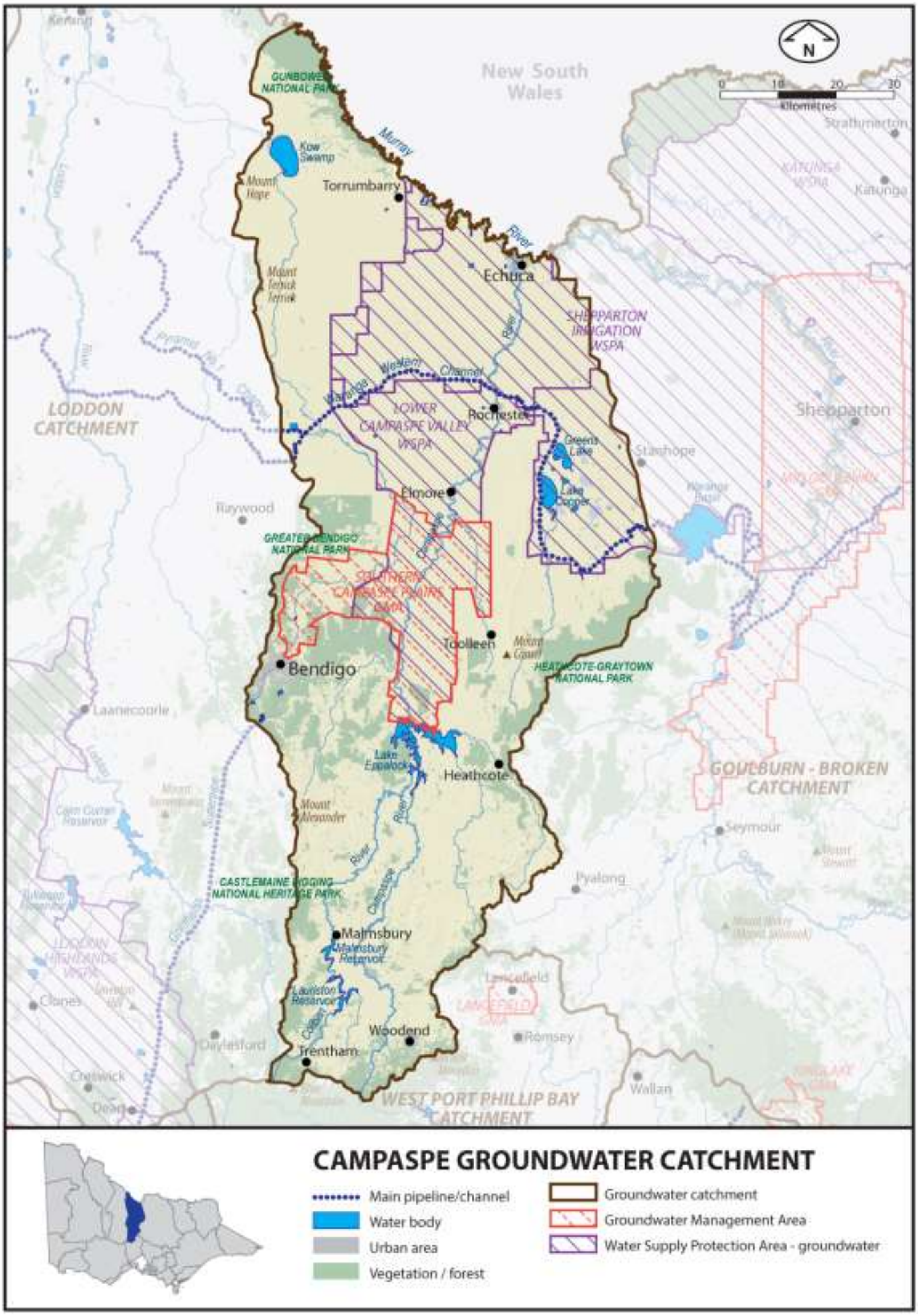
Table 7-9 Urban groundwater use in the Goulburn–Broken groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Goorambat	24	11	12
Katunga	110	44	52
Strathmerton	730	0	0
Total	**864**	**55**	**64**

7.7 Campaspe groundwater catchment

The Campaspe groundwater catchment is located in northern Victoria (Figure 7-5) and corresponds with the Campaspe river basin. The catchment extends from the Murray River near Echuca in the north to the Great Dividing Range at Woodend and Trentham in the south.

Figure 7-5 Map of the Campaspe groundwater catchment



7.7.1 Groundwater resources overview

Groundwater resources in the Campaspe catchment are managed by Goulburn–Murray Water, which is responsible for the development and implementation of groundwater management plans. Goulburn–Murray Water also issues licences for groundwater use and bore construction, as well as for surface water diversions. The Campaspe catchment is part of the Murray–Darling basin and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan.

The Campaspe groundwater catchment contains the Lower Campaspe WSPA, Shepparton Irrigation GMA and UAs. Groundwater resources supply licences and domestic and stock use in the area, and are also available for urban supply to the towns of Elmore and Trentham. The local management plan for the Central Victoria Mineral Springs GMA was approved in August 2013. The Shepparton Irrigation GMA, which extends into the Goulburn–Broken catchment, replaced the Shepparton Irrigation WSPA. Interim management arrangements are in place until the new plan is completed and approved in 2015.

In 2013–14, the groundwater level trend in the Lower Campaspe Valley WSPA was categorised as rising, while insufficient observation bores were available to determine a trend for Central Victorian Mineral Springs GMA and Shepparton Irrigation GMA.

7.7.2 Groundwater entitlements and use

A summary of the licensed entitlements and use from GMUs within the Campaspe catchment, excluding domestic and stock use, is presented in Table 7-10. Groundwater use was slightly lower in 2013–14 compared with 2012–13, largely due to decreased extraction in the Shepparton Irrigation GMA.

Table 7-10 Licensed groundwater volumes and use in the Campaspe groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Central Victorian Mineral Springs GMA (1)		2,220	288	n/a
Lower Campaspe Valley WSPA	All depths	55,874	26,534	27,260
Shepparton Irrigation GMA (2)	<=25	17,165	929	2,329
Unincorporated areas	-	4,883	499	689
Total		**80,142**	**28,250**	**30,278**

Notes:

(1) Central Victorian Mineral Springs GMA Groundwater Management Plan was approved in August 2014.

(2) The Minister for Water abolished the Shepparton Irrigation WSPA and revoked the Groundwater Management Plan in February 2014. Interim management arrangements are in place until the new plan is completed and approved in 2015.

n/a: information not available.

An estimate of domestic and stock groundwater use is provided in Table 7-11. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-10.

Table 7-11 Number of domestic and stock bores and estimated use in the Campaspe groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Central Victorian Mineral Springs GMA (1)	1,046	2,092
Lower Campaspe Valley WSPA	461	922
Shepparton Irrigation GMA (2)	199	398
Unincorporated areas	265	530
Total	1,971	3,942

Notes:

(1) Central Victorian Mineral Springs GMA Groundwater Management Plan was approved in August 2014.

(2) The Minister for Water abolished the Shepparton Irrigation WSPA and revoked the Groundwater Management Plan in February 2014. Interim management arrangements are in place until the new plan is completed and approved in 2015.

In the Campaspe catchment, groundwater is an option for urban water supply to the townships of Elmore and Trentham. In 2013–14, only Elmore drew on groundwater for urban use and used approximately half the volume of groundwater used in 2012–13 (Table 7-12).

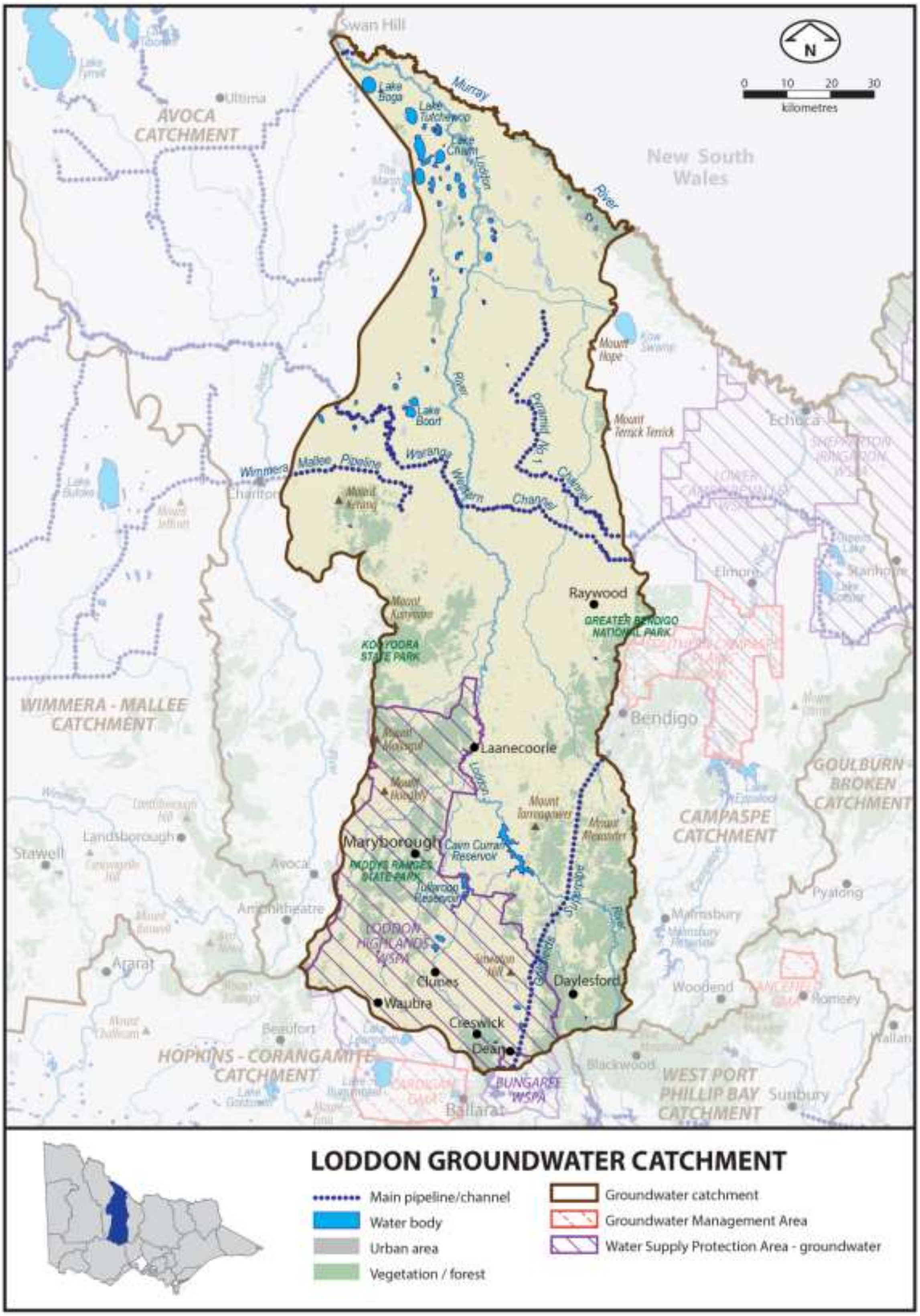
Table 7-12 Urban groundwater use in the Campaspe groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Elmore	284	124	62
Trentham	48	20	0
Total	**332**	**144**	**62**

7.8 Loddon groundwater catchment

The Loddon groundwater catchment is located in northern Victoria (Figure 7-6) and broadly corresponds with the Loddon river basin. The catchment covers an area between Creswick and Swan Hill. Neighbouring groundwater catchments are Avoca to the west, Otway–Torquay to the south and Campaspe to the east.

Figure 7-6 Map of the Loddon groundwater catchment



7.8.1 Groundwater resources overview

Groundwater resources in the Loddon catchment are managed by Goulburn–Murray Water, which is responsible for the development and implementation of groundwater management plans. Goulburn–Murray Water also issues licences for groundwater use and bore construction, as well as for surface water licensed diversions. The Loddon catchment is part of the Murray–Darling basin and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan.

The Loddon catchment contains all of the Mid Loddon GMA, Loddon Highlands WSPA and parts of the UAs. Groundwater resources supply licences, domestic and stock use and also the six townships in the area. The local management plan for the Central Victorian Mineral Springs GMA was approved in August 2013. This will cover the Loddon River upstream of Cairn Curran Reservoir, including the Coliban River and highlands section of the Campaspe River.

The groundwater level trend is generally categorised as rising for GMUs in this area.

7.8.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-13. Groundwater use in Mid Loddon GMA and Loddon Highlands WSPA was lower in 2013–14 compared with 2012–13.

Table 7-13 Licensed groundwater volumes and use in the Loddon groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits (m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Central Victorian Mineral Springs GMA(1)	All depths	2,712	176	n/a
Mid Loddon GMA	All depths	34,037	12,654	17,207
Loddon Highlands WSPA	All depths	20,694	6,229	7,052
Unincorporated area	-	5,225	34	329
Total		**62,668**	**19,093**	**24,588**

Note:
(1) Central Victorian Mineral Springs GMA Groundwater Management Plan was approved in August 2014.
n/a: information not available

An estimate of domestic and stock groundwater use is provided in Table 7-14. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-13.

Table 7-14 Number of domestic and stock bores and estimated use in the Loddon groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Central Victorian Mineral Springs GMA (1)	536	1,072
Mid Loddon GMA	343	686
Bungaree WSPA (2)	11	17
Loddon Highlands WSPA	562	1,124
Unincorporated area	101	202
Total	1,553	3,101

Notes:
(1) Central Victorian Mineral Springs GMA Groundwater Management Plan was approved in August 2014.
(2) Estimated domestic and stock use for Bungaree WSPA is calculated using a factor of 1.5 ML per bore.

Groundwater is an option for urban water supply to six towns within the catchment, though less than 25% of the licensed volume was used in 2013–14. The licensed entitlements and metered use for urban groundwater supplies in the Loddon catchment are provided in Table 7-15.

Loddon groundwater catchment

Table 7-15 Urban groundwater use in the Loddon groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Clunes	350	189	217
Daylesford	273	1	0
Forest Hill	350	159	162
Learmonth	100	48	53
Maryborough	851	29	0
Waubra	100	29	25
Total	**2,024**	**455**	**457**

7.9 Gippsland groundwater basin

The Gippsland groundwater basin is located in eastern Victoria and contains the East Gippsland, Central Gippsland, Seaspray and Moe groundwater catchments. It is a large sedimentary basin which extends offshore beneath Bass Strait.

The upper aquifers of the Gippsland basin occur along the river valleys, floodplains and near the coast. They consist of coarse sand and thick gravel sediments at shallow depths. They also feature the clay aquitard of the Haunted Hill formation, which overlies most of the sedimentary basin. The upper aquifers occur at or near the ground surface so they receive recharge directly from rainfall or floods, and discharge to streams and lakes.

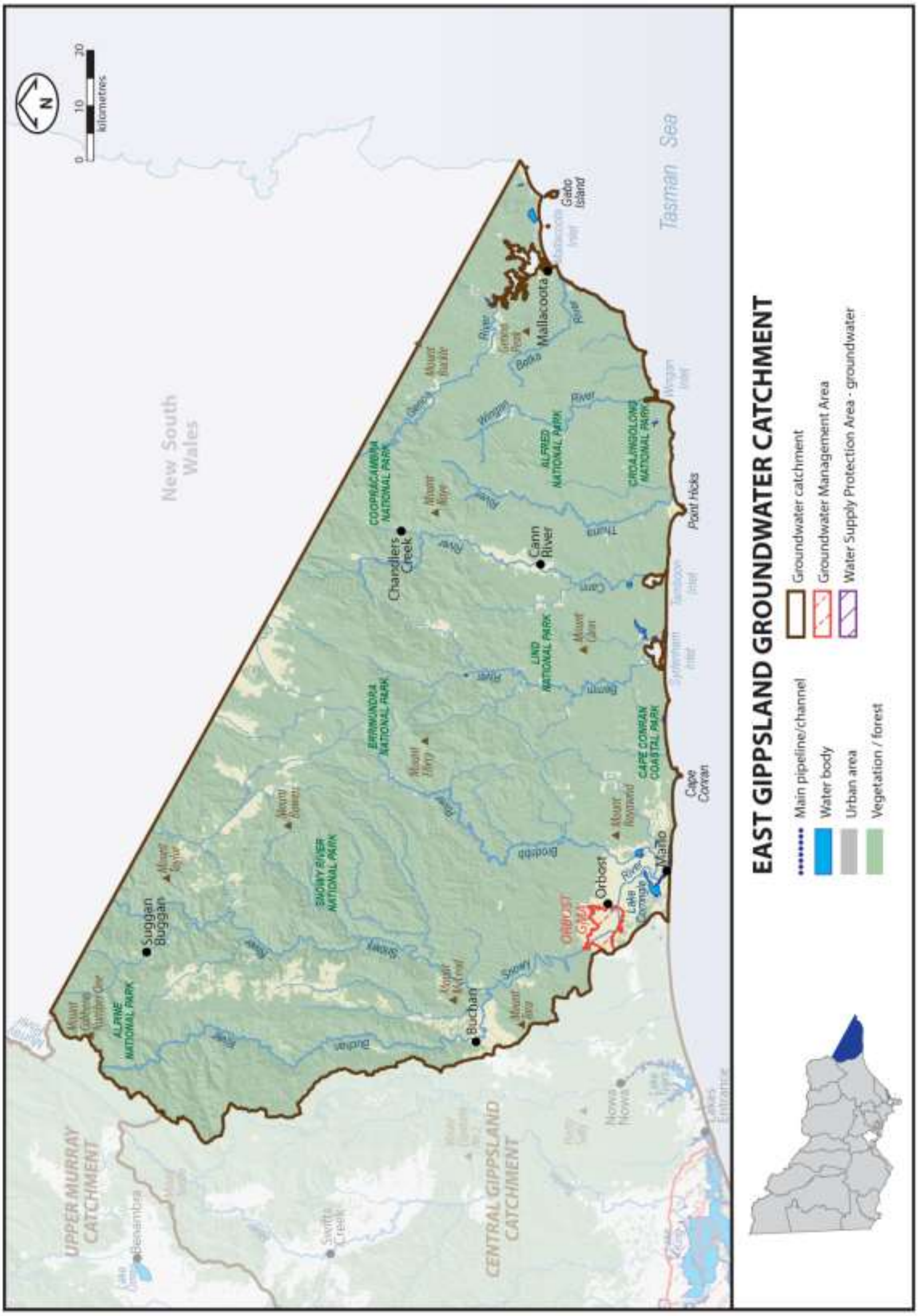
Middle aquifers cover a large part of the Gippsland groundwater basin from Moe to Bairnsdale. They comprise thick seams of sand aquifers separated by aquitards. The aquitards are generally clay or coal seams in the north-west of the Gippsland groundwater basin, and limestone in the east and centre of the basin. Recharge occurs from leakage through the overlying and surrounding sediments, and discharge is to the limestone aquitards to the east of the basin and along the coast.

Lower aquifers extend across the Gippsland basin and well offshore. They comprise thick sand sediments that rise to the surface in the west and along the basin margin, but are very deep along the coast and offshore. These aquifers are overlain by the upper and middle aquifers together with thick silt, clay, coal and limestone aquitards, while underlain by basement rock. Where the lower aquifers occur at or near the surface they receive direct recharge from rainfall and river leakage, while in the deeper basin recharge occurs by downward leakage. Discharge occurs offshore in Bass Strait.

7.10 East Gippsland groundwater catchment

The East Gippsland groundwater catchment (Figure 7-7) is located in the Gippsland basin in eastern Victoria and encompasses the rivers of the East Gippsland and Snowy River basins. Neighbouring groundwater catchments are the Central Gippsland catchment to the west and the Upper Murray catchment to the north-west.

Figure 7-7 Map of the East Gippsland groundwater catchment



7.10.1 Groundwater resources overview

Groundwater resources in the East Gippsland groundwater catchment are managed by Southern Rural Water, which is responsible licensing bore construction and groundwater extractions under take and use licences.

The East Gippsland groundwater catchment contains the Orbost GMA and UAs. Groundwater supplies licences and domestic and stock use in the area. Groundwater use in the East Gippsland groundwater catchment is predominantly for irrigation and it is also available for urban use in the town of Mallacoota.

The groundwater level trend in the Orbost GMA was categorised as stable to rising throughout 2013–14.

7.10.2 Groundwater entitlements and use

Licensed groundwater entitlements and use for the Orbost GMA and UAs are shown in Table 7-16.

Groundwater use was slightly lower in 2013–14 compared with 2012–13 due to decreased extraction in the Orbost GMA.

Table 7-16 Licensed groundwater volumes and use in the East Gippsland groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Orbost GMA	20–45	1,217	257	300
Unincorporated areas	-	537	57	62
Total		**1,754**	**314**	**361**

An estimate of domestic and stock groundwater use is provided in Table 7-17. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-16.

Table 7-17 Number of domestic and stock bores and estimated use in the East Gippsland groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Orbost GMA	3	5
Unincorporated areas	63	95
Total	**66**	**100**

Within the East Gippsland catchment, groundwater is available for urban water supply to the township of Mallacoota. Urban groundwater use in the East Gippsland catchment was similar in 2013–14 compared with the previous year. The licensed entitlements and metered use for this supply are provided in Table 7-18.

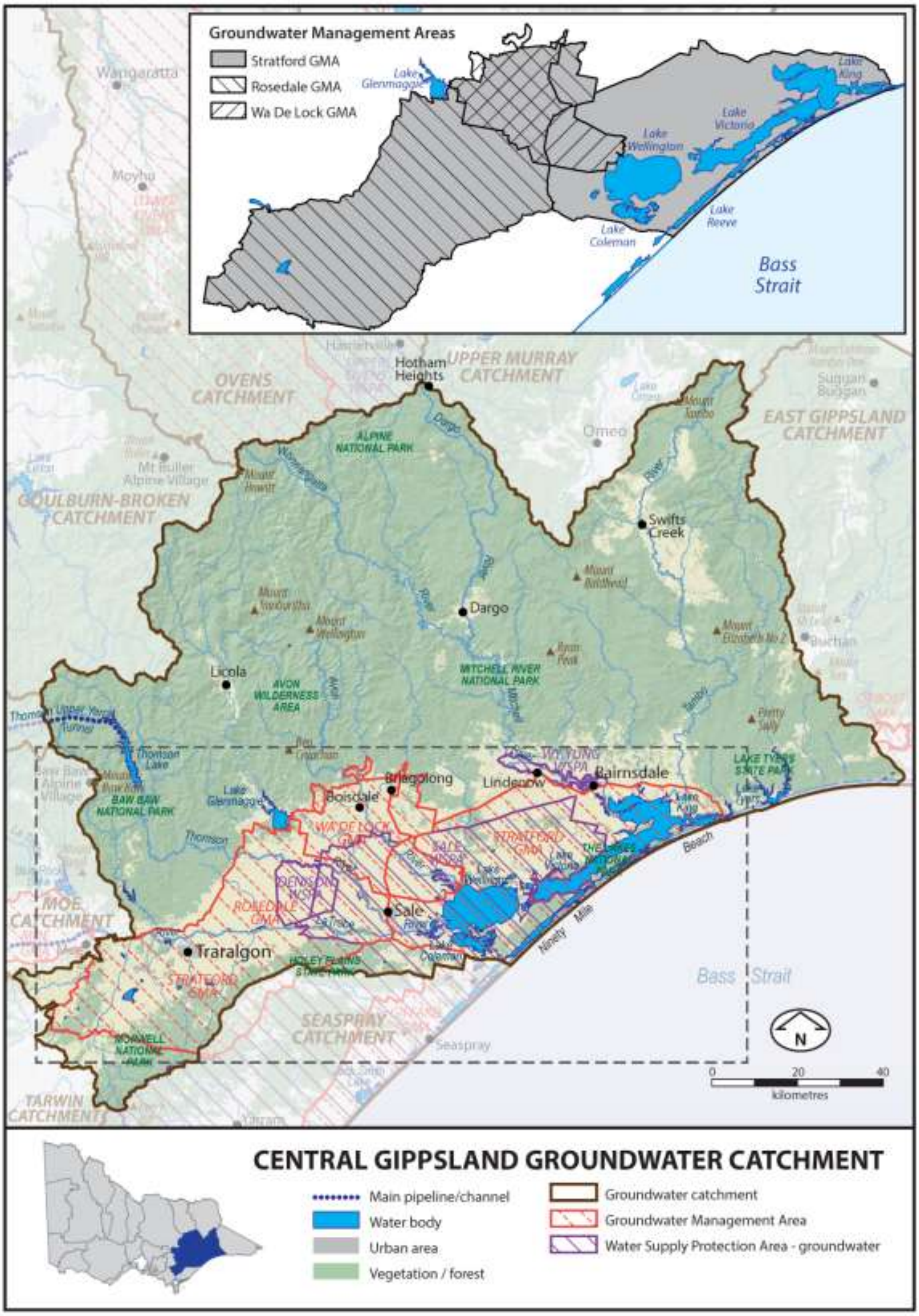
Table 7-18 Urban groundwater use in the East Gippsland groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Mallacoota	220	57	62
Total	**220**	**57**	**62**

7.11 Central Gippsland groundwater catchment

The Central Gippsland groundwater catchment (Figure 7-8) is located in the Gippsland groundwater basin in eastern Victoria. It encompasses the major systems of the Gippsland Lakes and contains the Tambo, Mitchell and Thomson river basins, and parts of the Latrobe and Snowy river basins. Neighbouring groundwater catchments are the Goulburn–Broken and Moe catchments to the west, the Ovens and Upper Murray catchments to the north and East Gippsland to the east.

Figure 7-8 Map of the Central Gippsland groundwater catchment



7.11.1 Groundwater resources overview

Groundwater resources in the Central Gippsland groundwater catchment are managed by Southern Rural Water, which is responsible for licensing bore construction and groundwater extractions under take and use licences.

The Central Gippsland groundwater catchment contains the Rosedale GMA, Wa De Lock GMA, Denison WSPA, Sale WSPA, Wy Yung WSPA and UAs. It also contains most of the Stratford GMA (which also extends into the Seaspray groundwater catchment), and a small part of both the Moe GMA (most of which is in the Moe groundwater catchment) and Yarram WSPA (most of which is in the Seaspray groundwater catchment).

Groundwater resources supply licences, domestic and stock use and some urban use. While most of the groundwater use in the Central Gippsland groundwater catchment is for irrigation purposes, groundwater resources also supply four towns in the area together with some power generators in the Latrobe Valley.

At the end of 2013–14, the groundwater level trends in the Wa De Lock GMA were generally rising, while levels were stable in the Rosedale GMA, Wy Yung WSPA and Yarram WSPA and declining in the Moe GMA and Stratford GMA.

7.11.2 Groundwater entitlements and use

A summary of the licensed entitlements and use from GMAs in the Central Gippsland catchment is shown in Table 7-19.

Groundwater use in the Central Gippsland groundwater catchment was significantly lower in 2013–14 compared with 2012–13, largely due to decreased extraction across most GMUs.

Table 7-19 Licensed groundwater volumes and use in the Central Gippsland groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Moe GMA	>25	28	8	6
Rosedale GMA (1)	Zone 1: 50–150 Zone 2: 25–350 Zone 3: 200–300	22,372	9,698	18,923
Stratford GMA (1)	Zone 1: >150 Zone 2: >350	27,283	22,251	17,667
Wa De Lock GMA (2)	<=25	29,286	5,960	8,181
Denison WSPA (2)	<=25	18,501	7,609	10,209
Sale WSPA	25-200	21,218	10,037	12,739
Wy Yung WSPA	<=25	7,462	765	932
Yarram WSPA	Zone 1: >200 Zone 2: All depths	5,261	3,940	3,757
Unincorporated areas	-	20,433	2,001	2,441
Total		**151,844**	**62,269**	**74,855**

Notes:

(1) The use volume reported in Rosedale GMA and Stratford GMA includes metered extractions from Latrobe Valley mines (Rosedale GMA 3,952 ML and Stratford GMA 22,249 ML).

(2) The volume of use in Wa De Lock GMA and Denison WSPA includes metered extractions for salinity control (Wa De Lock GMA 413 ML and Denison WSPA 1,725 ML).

An estimate of domestic and stock groundwater use is provided in Table 7-20. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-19.

Central Gippsland groundwater catchment

Table 7-20 Number of domestic and stock bores and estimated use in the Central Gippsland groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Rosedale GMA	56	84
Stratford GMA	644	966
Wa De Lock GMA	355	533
Denison WSPA	180	270
Sale WSPA	341	512
Wy Yung WSPA	30	45
Yarram WSPA	95	143
Unincorporated areas	307	461
Total	2,008	3,014

Groundwater is used to provide urban water supply for the townships of Boisdale, Briagolong, Lindenow and Sale. The licensed entitlements and metered use for these supplies is presented in Table 7-21.

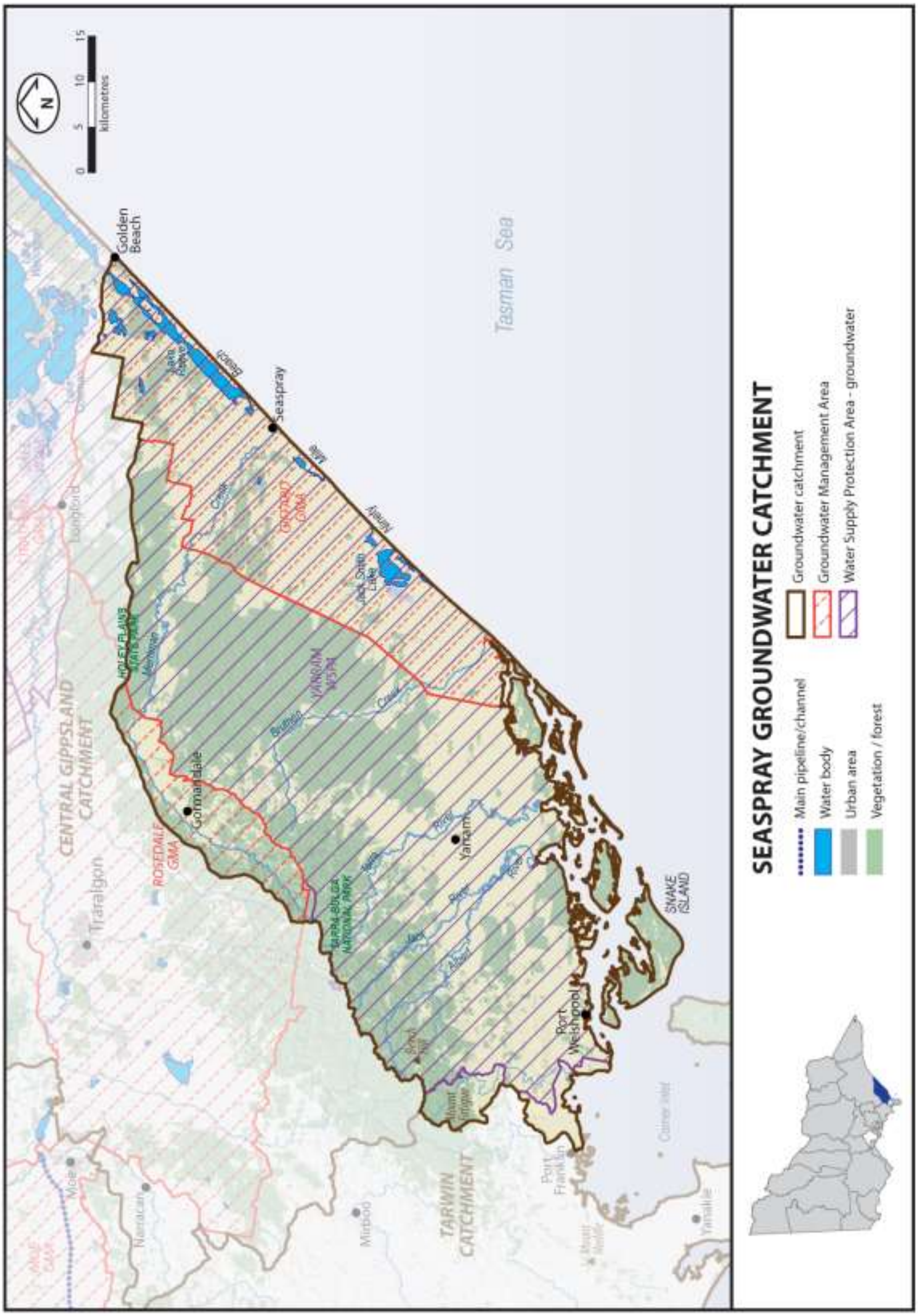
Table 7-21 Urban groundwater use in the Central Gippsland groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Boisdale	37	0	0
Briagolong	160	116	110
Lindenow	120	0	60
Sale	3,500	1,910	1,924
Total	**3,817**	**2,026**	**2,094**

7.12 Seaspray groundwater catchment

The Seaspray groundwater catchment (Figure 7-9) is located in the Gippsland groundwater basin in Victoria's south-east, and falls within the South Gippsland river basin. Neighbouring groundwater catchments are Central Gippsland to the north and Tarwin to the west.

Figure 7-9 Map of the Seaspray groundwater catchment



7.12.1 Groundwater resources overview

Groundwater resources in the Seaspray groundwater catchment are managed by Southern Rural Water, which is responsible for licensing bore construction and groundwater extractions under take and use licences.

The catchment contains the Giffard GMA and UAs, together with most of the Yarram WSPA which also extends into the Central Gippsland catchment. Groundwater resources supply licences, domestic and stock use and the township of Yarram. Groundwater use in the Seaspray catchment is predominantly for irrigation.

Groundwater level trends were categorised as increasing in the Giffard GMA, stable in the Yarram WSPA and declining for Stratford GMA.

7.12.2 Groundwater entitlements and use

A summary of the licensed groundwater entitlements and use from GMUs in the Seaspray catchment is shown in Table 7-22. Groundwater use was lower in 2013–14 compared with 2012–13, due to decreased extraction in the Giffard GMA and Yarram WSPA.

Table 7-22 Licensed groundwater volumes and use in the Seaspray groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Giffard GMA	50–200	5,689	1,436	1,504
Stratford GMA	Zone 1: >150 Zone 2: >350	362	20	45
Yarram WSPA	Zone 1: >200 Zone 2: All depths	20,428	6,137	7,911
Unincorporated areas	-	518	105	174
Total		**26,997**	**7,698**	**9,634**

An estimate of domestic and stock groundwater use is provided in Table 7-23. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-22.

Table 7-23 Number of domestic and stock bores and estimated use in the Seaspray groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Giffard GMA	72	108
Rosedale GMA	3	5
Yarram WSPA	190	285
Unincorporated areas	107	161
Total	**372**	**559**

Groundwater supplies are available for the town of Yarram, however there was no metered use of groundwater for urban supply in 2013–14 (Table 7-24).

Table 7-24 Urban groundwater use in the Seaspray groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Yarram	154	0	0
Total	**154**	**0**	**0**

7.13 Moe groundwater catchment

The Moe groundwater catchment (Figure 7-10) is located in the Gippsland basin in eastern Victoria and falls within the Latrobe river basin. Neighbouring groundwater catchments are Central Gippsland to the east and south-east, East Port Phillip Bay and Westernport to the west and Tarwin to the south.

Figure 7-10 Map of the Moe groundwater catchment

7.13.1 Groundwater resources overview

Groundwater resources in the Moe groundwater catchment are managed by Southern Rural Water, which is responsible for licensing bore construction and groundwater extractions under take and use licences.

The Moe catchment contains the Moe GMA and parts of UAs. Groundwater resources supply licences and domestic and stock use and are also available for the town of Trafalgar. While most groundwater licensed in the Moe GMA is used for irrigation purposes, it is also used for dairy wash-down.

The groundwater level trend in the Moe GMA was categorised as declining throughout 2013–14.

7.13.2 Groundwater entitlements and use

A summary of the licensed groundwater entitlements and use from GMUs is presented in Table 7-25.

Groundwater use was slightly lower in 2013–14 compared with 2012–13, largely due to decreased extraction in the Moe GMA.

Table 7-25 Licensed groundwater volumes and use in the Moe groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Moe GMA	>25	3,962	790	902
Unincorporated areas	-	1,050	219	241
Total		**5,012**	**1,009**	**1,143**

An estimate of domestic and stock groundwater use is provided in Table 7-26. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-25.

Table 7-26 Number of domestic and stock bores and estimated use in the Moe groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Moe GMA	129	194
Unincorporated areas	101	152
Total	230	346

Groundwater is available for urban water supply to the township of Trafalgar, however this entitlement is not currently metered or used (Table 7-27).

Table 7-27 Urban groundwater use in the Moe groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Trafalgar	100	0	0
Total	**100**	**0**	**0**

7.14 Central groundwater basins

The Central groundwater basins comprise the Port Phillip, Westernport and Tarwin groundwater basins, which are grouped for management purposes. These basins are located in the south-central region of Victoria, encompassing the area around Port Phillip Bay and extending into the South Gippsland region. Groundwater catchments within the Central groundwater basins are Tarwin, Westernport, East Port Phillip Bay and West Port Phillip Bay. See Figure 7-1.

The upper aquifers of the Central groundwater basins occur along the river valleys, near the coast and on the plains west of Melbourne. Sand and gravel aquifers underlie productive farmland along the river valleys and floodplains of Bacchus Marsh, Werribee and near Yarra Glen. Near Koo Wee Rup, the upper aquifer is mostly formed of clay and generally acts as an aquitard, except in the south-eastern area where it occurs at the surface. Recharge to the upper aquifers occurs directly from rainfall and discharge is to streams and the bays.

The middle aquifers of the Central groundwater basins cover a large part of the region. They are made up of several formations, which are connected and act as one aquifer in each basin. These aquifers vary in composition, and include fine sands, coarse sand and gravel, clay and limestone. These aquifers are partially underlain by the middle aquitard, which mainly consists of coal and silt. The middle aquifers are mostly buried and confined by the upper aquifer, however they are at the surface and unconfined on the eastern side of Port Phillip Bay. Recharge occurs from leakage through the overlying sediments or, where the aquifers are near the surface, from direct rainfall recharge.

Lower aquifers extend across the region, lying very deep along the coast or, in some areas, at or close to the surface. The aquifers largely comprise sand, sandstone and basalt, and some also contain clay and coal layers that act as aquitards. The basement rock is buried by the lower aquifers where they are deepest along the coast, but it reaches the surface in the highlands, where it forms the Great Dividing Range, Mornington Peninsula Highlands and Strzelecki Ranges. In the ranges, the basement rock acts as a low-yielding fractured rock aquifer and, where it is buried, it acts as an aquitard. Direct rainfall recharge occurs where the aquifers and basement rock are at the surface; elsewhere recharge occurs as leakage.

7.15 Tarwin groundwater catchment

The Tarwin groundwater catchment is located in south-eastern Victoria (Figure 7-11) and overlaps part of the South Gippsland surface water basin. Neighbouring groundwater catchments are Westernport to the west, Central Gippsland and Seaspray to the east and Moe to the north. Bass Strait forms the southern boundary of the onshore catchment.

Figure 7-11 Map of the Tarwin groundwater catchment

7.15.1 Groundwater resources overview

Groundwater resources in the Tarwin groundwater catchment are managed by Southern Rural Water, which is responsible for licensing bore construction and groundwater extractions under take and use licences.

The Tarwin groundwater catchment contains the Leongatha GMA, Tarwin GMA and parts of UAs. Groundwater resources supply licences, domestic and stock use and also the township of Leongatha.

The groundwater level trend in this catchment is generally categorised as stable.

7.15.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-28.

Table 7-28 Licensed groundwater volumes and use in the Tarwin groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Leongatha GMA	All depths	1,841	209	180
Tarwin GMA	<=25	38	21	13
Unincorporated areas	-	351	63	70
Total		**2,230**	**293**	**263**

An estimate of domestic and stock groundwater use is provided in Table 7-29. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-28.

Table 7-29 Number of domestic and stock bores and estimated use in the Tarwin groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Leongatha GMA	75	113
Tarwin GMA	659	989
Unincorporated areas	317	476
Total	**1,051**	**1,578**

Groundwater supply is available for the township of Leongatha. The licensed entitlements and metered use for the supply is presented in Table 7-30. Similar to 2012–13, very little water was extracted under the licence in 2013–14.

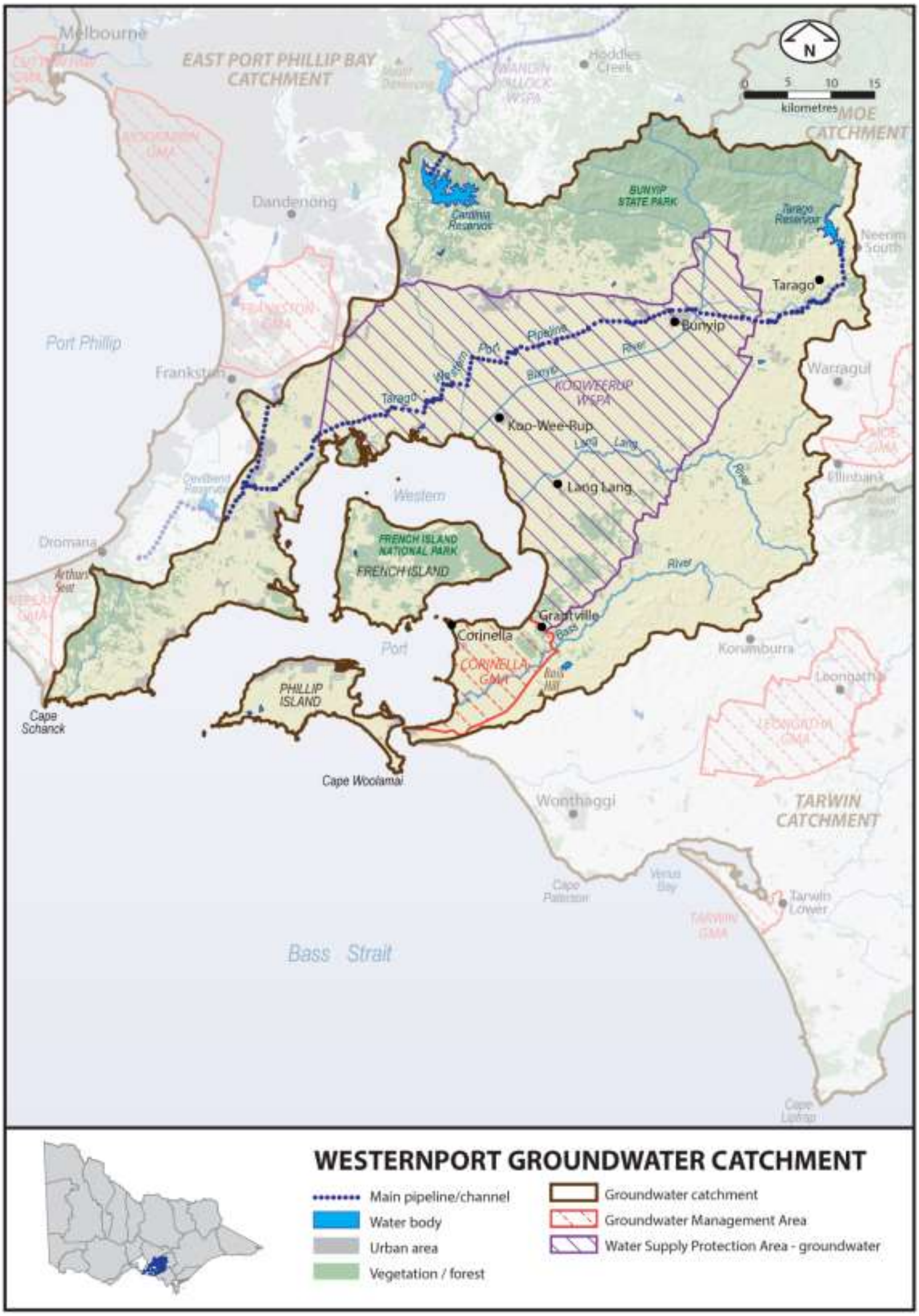
Table 7-30 Urban groundwater use in the Tarwin groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Leongatha	715	2	4
Total	**715**	**2**	**4**

7.16 Westernport groundwater catchment

The Westernport groundwater catchment is located in southern Victoria (Figure 7-12) and contains the Bunyip river basin. Neighbouring groundwater catchments are East Port Phillip Bay to the west, Moe to the north-east and Tarwin to the south-east.

Figure 7-12 Map of the Westernport groundwater catchment



7.16.1 Groundwater resources overview

Groundwater resources in the Westernport groundwater catchment are managed by Southern Rural Water, which is responsible for licensing bore construction and groundwater extractions under take and use licences.

The Westernport groundwater catchment contains the Corinella GMA, Koo Wee Rup WSPA and UAs. Groundwater resources supply licences, domestic and stock use and also the townships of Corinella/Grantville and Lang Lang.

In 2013–14, the groundwater level trend for both Corinella GMA and Koo Wee Rup WSPA was categorised as rising.

7.16.2 Groundwater entitlements and use

A summary of the licensed entitlements and use from GMUs within the Westernport catchment is presented in Table 7-31.

Total groundwater use was similar in 2013–14 compared with 2012–13.

Table 7-31 Licensed groundwater volumes and use in the Westernport groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Corinella GMA	All depths	662	76	74
Koo Wee Rup WSPA	All depths	12,501	3,277	3,474
Unincorporated areas	-	4,080	580	404
Total		**17,243**	**3,933**	**3,952**

An estimate of domestic and stock groundwater use is provided in Table 7-32. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-31.

Table 7-32 Number of domestic and stock bores and estimated use in the Westernport groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Corinella GMA	69	104
Koo Wee Rup WSPA	1,125	1,688
Unincorporated areas	499	749
Total	**1,693**	**2,541**

Groundwater is available as an urban water supply to the townships of Corinella/Grantville and Lang Lang. In 2013–14, groundwater was not used for urban supply at Lang Lang and metered groundwater use for the township of Corinella/Grantville was less than 5% of the licensed volume (Table 7-33).

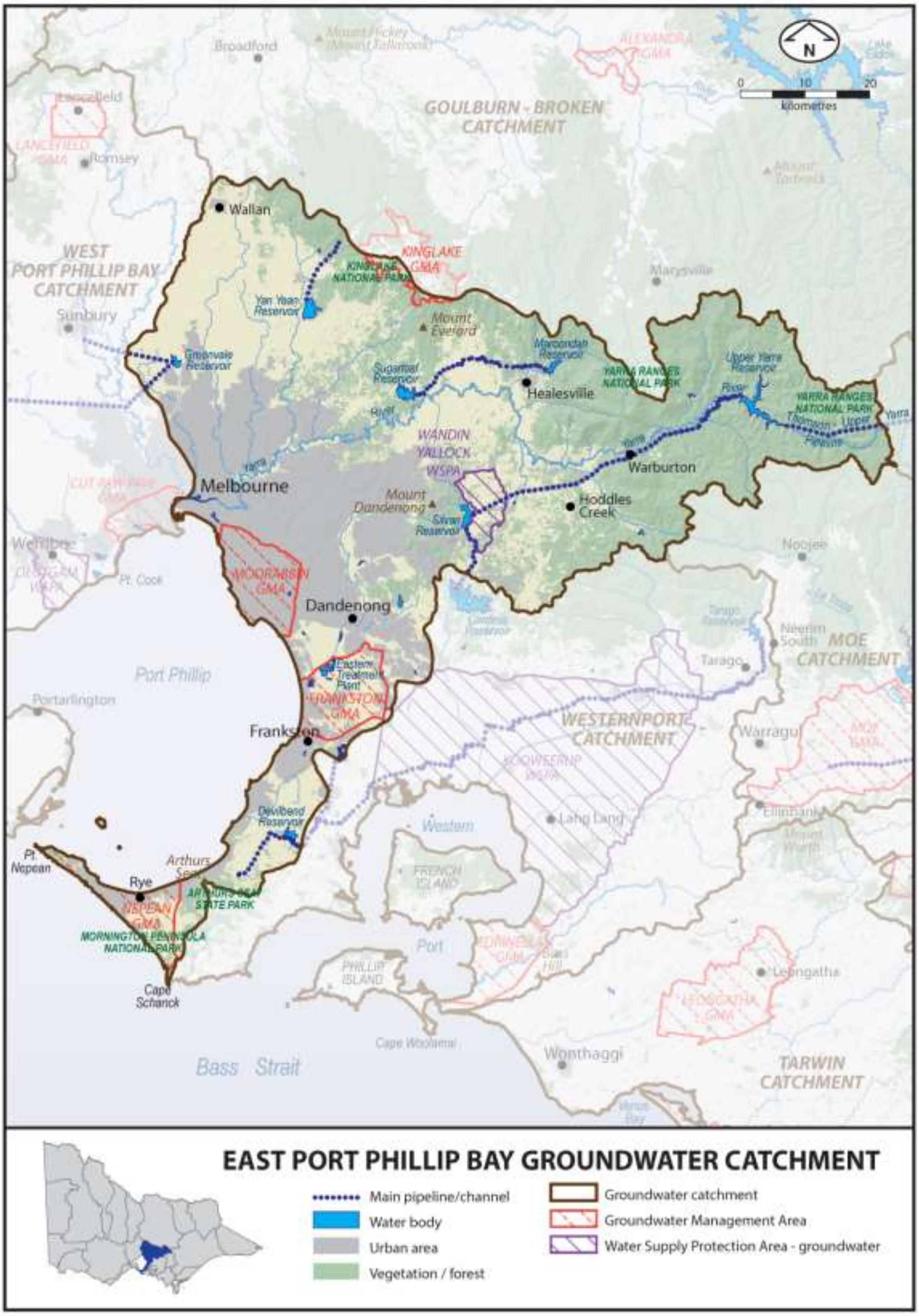
Table 7-33 Urban groundwater use in the Westernport groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Corinella / Grantville	490	22	41
Lang Lang	119	0	0
Total	**609**	**22**	**41**

7.17 East Port Phillip Bay groundwater catchment

The East Port Phillip Bay groundwater catchment is located in southern Victoria (Figure 7-13) and overlaps parts of the Yarra and Bunyip surface river basins. Neighbouring groundwater catchments are West Port Phillip Bay to the west, Goulburn–Broken to the north and Westernport and Moe to the east.

Figure 7-13 Map of the East Port Phillip Bay groundwater catchment



7.17.1 Groundwater resources overview

Groundwater resources in the East Port Phillip Bay groundwater catchment are managed by Southern Rural Water, which licenses bore construction and groundwater extractions under take and use licences.

The East Port Phillip Bay catchment contains the Frankston GMA, Kinglake GMA, Moorabbin GMA, Nepean GMA, Wandin Yallock WSPA, a small part of Koo Wee Rup WSPA and UAs. Groundwater resources supply licences and domestic and stock use. Groundwater in the East Port Phillip Bay catchment is mainly used for irrigation purposes, with some bores licensed for industrial and commercial purposes. Groundwater resources are not used for urban supply in the East Port Phillip Bay catchment.

The groundwater level trends for GMUs in this catchment are generally categorised as increasing or stable, the same as in 2012–13.

7.17.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-34.

Groundwater use across the East Port Phillip Bay catchment decreased slightly in 2013–14 compared with 2012–13.

Table 7-34 Licensed groundwater volumes and use in the East Port Phillip Bay groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Frankston GMA	50–200	1,671	122	218
Moorabbin GMA	All depths	2,624	1,132	1,053
Nepean GMA	All depths	6,110	3,004	3,159
Koo Wee Rup WSPA	All depths	111	0	0
Wandin Yallock WSPA	All depths	3,005	366	450
Unincorporated areas	-	12,185	2,253	2,295
Total		**25,706**	**6,877**	**7,175**

An estimate of domestic and stock groundwater use is provided in Table 7-35. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-34.

Table 7-35 Number of domestic and stock bores and estimated use in the East Port Phillip Bay groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Frankston GMA	110	165
Moorabbin GMA	264	396
Nepean GMA (1)	1,958	1,958
Upper Goulburn GMA (2)(3)	5	10
Koo Wee Rup WSPA	1	2
Wandin Yallock WSPA	74	111
Unincorporated areas	1,278	1,917
Total	3,690	4,559

Notes:

(1) Estimated domestic and stock use for Neapean GMA calculated using a factor of 1 ML per bore.

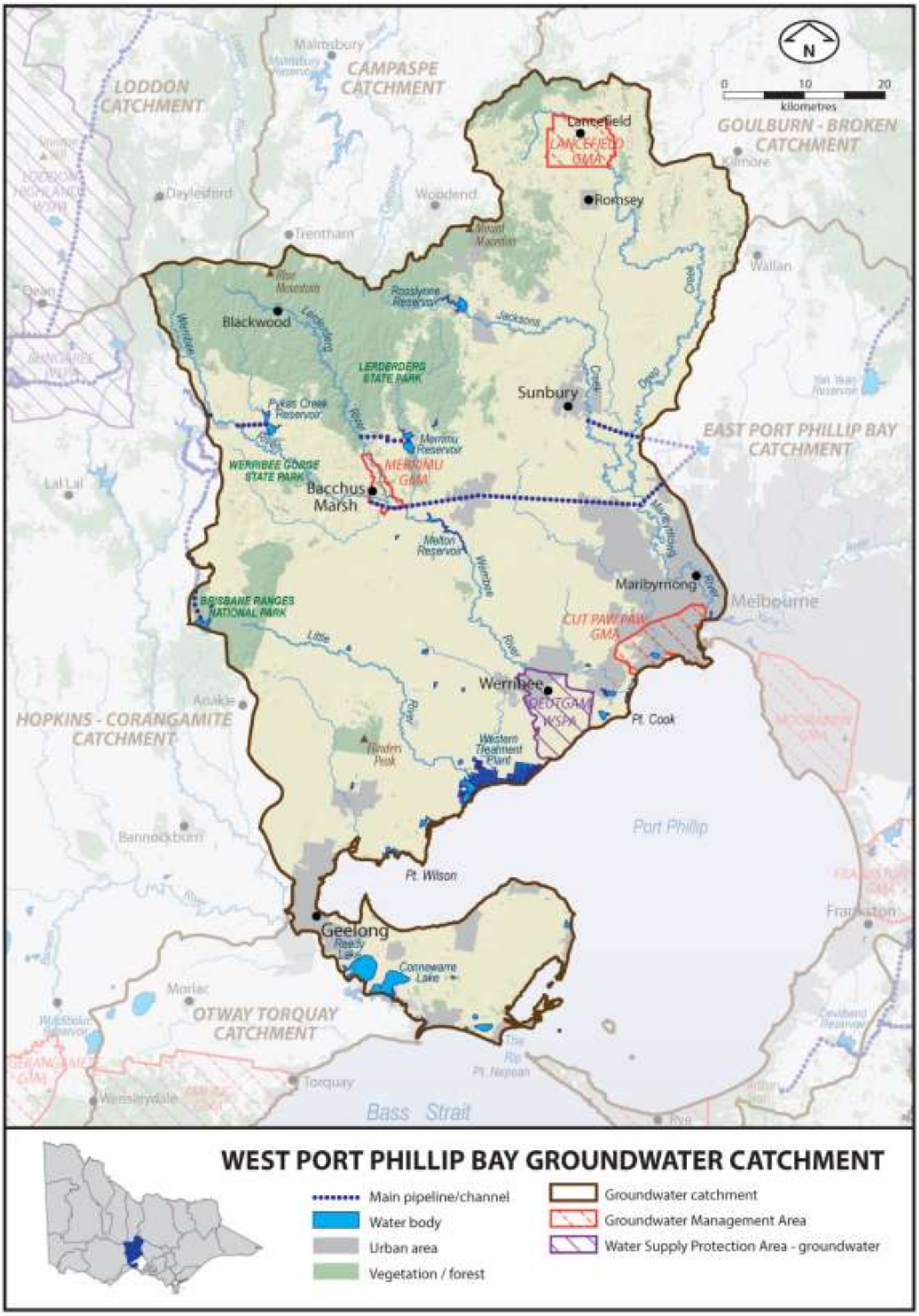
(2) Kinglake GMA was revoked during the year. The licences in the area are now in the new Upper Goulburn GMA.

(3) Upper Goulburn GMA Groundwater Management Plans were approved in August 2014. Estimated domestic and stock use for Upper Goulburn GMA calculated using a factor of 2 ML per bore.

7.18 West Port Phillip Bay groundwater catchment

The West Port Phillip Bay groundwater catchment is located in the Port Phillip groundwater basin in southern Victoria (Figure 7-14). Neighbouring groundwater catchments are the Hopkins-Corangamite to the west; Loddon, Campaspe and Goulburn–Broken to the north; and East Port Phillip Bay to the east.

Figure 7-14 Map of the West Port Phillip Bay groundwater catchment



7.18.1 Groundwater resources overview

Groundwater resources in the West Port Phillip Bay groundwater catchment are managed by Southern Rural Water. The catchment contains the Cut Paw Paw GMA, Lancefield GMA, Merrimu GMA, Deutgam WSPA and parts of UAs. Groundwater resources supply licences and domestic and stock use in the area and are also available to supply the towns of Blackwood, Lancefield and Romsey.

Groundwater level trends were categorised as increasing in the Deutgam WSPA and stable in Lancefield GMA, while the trend for Merrimu GMA was categorised as declining. Insufficient observation bores were available to determine a trend for Cut Paw Paw GMA.

7.18.2 Groundwater entitlements and use

A summary of the licensed entitlements and use for GMUs is shown in Table 7-36.

Table 7-36 Licensed groundwater volumes and use in the West Port Phillip Bay groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Cut Paw Paw GMA	>50	514	424	208
Lancefield GMA	All depths	1,378	623	224
Merrimu GMA	<=30	440	124	28
Deutgam WSPA	<=30	5,082	802	1,389
Unincorporated areas	-	8,223	1,272	959
Total		**15,637**	**3,245**	**2,808**

An estimate of domestic and stock groundwater use is provided in Table 7-37. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-36.

Table 7-37 Number of domestic and stock bores and estimated use in the West Port Phillip Bay groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Central Victorian Mineral Springs GMA (1)(2)	9	18
Lancefield GMA	61	92
Merrimu GMA	8	12
Deutgam WSPA	122	183
Unincorporated areas	1,287	1,931
Total	1,487	2,236

Notes:

(1) Central Victorian Mineral Springs GMA Groundwater Management Plan was approved in August 2014.

(2) Estimated domestic and stock use for Central Victorian Mineral Springs GMA calculated using a factor of 2 ML per bore.

Within the West Port Phillip Bay catchment, groundwater is an option for urban water supply to the townships of Blackwood, Lancefield and Romsey. As shown in Table 7-38, only Lancefield drew on groundwater for urban use in 2013–14.

Table 7-38 Urban groundwater use in the West Port Phillip Bay groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Blackwood	50	0	0
Lancefield	294	167	130
Romsey	600	0	0
Total	**944**	**167**	**130**

7.19 Otway–Torquay groundwater basin

The Otway–Torquay groundwater basin is located in south-west Victoria and extends offshore beneath the Southern Ocean. It borders the Goulburn–Murray basin and Wimmera–Mallee basin to the north and the Central basins to the east.

The upper aquifers of the Otway–Torquay groundwater basin are widely located across the basin’s south-west, and include volcanic aquifers, a significant sand and limestone aquifer, and a number of older sand aquifers. The unconfined volcanic aquifers stretch from Ballarat to Portland and consist of scoria and fractured basalt. They are thickest near Ballarat, Colac, Portland and south of Hamilton. The unconfined sand and limestone aquifer occurs along the South Australian border. In the places where these aquifers are at the ground surface, they can receive recharge directly from rainfall. Discharge is predominantly through leakage from the upper aquifer to the middle aquifer, and also occurs through baseflow to streams. The upper aquifers interact closely with surface water such as rivers, creeks, drainage lines, wetlands, swamps and lakes.

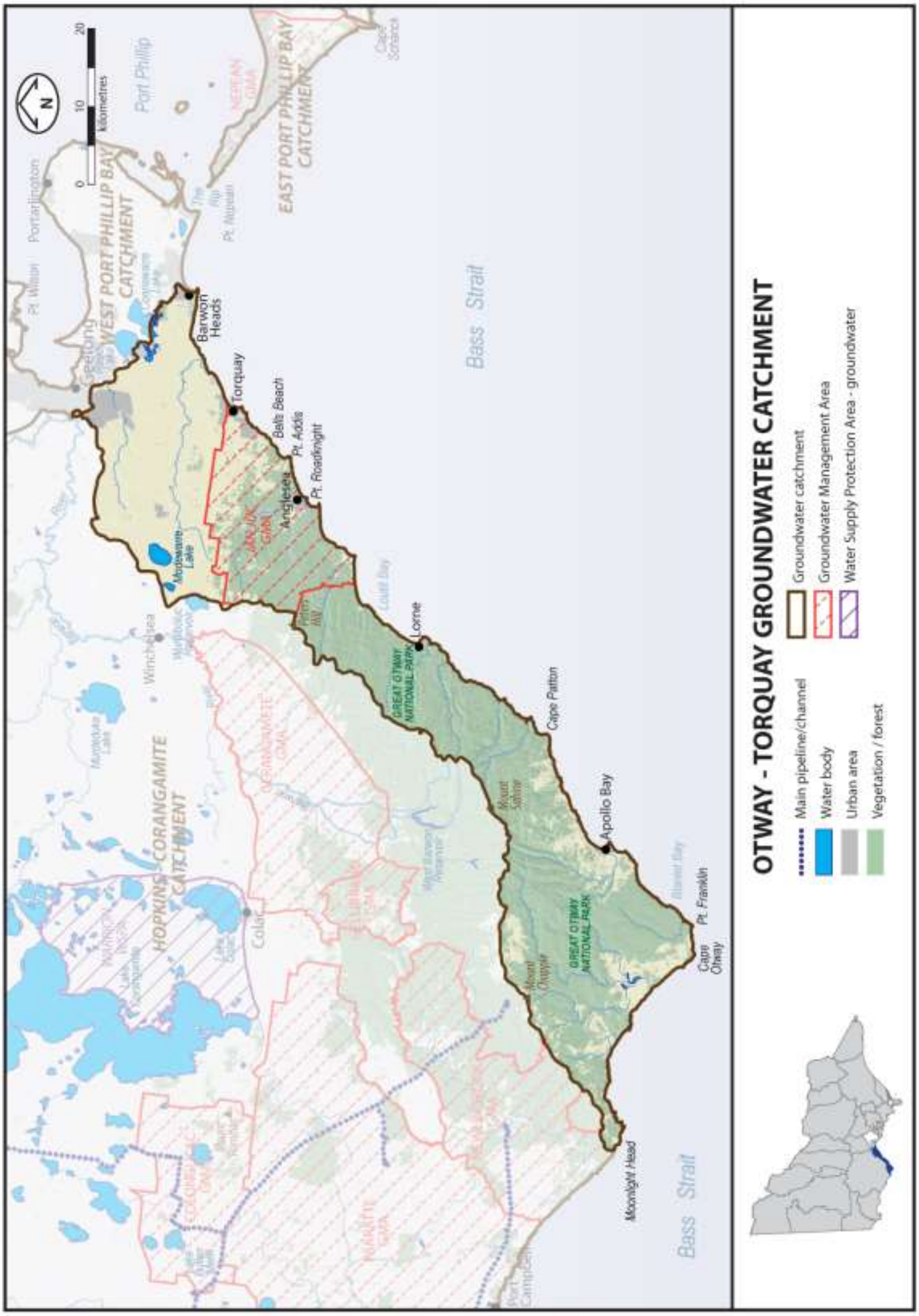
Middle aquifers occur across the southern part of the region, stretching from the South Australian border near the Grampians across to Port Campbell. There are two main levels of middle aquifers known as the upper middle aquifers and lower middle aquifers, which are separated by a thick aquitard of impermeable silts and clays. The upper middle aquifer largely comprises Port Campbell Limestone and is located close to the surface. It is semi-confined by the upper aquifer, and receives recharge mainly from rainfall. It sometimes acts as one unit with the overlying sand and limestone aquifer. Most of the lower middle aquifer is confined by overlying layers and below by thick marl aquitards; the exception is the region along its northern reaches where it connects to the lower aquifers. The lower middle aquifer relies on upward and downward leakage from adjacent formations for recharge. Discharge for both the upper middle and lower middle aquifers is most likely to occur along the coastline or into other formations; additionally there is some surface discharge to swamps and leakage in low-lying areas.

The lower aquifers occur across the basin’s south, stretching from the South Australian border south of the Grampians across to Port Phillip Bay. In many parts of the basin they are overlain by hundreds of metres of sediment, however in the basin’s north and around the Otway Ranges they occur at or near the surface as unconfined aquifers. The lower aquifers mainly comprise alternating layers of sand and clay, however some are sand aquifers with minor amounts of silt and brown coal. Near the coast, the aquifers are under very high pressure from the weight of the large amount of overlying sediments and water. As a result of the pressure, the groundwater from these aquifers can reach temperatures of 50 to 60°C. The lower aquifers are underlain by basement rock comprised mainly of siltstone, which reaches the surface around the basin margin to form the Grampians, the Otway Ranges and the Central Highlands. The lower aquifers of the Otway–Torquay basin are one of the most substantial and reliable groundwater sources in Victoria due to their massive storage. However, their relatively small annual recharge restricts their potential. Groundwater around the Otway Ranges discharges offshore, while further inland the lower aquifer groundwater primarily discharges to other aquifers.

7.20 Otway–Torquay groundwater catchment

The Otway–Torquay groundwater catchment (Figure 7-15) is located in the Otway–Torquay groundwater basin in south-western Victoria and falls within the Otway Coast surface water basin. Much of the catchment boundary is along the coastline; neighbouring groundwater catchments are Hopkins–Corangamite to the north-west and West Port Phillip to the north-east.

Figure 7-15 Map of the Otway–Torquay groundwater catchment



7.20.1 Groundwater resources overview

Groundwater resources in the Otway–Torquay groundwater catchment are managed by Southern Rural Water, which is responsible for licensing bore construction and groundwater extractions under take and use licences.

The Otway–Torquay catchment contains the Jan Juc GMA and UAs. Groundwater resources supply licences and domestic and stock use in the area and are also available to supply the city of Geelong.

The groundwater level trend in the Jan Juc GMA was categorised as declining throughout 2013–14.

7.20.2 Groundwater entitlements and use

A summary of licensed groundwater entitlements and use from GMUs within the Otway–Torquay catchment is presented in Table 7-39. Total groundwater use for 2013–14 was similar compared with 2012–13. Most use is attributed to the Alcoa mine at Anglesea.

Table 7-39 Licensed groundwater volumes and use in the Otway–Torquay groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Jan Juc GMA	All depths	11,250	3,577	3,505
Unincorporated areas	All depths	90	0	0
Total		**11,340**	**3,577**	**3,505**

An estimate of domestic and stock groundwater use is provided in Table 7-40. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-39.

Table 7-40 Number of domestic and stock bores and estimated use in the Otway–Torquay groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Jan Juc GMA	4	6
Unincorporated areas	42	63
Total	46	69

In the Otway–Torquay catchment, groundwater is used for urban water supply in the Greater Geelong region. The licensed entitlements and metered use for these groundwater supplies are provided in Table 7-41. 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 it cannot exceed an average of 7,000 ML per year over any five-year period. The bulk entitlement supplements supply to homes and businesses in the Greater Geelong region. No groundwater was extracted under this bulk entitlement in 2013–14.

Table 7-41 Urban groundwater use in the Otway–Torquay groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Greater Geelong (Anglesea borefield) (1)	7,000	0	0
Total	**7,000**	**0**	**0**

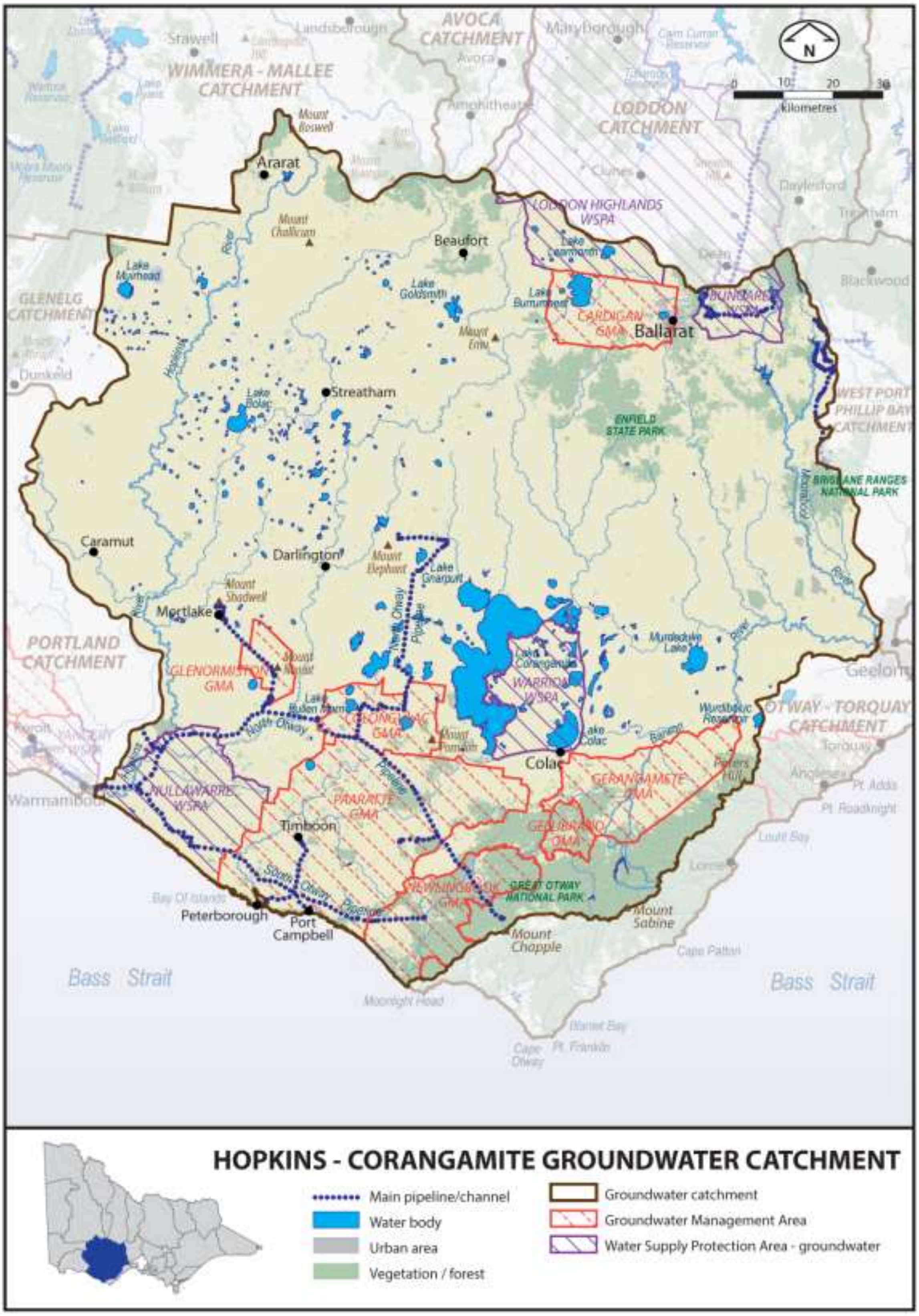
Note:

(1) The bulk entitlement for Greater Geelong (Anglesea, Torquay, Lorne) is split into Greater Geelong (Anglesea borefield) located in the Otway–Torquay catchment, and Greater Geelong (Barwon Downs borefield) located in the Hopkins-Corangamite catchment. The *Bulk Entitlement (Anglesea Groundwater) Order 2009* allows Barwon Water to extract a maximum of 10,000 ML of groundwater from the Anglesea borefield in any given year, however it cannot exceed an average of 7,000 ML per year over any five-year period.

7.21 Hopkins–Corangamite groundwater catchment

The Hopkins–Corangamite groundwater catchment (Figure 7-16) is located in the Otway–Torquay groundwater basin in south-western Victoria. Neighbouring groundwater catchments are Portland and Glenelg to the west; Wimmera–Mallee, Avoca and Loddon to the north; West Port Phillip Bay to the east; and Otway–Torquay to the south-east.

Figure 7-16 Map of the Hopkins–Corangamite groundwater catchment



7.21.1 Groundwater resources overview

Groundwater resources in the Hopkins–Corangamite groundwater catchment are managed by Southern Rural Water, which is responsible for issuing licences for groundwater use and bore construction.

The Hopkins–Corangamite catchment contains a number of GMUs: Bungaree WSPA, Cardigan GMA, Colongulac GMA, Gellibrand GMA, Gerangamete GMA, Glenormiston GMA, Newlingrook GMA, Nullawarre WSPA, Paaratte GMA and Warrion WSPA. It also contains a small part of the Loddon Highlands WSPA, most of which is within the Loddon groundwater catchment.

Groundwater resources in the Hopkins–Corangamite catchment are predominantly used for urban supply and irrigation.

In 2013–14, the groundwater level trend for most GMUs in the Hopkins–Corangamite catchment was categorised as increasing to stable.

7.21.2 Groundwater entitlements and use

A summary of the licensed entitlements and use for GMUs is shown in Table 7-42.

Table 7-42 Licensed groundwater volumes and use in the Hopkins–Corangamite groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Cardigan GMA	All depths	3,878	462	563
Colongulac GMA	All depths	4,257	1,134	1,215
Gerangamete GMA (1)	>60	20,000	0	0
Glenormiston GMA	<=60	2,630	1,210	1,167
Newlingrook GMA	All depths	1,958	44	326
Paaratte GMA	>120	3,212	323	345
Bungaree WSPA (2)	All depths	5,293	3,094	2,729
Nullawarre WSPA	<=250	22,627	9,060	11,583
Warrion WSPA	All depths	14,081	3,426	4,530
Unincorporated areas	-	15,559	4,641	5,162
Total		**93,495**	**23,394**	**27,620**

Notes:

(1) 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 7-42 represents the single year limit, however compliance would also need to be assessed at the 10-year and 100-year level.

(2) The licensed entitlement volume for Bungaree WSPA includes a 55 ML mineral water licence.

An estimate of domestic and stock groundwater use is provided in Table 7-43. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed use in Table 7-42.

Table 7-43 Number of domestic and stock bores and estimated use in the Hopkins–Corangamite groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Cardigan GMA	93	140
Colongulac GMA	110	165
Gellibrand GMA	1	2
Gerangamete GMA	3	5
Glenormiston GMA	79	119
Newlingrook GMA	3	5
Paaratte GMA	3	5
Bungaree WSPA	192	288
Loddon Highlands WSPA (1)	101	202
Nullawarre WSPA	898	1,347
Warrion WSPA	286	429
Unincorporated areas	1,455	2,183
Total	3,224	4,890

Note:

(1) Estimated domestic and stock use calculated using a factor of 2 ML per bore.

In the Hopkins–Corangamite catchment, groundwater is available for urban water supply to the townships of Beaufort, Caramut, Darlington, Dean, Mortlake, Port Campbell, Timboon and Peterborough, Streatham, areas around Carlisle, as well as the cities of Ballarat and Geelong. Licensed entitlements and metered use for urban supply are presented in Table 7-44.

Table 7-44 Urban groundwater use in the Hopkins–Corangamite groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Ballarat – Bungaree bore	120	0	0
Ballarat West (1)	1,700	236	374
Beaufort	200	48	0
Caramut	50	39	31
Darlington	10	5	3
Dean	30	21	22
Greater Geelong (Barwon Downs borefield)(2)	8,000	0	0
Mortlake (part)	335	25	31
Otway System (Carlisle)	1,800	4	263
Port Campbell, Timboon and Peterborough	3,159	327	345
Streatham	60	38	38
Total	**15,464**	**743**	**1,107**

Notes:

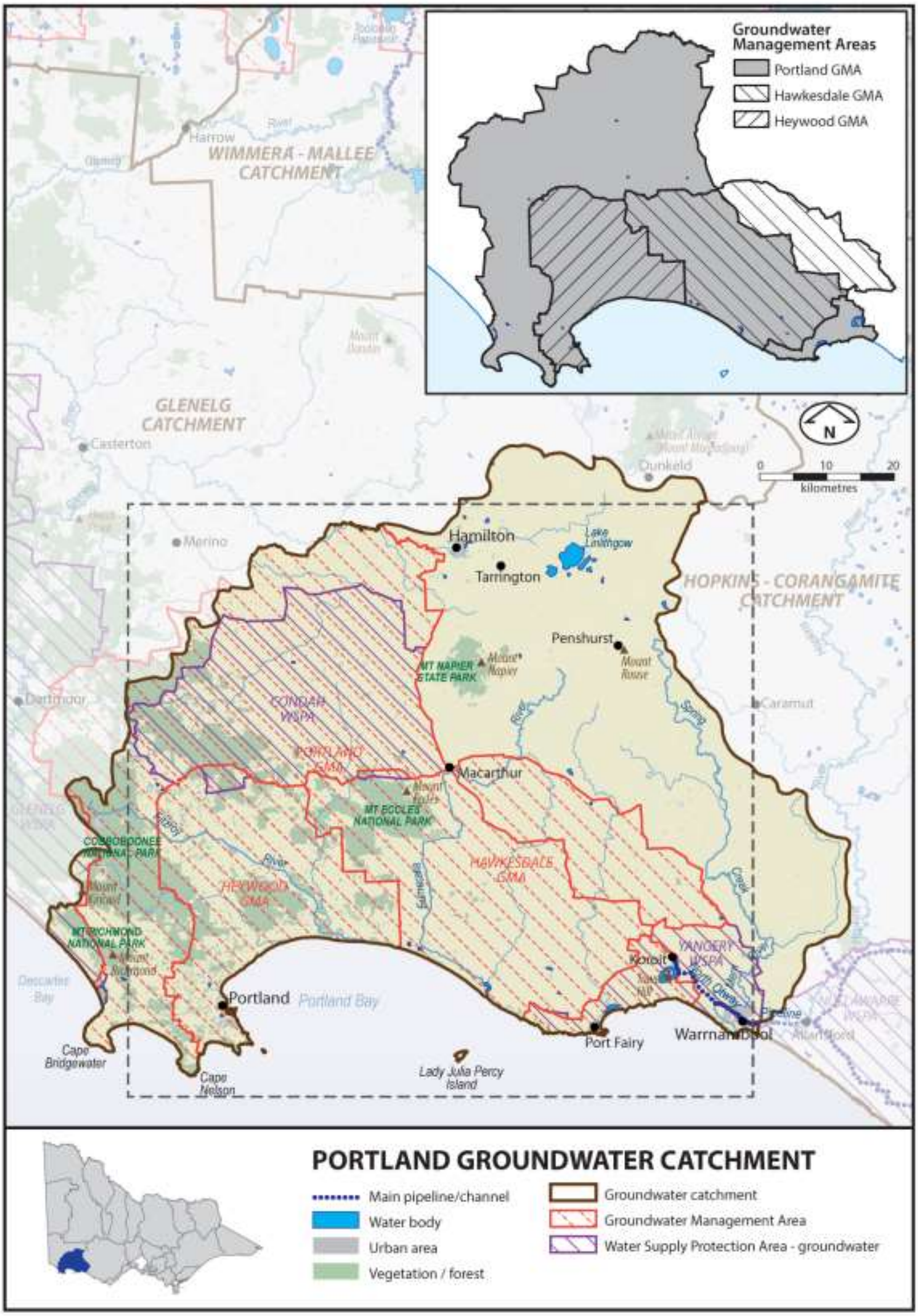
(1) Volume of the licence for Ballarat is 1,700 ML, but up to 3,000 ML may be taken in any one year during a water shortage.

(2) The bulk entitlement for Greater Geelong (Anglesea, Torquay, Lorne) is split into Greater Geelong (Barwon Downs borefield) located in the Hopkins-Corangamite catchment, and Greater Geelong (Anglesea borefield) located in the Otway–Torquay catchment. The *Bulk Entitlement (Anglesea Groundwater) Order 2009* allows Barwon Water to extract 8,000 ML per year, however in a drought year up to 20,000 ML may be extracted.

7.22 Portland groundwater catchment

The Portland groundwater catchment (Figure 7-17) is located in the Otway–Torquay groundwater basin in south-west Victoria. It overlaps both the Goulburn and Broken river basins. Neighbouring groundwater catchments are Glenelg to the west and Hopkins–Corangamite to the east.

Figure 7-17 Map of the Portland groundwater catchment



7.22.1 Groundwater resources overview

Groundwater resources in the Portland groundwater catchment are managed by Southern Rural Water, which is responsible for issuing licences for groundwater use and bore construction.

The Portland groundwater catchment contains the Condah WSPA, Hawkesdale GMA, Heywood GMA, Portland GMA and Yangery WSPA and UAs. It also contains part of the Nullawarre WSPA, which extends into the Hopkins–Corangamite catchment.

Groundwater resources supply licences, domestic and stock use and a number of towns in the area. Most groundwater use in the Portland groundwater catchment is for irrigation and urban use and, to a lesser extent, for dairy wash and industrial supply.

In 2013–14, the groundwater level trends in the GMUs of the Portland groundwater catchment were generally categorised as stable or rising.

7.22.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-45.

Groundwater use within the catchment decreased slightly in 2013–14 compared with 2012–13.

Table 7-45 Licensed groundwater volumes and use in the Portland groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Hawkesdale GMA	As per plan	12,451	4,540	5,939
Heywood GMA	<-70	7,011	1,359	1,726
Portland GMA	>200	7,794	2,645	2,692
Condah WSPA	70-200	7,475	2,148	3,380
Nullawarre WSPA	<=250	106	8	31
Yangery WSPA	<-100	14,343	2,815	3,059
Unincorporated areas	-	7,065	836	886
Total		**56,245**	**14,351**	**17,713**

An estimate of domestic and stock groundwater use is provided in Table 7-46. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-45.

Table 7-46 Number of domestic and stock bores and estimated use in the Portland groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Hawkesdale GMA	1,097	1,646
Heywood GMA	1,168	1,752
Portland GMA	2	3
Condah WSPA	54	81
Glenelg WSPA	14	21
Yangery WSPA	805	1,208
Unincorporated areas	1,841	2,762
Total	4,981	7,473

Groundwater is used as an urban water supply for some townships in the Portland groundwater catchment. The licensed entitlements and metered use for these supplies are presented in Table 7-47.

Portland groundwater catchment

Table 7-47 Urban groundwater use in the Portland groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Hamilton, Tarrington, Dunkeld	1,102	6	1
Heywood	333	155	179
Koroit	524	4	4
Macarthur	130	36	38
Penshurst	250	70	100
Port Fairy	1,026	620	646
Portland	6,222	1,879	1,867
Warrnambool, Allansford and Koroit (part)	750	443	383
Total	**10,337**	**3,213**	**3,218**

7.23 Glenelg groundwater catchment

The Glenelg groundwater catchment (Figure 7-18) is located in the Otway–Torquay basin in western Victoria, and contains the Glenelg river basin and part of the Millicent Coast basin. The Victorian/South Australian border forms the western boundary of the Glenelg groundwater catchment, and the area that extends 20 km east from the border forms part of the South Australia/Victoria Designated Area. Neighbouring catchments are the Portland groundwater catchment to the south-east, the Hopkins–Corangamite catchment in the east and the West Wimmera and Wimmera–Mallee catchments to the north.

Figure 7-18 Map of the Glenelg groundwater catchment

7.23.1 Groundwater resources overview

Groundwater resources in the Glenelg groundwater catchment are managed by Southern Rural Water, which is responsible for issuing licenses for groundwater use and bore construction. The part of the Glenelg groundwater catchment that falls within the Victorian/South Australian Border Designated Area is managed under the *Border Groundwaters Agreement*, with management responsibilities shared between Southern Rural Water and South Australia's Department of Environment, Water and Natural Resources.

The Glenelg groundwater catchment contains the Glenelg WSPA and UAs, along with very small parts of the Portland GMA and West Wimmera GMA. Groundwater resources supply licences, domestic and stock use and the townships of Casterton, Dartmoor and Merino.

The groundwater level trend in the Glenelg WSPA was categorised as stable throughout 2013–14.

7.23.2 Groundwater entitlements and use

A summary of the licensed entitlements and use for GMUs is presented in Table 7-48.

Table 7-48 Licensed groundwater volumes and use in the Glenelg groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Glenelg WSPA	All depths	33,261	4,904	8,938
Unincorporated areas	-	2,075	613	279
Total		**35,336**	**5,517**	**9,217**

An estimate of domestic and stock groundwater use is provided in Table 7-49. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-48.

Table 7-49 Number of domestic and stock bores and estimated use in the Glenelg groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Glenelg WSPA	1,112	1,668
West Wimmera GMA (1)	2	4
Unincorporated areas	285	428
Total	1,399	2,100

Note:
(1) Estimated domestic and stock use for this GMA is calculated using a factor of 2 ML per bore.

Groundwater is available for urban water supply to the townships of Casterton, Dartmoor and Merino. The licensed entitlements and metered use for these supplies is presented in Table 7-50.

Table 7-50 Urban groundwater use in the Glenelg groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Casterton	1,000	456	506
Dartmoor	150	17	25
Merino	100	0	0
Total	**1,250**	**473**	**531**

7.24 Wimmera–Mallee groundwater basin

The Wimmera–Mallee groundwater basin is located in north-west Victoria. It borders the Otway–Torquay groundwater basin to the south and the Goulburn–Murray groundwater basin to the east. The Wimmera–Mallee groundwater basin also forms part of the Murray river basin in Victoria. The Wimmera–Mallee region is dominated in its northern plains by sedimentary aquifers and in the south by fractured rock highlands extending along the Great Dividing Range.

As depth increases, the major aquifers in the region are:

- Upper Tertiary Aquifer – including the Parilla Sands Aquifer, also known as the Pliocene Sands Aquifer
- Mid Tertiary Aquifer – including the Murray Group Limestone Aquifer
- Lower Tertiary Aquifer – primarily consisting of the Tertiary Confined Sands Aquifer, also known as the Renmark Group Aquifer.

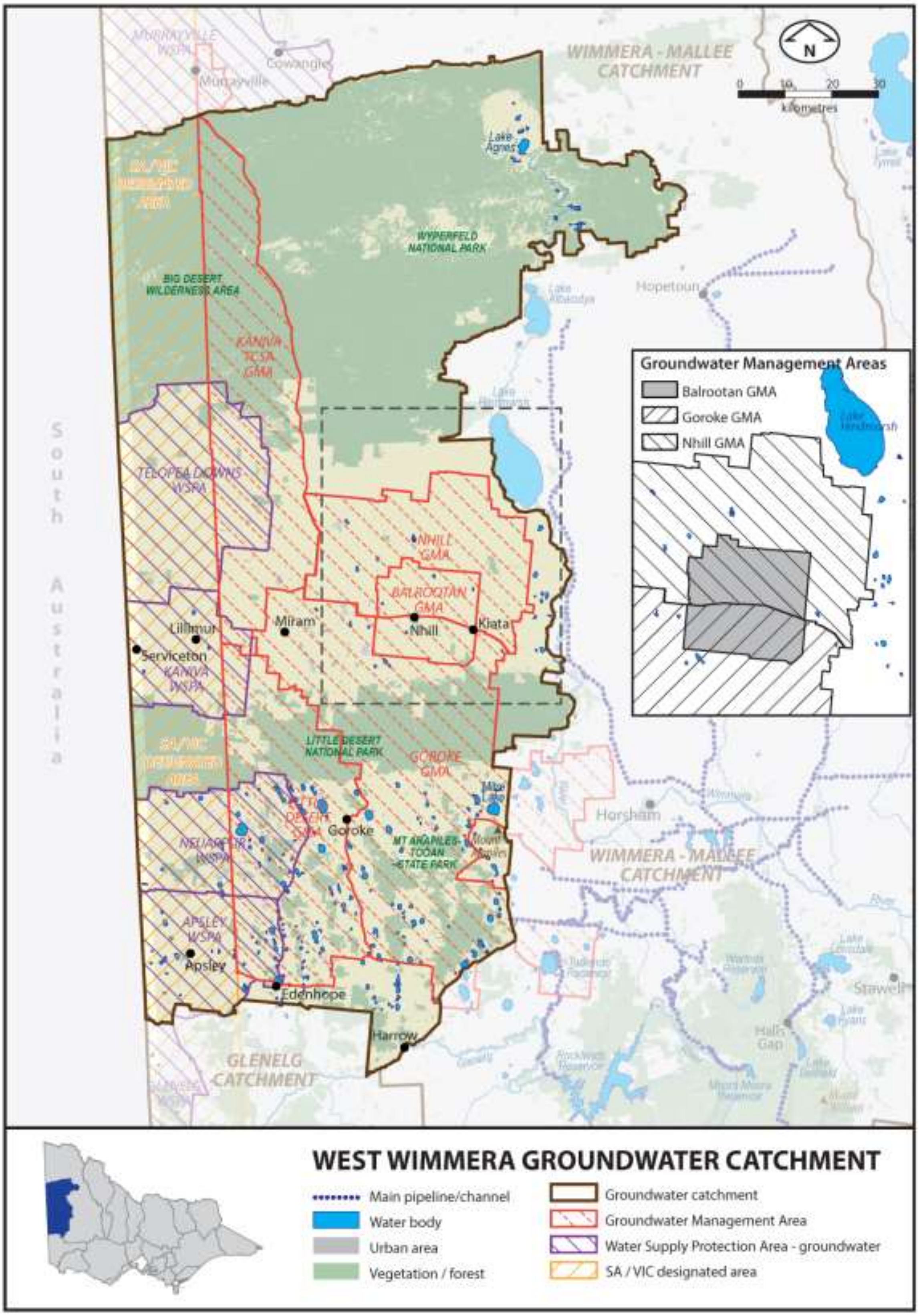
In most areas the aquifers are all considered to be connected, with thin aquitards between the aquifers in part or all of the catchment. The exception to this is the Renmark Group Aquifer in the West Wimmera GMA, which is considered to be disconnected from the water above it.

Most groundwater is extracted from the Murray Group and deeper Renmark Group aquifers along the border with South Australia, and from the fractured basement rock aquifers of the Grampians. The water in the Murray Group and Renmark Group aquifers is thought to originate from recharge received during a much wetter period about 20,000 years ago. The contribution of modern recharge is considered to be modest across much of the area and less than the rate of use.

7.25 West Wimmera groundwater catchment

The West Wimmera groundwater catchment (Figure 7-19) is located in western Victoria and contains portions of the Mallee, Wimmera and Millicent Coast river basins. The Victorian/South Australian border forms the western boundary of the West Wimmera groundwater catchment, and the area that extends 20 km east from the border forms part of the South Australia/Victoria Designated Area. Neighbouring groundwater catchments are the Wimmera–Mallee catchment to the east and Glenelg catchment to the south.

Figure 7-19 Map of the West Wimmera groundwater catchment



7.25.1 Groundwater resources overview

Groundwater resources in the West Wimmera catchment are managed by GWMWater, which is responsible for the development and implementation of groundwater management plans. GWMWater issues licences for groundwater use and bore construction, as well as for surface water licensed diversions. The West Wimmera catchment forms part of the Murray–Darling basin, and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan. The part of the catchment that falls within the Victorian/South Australian Border Designated Area is managed under the *Border Groundwaters Agreement*, with management responsibilities shared between GWMWater and South Australia's Department of Environment, Water and Natural Resources.

The West Wimmera groundwater catchment is covered entirely by the West Wimmera GMA, which replaced the Balrootan, Nhill, Goroke, Kaniva TCSA and Little Desert GMAs, and the Apsley, Kaniva, Neuarpur and Telopea Downs WSPAs. Groundwater resources supply licensed use, domestic and stock use and the townships of Apsley, Harrow, Miram, Serviceton, Edenhope, Kiata, Goroke, Lillimur and Nhill.

Groundwater level trends are generally categorised as stable in the area, however levels in the western part of the catchment have historically been declining. In response to this, a strategy was proposed to restrict some licensed entitlements to groundwater by 4% per year until levels stabilise. In line with this strategy, licence holders in Neuarpur sub-zone 1 were restricted to 88% of their licence volume during 2013–14.

7.25.2 Groundwater entitlements and use

Licensed entitlements and use within the West Wimmera groundwater catchment are shown in Table 7-51.

Table 7-51 Licensed groundwater volumes and use in the West Wimmera groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
West Wimmera GMA	All depths	53,327	16,965	17,866
Total		**53,327**	**16,965**	**17,866**

An estimate of domestic and stock groundwater use is provided in Table 7-52. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-51.

Table 7-52 Number of domestic and stock bores and estimated use in the West Wimmera groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
West Wimmera GMA	All depths	53,327	16,965	17,866
Total		**53,327**	**16,965**	**17,866**

Groundwater is available for urban water supply to the townships of Apsley, Edenhope, Goroke, Harrow, Kaniva, Kiata, Lillimur, Miram, Nhill and Serviceton. The licensed entitlements and metered use for these supplies are presented in Table 7-53.

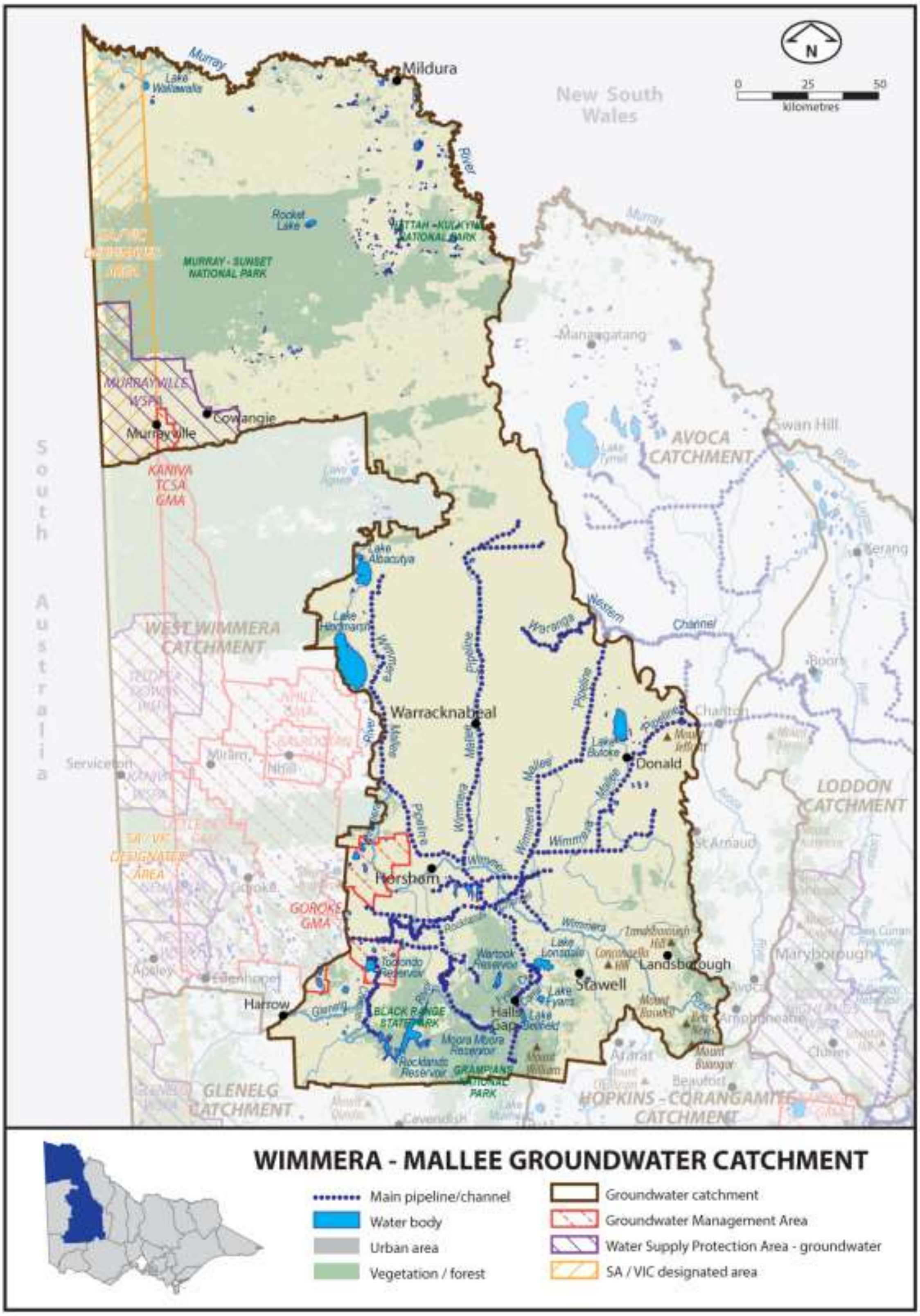
Table 7-53 Urban groundwater use in the West Wimmera groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Apsley	40	29	33
Edenhope	250	158	145
Goroke	86	51	62
Harrow	39	35	54
Kaniva	600	248	232
Kiata	40	4	0
Lillimur	32	8	8
Miram	7	2	2
Nhill	1,000	290	450
Serviceton	25	9	9
Total	**2,119**	**834**	**995**

7.26 Wimmera–Mallee groundwater catchment

The Wimmera–Mallee catchment (Figure 7-20) is located in north-west Victoria and overlaps the Mallee river basin in its north and Wimmera river basin in its south. The Victorian/South Australian border forms the north-western boundary of the Wimmera–Mallee groundwater catchment, and the area that extends 20 km east from the border forms part of the South Australia/Victoria Designated Area. Neighbouring groundwater catchments are the West Wimmera catchment to the west, the Avoca catchment to the east and the Glenelg and Hopkins–Corangamite catchments to the south.

Figure 7-20 Map of the Wimmera–Mallee groundwater catchment



7.26.1 Groundwater resources overview

Groundwater resources in the Wimmera–Mallee catchment are managed by GWMWater, which is responsible for the development and implementation of groundwater management plans. GWMWater issues licences for groundwater use and bore construction, as well as for surface water diversions. The Wimmera–Mallee groundwater catchment forms part of the Murray–Darling basin and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan. The part of the Wimmera–Mallee groundwater catchment that falls within the Victorian/South Australian Border Designated Area is managed under the *Border Groundwaters Agreement*, with management responsibilities shared between GWMWater and South Australia's Department of Environment, Water and Natural Resources.

The Wimmera–Mallee catchment contains the Murrayville WSPA and UAs. Groundwater resources supply licences, domestic and stock use and also the townships of Cowangie, Horsham, Mt Zero, Landsborough and Murrayville. Groundwater resources from the Wimmera–Mallee catchment also supply the township of Willaura, though the town itself is located outside the catchment.

The groundwater level trend in the Murrayville WSPA is generally categorised as stable and in line with management objectives.

7.26.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from GMUs are presented in Table 7-54.

Table 7-54 Licensed groundwater volumes and use in the Wimmera–Mallee groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Murrayville WSPA	70–200	9,634	3,586	5,568
Unincorporated areas	-	13,574	4,223	2,894
Total		**23,208**	**7,809**	**8,462**

An estimate of domestic and stock groundwater use is provided in Table 7-55. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-54.

Table 7-55 Number of domestic and stock bores and estimated use in the Wimmera–Mallee groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2.0 ML per bore) (ML)
Murrayville WSPA	117	234
Unincorporated area-GWMWater	363	726
Total	480	960

Groundwater is used as an urban water supply to the townships of Cowangie, Horsham, Mt Zero, Landsborough, Murrayville and Willaura. The licensed entitlements and metered use for these supplies are presented in Table 7-56.

Table 7-56 Urban groundwater use in the Wimmera–Mallee groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Cowangie	40	8	12
Horsham Mt Zero	1,200	3	0
Landsborough	150	30	35
Murrayville	475	116	144
Willaura system (1)	220	74	118
Total	**2,085**	**231**	**309**

Note:

(1) While the township of Willaura is located in Hopkins–Corangamite groundwater catchment, the bores that supply the town are situated within the Wimmera–Mallee catchment in Mafeking.

7.27 Avoca groundwater catchment

The Avoca groundwater catchment is located in north-west Victoria (Figure 7-21) and contains the Avoca river basin and a portion of the Wimmera basin. Neighbouring groundwater catchments are the Wimmera–Mallee to the west and Loddon to the east.

Figure 7-21 Map of the Avoca groundwater catchment

7.27.1 Groundwater resources overview

Groundwater resources in the Avoca catchment are mainly managed by GWMWater, which is responsible for the development and implementation of groundwater management plans. GWMWater also issues licences for groundwater use and bore construction. Central Highlands Water supplies groundwater for the townships of Amphitheatre, Avoca and Redbank.

The Avoca catchment forms part of the Murray–Darling basin, and groundwater management arrangements are subject to the requirements of the Murray–Darling Basin Plan.

There are no GMAs or WSPAs located within the Avoca catchment.

7.27.2 Groundwater entitlements and use

Licensed groundwater entitlements and use from parts of UAs are presented in Table 7-57.

Table 7-57 Licensed groundwater volumes and use in the Avoca groundwater catchment

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2013–14	Total licensed groundwater use (ML) 2012–13
Unincorporated areas	-	2,335	865	976
Total		**2,335**	**865**	**976**

An estimate of domestic and stock groundwater use is provided in Table 7-55. A number of groundwater licences also incorporate domestic and stock use, and in these cases use from these bores is reported in the licensed volume in Table 7-57.

Table 7-58 Number of domestic and stock bores and estimated use in the Avoca groundwater catchment

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Unincorporated areas	71	142
Total	71	142

Groundwater is used to provide urban water supply to some towns in the Avoca groundwater catchment. The licensed entitlements and metered use for these supplies are presented in Table 7-56. Groundwater use for Avoca and Redbank decreased slightly in 2013–14 compared with 2012–13, and no groundwater was used for urban supply to Amphitheatre during the year.

Table 7-59 Urban groundwater use in the Avoca groundwater catchment

Town supplied	Licensed volume (ML)	Metered use 2013–14 (ML)	Metered use 2012–13 (ML)
Amphitheatre	20	0	0
Avoca	250	99	103
Redbank	50	4	10
Total	**320**	**103**	**113**

8 Distribution system water accounts 2013–14

8.1 Overview of methodology

Because distribution systems start where water is taken from a waterway or aquifer, these distribution system accounts include off-stream storages, bulk supply channels, treatment plants and the like, as well as reticulation networks to supply customers.

Sometimes the accounts partition a distribution system into its bulk (or feeder) and reticulation components.

On-stream storages such as Lake Eildon are covered in the first half of each of the Victorian Water Accounts, which track water in waterways.

An off-stream storage often has a certain amount of catchment inflow (i.e. it has some on-stream characteristics). The bulk water entitlements that authorise water being taken from waterways serve as a guide to whether a storage is off-stream.

8.1.1 Groupings of distribution systems

Water may pass through more than one distribution system before it reaches the eventual customer. For example, water for Melbourne is diverted by Melbourne Water to supply several retail water corporations. In turn their distribution systems supply residential, commercial and municipal customers.

Distribution system boundaries do not necessarily align with basins. For example, Goulburn–Murray Water’s Goulburn system straddles the Goulburn, Campaspe and Loddon basins, and also supplies water further west into the Avoca basin. Distribution systems (with the exception of the Goldfields Superpipe) are all operated by a single water corporation and are generally located in one of the four regions (Northern, Gippsland, Central and Western). Southern Rural Water operates three irrigation systems: one in the Gippsland region, and two in the Central region. Southern Rural Water systems therefore appear in two regions: Central and Gippsland.

Most water corporation websites have diagrams or maps of their distribution systems.

8.1.2 Types of distribution systems

For convenience of description, the following titles are used.

Common distribution system: This is a bulk or feeder system that mainly supplies two or more other distribution systems. It may have few, or no, retail customers. Examples are Melbourne Water’s system, the Goldfields Superpipe (operated jointly by Coliban Water and Central Highlands Water), and the Waranga Western Channel (which supplies several irrigation and other systems including the Goldfields Superpipe).

Rural distribution system: This may be:

- An irrigation system which primarily supplies irrigation water, although it may also supply other commercial customers, urban systems and domestic and stock water.
- A domestic and stock system which primarily supplies non-irrigation rural customers and may also supply urban systems. It may previously have been (wholly or partly) a natural stream (e.g. the upper and lower Broken Creek and several waterways in the Torrumbarry area), the flows of which are now controlled to the extent that it is more correctly described as all or part of a distribution system than as a river or stream.

Urban distribution system: This is a system that primarily supplies urban customers. It may supply a single town or a group of towns, and may also transfer water to other distribution systems. As explained above, an urban distribution system may have feeder and reticulation components, with the water balance for the two components shown separately.

Two water corporations (Wannon Water and Grampians Wimmera Mallee Water) each operate rural distribution systems that supply several towns as well as rural customers. While deliveries to different customer groups can usually be separated (e.g. deliveries to towns can be identified and shown separately from deliveries to rural customers), inflows and distribution losses often cannot be separated. For simplicity, reports on these systems consolidate urban and rural components as ‘combined distribution systems’.

8.1.3 Data sources and limitations

Almost all the data used for the accounts was provided by the water corporations that operate the systems. They obtained the data using various types of meters, various methods of infilling data when meters fail, hydrographic measurement, hydrologic techniques to estimate inflows they did not measure, and back-calculation. Details of these methods are available from the relevant corporation and are not necessarily included in notes to the accounts, which are as concise as possible.

The presentation of the accounts is consistent with the draft National Water Accounting Standards developed under the Council of Australian Governments (COAG). For example, whereas water accounts traditionally might have reported net evaporation from a storage as a loss, the draft standards prefer that data on rainfall and evaporation is reported separately as inflows and outflows. This may affect efficiency as well as loss measures, although usually the differences when compared with traditional figures are small.

8.1.4 Balancing items

In many cases, water balances are exact. This is because one of the items is back-calculated, thus forcing inflows to equal outflows. In the reports, the balancing item (usually distribution system losses, but sometimes inflows) is always identified as such.

In cases where all items in the accounts can be measured or estimated without resorting to back-calculations, the account will not balance exactly because of inevitable measurement inaccuracies. In such cases, a separate balancing item is shown as an unaccounted-for outflow or loss. If that figure is negative, it is an unaccounted-for inflow.

8.1.5 Efficiency calculations

System efficiency calculations are based on the formula Efficiency = 100 x (delivered to customers + passed to other systems) / total outflows.

‘Total outflows’ includes all the end uses of water received by the distribution system (the inflows). It includes deliveries to customers and water passed to other systems (these two together constitute useful deliveries), plus losses.

The reports classify outfalls at the end of channels as water passed to other systems if they are regulated to a river, wetland or downstream distribution system. Outfalls due to rain rejections or inaccuracies in system regulation are classified as a distribution system loss, even though they may turn up in the downstream system as an unregulated inflow.

Some cases do not fit the above classifications and call for a common sense approach. For example, at Loddon Weir in periods of regulated flows, inflows are received from the Loddon into the Waranga Western Channel (WWC) and regulated westward along the channel, leaving a minimum flow to be passed downstream. In wet periods, almost all the Loddon inflow simply passes downstream because there is no capacity to re-regulate it. In both cases, it is common sense to record all Loddon inflows as inflow to the WWC and all water passed to the Loddon as passed to other systems, to achieve a reasonable indication of distribution system efficiency.

In systems where there is a large balancing item (which implies poor measurement somewhere), the efficiency calculation may be rather meaningless. In such cases, no calculated figure is shown in the tables and efficiency is simply recorded as ‘n/a’ (not applicable). In other cases, small measurement errors or unmeasured inflows result in a calculated efficiency higher than 100%, which is reported as such.

DELWP recognises that the system efficiency formula above is only one of many used in the water industry.

The efficiency figures that water corporations include in their annual reports and provide to the Essential Services Commission are often for the reticulation component of a distribution system, rather than for off-stream storages and treatment plants, as is essential in the present accounts. As explained above, in some cases it makes sense to show feeder and reticulation components separately. More corporations may choose to do this in future.

8.1.6 Interpreting and using distribution system accounts

The accounts in this chapter are summarised: the full account for a system has usually been condensed to a single line in a table. Nonetheless, the accounts are useful in drawing attention to possible management issues. For example, an unusually low distribution efficiency could occur for various reasons, such as:

- poor or difficult measurement
- the system configuration giving rise to intrinsically low efficiency (an example is the Millewa Rural system, which includes Lake Cullulleraine with its high evaporation – management options to improve the situation are limited, although they exist)
- inadequately maintained infrastructure, or infrastructure that cannot be improved economically
- relatively high treatment system losses in small urban systems
- unmeasured deliveries for purposes such as fire-fighting and transport by tanker as a drought-relief measure.

Conversely, an unusually high efficiency can be the result of poor measurement, unmeasured inflows or other unknown factors.

The accounts can only indicate a possible issue: managers would need to investigate and analyse an issue before determining a response. Any management response would, of course, need to be cost-effective.

Any low efficiencies in systems with treated or desalinated water are particularly noteworthy because of the energy cost of, and the value added by, the treatment.

As far as possible, the accounts have been prepared on a consistent basis, while recognising the substantial differences between systems. They should become more useful after a number of years as trends become apparent.

8.2 Northern region

8.2.1 North East Water

North East Water provides water and sewerage services to 37 towns, villages and cities in north-east Victoria. It is one of 12 similar corporations throughout regional Victoria. It operates largely as a retailer that on-sells water from the wholesaler, Goulburn–Murray Water, which manages water storage, delivery and drainage systems.

North East Water serves approximately 115,000 people in an area of about 20,000 km^2. The region extends from Corryong in the east, along the Murray River to Yarrawonga, then south to Benalla and the alpine towns of Bright, Mount Beauty and Dartmouth. Table 8-1 summarises North East Water's urban distribution systems.

Table 8-1 North East Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location
Alpine	Bright system – Bright, Wandiligong and Porepunkah	Unregulated Ovens River	Bright
	Harrietville	Simmons Creek and unregulated Ovens River	Harrietville
	Mount Beauty system – Tawonga, Tawonga South and Mount Beauty	West Kiewa River	Tawonga South
	Myrtleford	Buffalo Creek	Myrtleford
Broken River	Benalla	Ryan and Whiskey creeks	Benalla
Central	Goorambat	Groundwater	Goorambat
King and Ovens rivers	Glenrowan	Fifteen Mile Creek	Glenrowan
	Moyhu	Regulated King River	Moyhu
	Oxley	Regulated King River	Oxley
	Wangaratta and Glenrowan	Regulated Ovens River, groundwater	Wangaratta
	Whitfield	Musk Gully Creek	Whitfield
Mitta Mitta River	Dartmouth	Mt Tabor Creek	Dartmouth
	Eskdale	Regulated Mitta Mitta River	Eskdale
Murray River	Bellbridge	Lake Hume	Bellbridge
	Tallangatta	Lake Hume	Tallangatta
	Wahgunyah system – Wahgunyah and Rutherglen	Regulated Murray River	Wahgunyah
	Wodonga system – Wodonga, Baranduda, Kiewa, Springhurst, Tangambalanga, Bonegilla, Ebden, Barnawartha and Chiltern	Regulated Murray River	Wodonga
	Yarrawonga system – Yarrawonga, Tungamah, St James and Devenish	Regulated Murray River	Yarrawonga
Sub-alpine	Beechworth	Nine Mile Creek Frenchmans Creek Lake Kerferd catchment	Beechworth
	Yackandandah	Nine Mile Creek	Yackandandah
Upper Murray	Corryong system – Corryong and Cudgewa	Nariel Creek	Corryong
	Walwa	Unregulated Murray River	Walwa

Table 8-2 shows North East Water's urban distribution systems' water balances.

Table 8-2 North East Water urban distribution systems' water balances

Area/system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)					End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses				
			To urban residential	To urban non-residential	From treatment plants	From distribution systems (1)	Total outflows		
Alpine area									
Bright system	3	612	288	160	57	107	613	3	73%
Harrietville	.3	46.7	26.3	13.3	2.1	4.9	46.6	.4	85%
Mount Beauty System	4	413	186	111	10	107	413	4	72%
Myrtleford(2)	366	669	291	218	19	139	666	369	76%
Broken River									
Benalla	19	1,336	916	305	85	31	1,337	18	91%
Kings and Ovens Rivers									
Moyhu	.1	31.8	21.3	4.1	4.3	2.2	31.8	.1	80%
Oxley	.2	60.7	28.6	1.6	7.8	22.8	60.7	.2	50%
Wangaratta group	21	3,631	1,691	1,067	216	659	3,633	19	76%
Whitfield	.5	15.4	10.9	4.7	0.0	(.1)	15.5	.4	101%
Mitta Mitta River									
Dartmouth	.2	26.8	8.3	7.7	2.2	8.5	26.7	.3	60%
Eskdale	.1	14.9	8.3	3.7	1.3	1.6	14.8	.1	80%
Murray River									
Bellbridge	1	50	38	2	2	8	50	1	79%
Rutherglen/Wahgunyah system	6	674	369	160	58	88	674	6	78%
Tallangatta	2	177	82	49	15	32	178	2	74%
Wodonga system	75	6,100	3,547	1,949	180	419	6,095	81	90%
Yarrawonga system	12	1,338	915	193	120	110	1,340	11	83%
Sub-alpine area									
Beechworth(2)	817	729	294	133	21	335	784	761	55%
Yackandandah	25	172	78	39	7	48	172	25	68%
Upper Murray River									
Corryong system	79	233	132	57	6	50	245	67	77%
Walwa	.7	20.2	8.6	6.6	2.2	3.0	20.4	.4	75%
Supplied from Groundwater									
Goorambat	.1	10.7	9.3	1.0	0.0	(.4)	9.9	.9	104%

Notes:
(1) Where an account does not balance exactly, any unaccounted-for flows have been added to distribution system losses.
(2) For the Myrtleford and Beechworth systems, the distribution system efficiency includes allowance for evaporation.

8.2.2 Goulburn Valley Water

Goulburn Valley Water provides urban water and wastewater services to more than 129,000 people. It services around 57,500 properties in 54 towns, from the outskirts of Melbourne in the south to the Murray River in the north. Bulk water supply is principally from the Goulburn/Broken, Murray, Steavenson, Rubicon and Delatite River systems, and from some smaller local streams such as Sunday Creek and Seven Creeks. Table 8-3 summarises Goulburn Valley Water's urban distribution systems.

Distribution systems: Northern region

Table 8-3 Goulburn Valley Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location/ Comment
Broken Creek	Nathalia	Broken Creek	Nathalia
	Numurkah system – Numurkah and Wunghnu	Broken Creek and the Murray 6/6 Channel	Numurkah
Goulburn channels	Towns supplied from Shepparton Irrigation Area – Dookie and Katandra West	Shepparton Irrigation Area	At each town
	Towns supplied from Central Goulburn Irrigation Area – Tatura, Kyabram, Tongala, Girgarre, Stanhope, Merrigum and Rushworth	Central Goulburn Irrigation Area	At each town except Merrigum which is supplied from Kyabram
	Colbinabbin	Rochester Irrigation Area	Colbinabbin
	Corop	Rochester Irrigation Area	Disinfection only
Goulburn River	Alexandra	Regulated Goulburn River	Alexandra
	Murchison	Regulated Goulburn River	Murchison
	Nagambie	Regulated Goulburn River	Nagambie
	Seymour system – Seymour, Avenel, Mangalore and Tallarook	Regulated Goulburn River	Seymour
	Shepparton system – Shepparton, Mooroopna, Congupna, Toolamba and Tallygaroopna	Regulated Goulburn River	Shepparton
	Kirwans Bridge	Regulated Goulburn River	Disinfection only
	Molesworth	Regulated Goulburn River	Disinfection only
	Baxters Road	Regulated Goulburn River	Disinfection only
	Woods Point	Unregulated Goulburn River	Disinfection only
Goulburn River tributaries	Euroa system – Euroa and Violet Town	Mountain Hut Creek and Seven Creeks	Euroa
	Strathbogie	Seven Creeks	Disinfection only
	Longwood	Nine Mile Creek	Longwood
	Mansfield	Delatite River	Mansfield
	Upper Delatite system – Sawmill Settlement and Merrijig	Delatite River	Sawmill Settlement
	Marysville system – Marysville and Buxton	Steavenson River	Marysville
	Yea	Yea River	Yea
	Pyalong	Mollisons Creek	Pyalong
	Broadford system – Broadford and Waterford Park (Clonbinane)	Sunday Creek Reservoir on Sunday Creek and Regulated Goulburn River at Tallarook	Broadford
	Kilmore system – Kilmore, Wandong and Heathcote Junction	Sunday Creek Reservoir on Sunday Creek, Hazels Creek	Kilmore
Lake Eildon	Bonnie Doon	Brankeet Creek/Lake Eildon	Bonnie Doon
Murray channels	Katamatite and Picola	Murray Valley Irrigation Area	At each town
Murray River	Cobram system – Cobram, Strathmerton and Yarroweyah	Murray River	Cobram
	Barmah	Murray River	Barmah
Supplied from groundwater	Katunga		Disinfection only

Table 8-4 shows Goulburn Valley Water's urban distribution systems' water balances.

Table 8-4 Goulburn Valley Water urban distribution systems' water balances

Area/system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)						End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses		Passed to other systems[2]	Total outflows		
			To urban residential	To urban non-residential	From treatment plants [1]	From distribution systems				
Broken Creek										
Nathalia	0	414	211	74	15	50	64	414	0	84%
Numurkah system	0	1,038	607	340	19	59	13	1,038	0	92%
Goulburn channels										
Towns supplied from Central Goulburn IA[1]	638	5,000	1,778	2,646	(302)	797	81	5,000	638	90%
Towns supplied from Rochester IA	0	35	20	7	3	3	2	35	0	83%
Towns supplied from Shepparton IA	0	158	90	38	12	10	8	158	0	86%
Goulburn River										
Alexandra	0	561	226	87	4	56	188	561	0	89%
Murchison	0	181	99	31	14	17	20	181	0	83%
Nagambie system	0	624	204	377	4	34	5	624	0	94%
Seymour system	0	1,629	861	340	93	149	186	1,629	0	85%
Shepparton system	0	11,570	6,008	3,564	10	1,208	780	11,570	0	89%
Woods Point	0	8	5	1	1	1	0	8	0	75%
Goulburn River tributaries										
Broadford system	93	596	375	103	20	101	0	599	90	80%
Euroa system	0	693	496	130	66	1	0	693	0	90%
Kilmore system	54	929	638	107	40	85	44	914	69	86%
Longwood	20	68	40	10	5	12	6	73	15	77%
Mansfield	298	1,034	360	114	43	238	20	775	557	64%
Marysville & Buxton[1]	85	202	63	24	(17)	116	7	193	94	49%
Pyalong[1]	32	35	26	1	(13)	13	0	27	40	100%
Thornton	0	43	25	12	0	6	0	43	0	86%
Upper Delatite system	0	64	25	8	5	8	18	64	0	80%
Yea system	0	252	139	49	1	59	4	252	0	76%
Lake Eildon										
Eildon and Bonnie Doon	42	219	109	44	15	42	8	218	43	74%
Murray channels										
Katamatite and Picola	16	66	35	11	2	5	13	66	16	89%
Murray River										
Barmah	0	55	27	10	8	6	4	55	0	75%
Cobram system	0	2,979	666	1,829	70	(9)	423	2,979	0	98%
Supplied from groundwater										
Katunga	0	44	31	7	0	3	3	44	0	93%

Notes:

(1) Treatment plant losses are used as the balancing item, where the treatment plant loss reported is negative, metering issues have been identified that explain the apparent unaccounted-for inflow.

(2) Passed to other systems includes (based on Goulburn Valley Water's 2012 water plan demand strategy forecast) estimated water treatment supernatant/backwash water returned to wastewater management facilities, rivers and channel systems.

8.2.3 Goulburn–Murray Water

Goulburn–Murray Water manages water-related services in a region of 68,000 km^2 bordered by the Great Dividing Range in the south and the Murray River in the north, and stretching from Corryong in the east downriver to Nyah. It supplies irrigators and other rural water users and provides bulk water supply to many towns within irrigation areas and along regulated rivers.

It operates two common distribution systems:

- the Waranga Western Channel (WWC)
- the Victorian Mid-Murray Storages and associated bulk carriers.

It also operates nine irrigation and six other rural distribution systems, as shown in Table 8-8.

8.2.3.1 Waranga Western Channel

The WWC sources most of its water from the Goulburn River at Goulburn Weir, and is supplemented by extractions from the Campaspe and Loddon rivers. The major supply channels of Stuart Murray Canal and Cattenach Canal are included in the WWC. It supplies water to three irrigation areas, three domestic and stock areas and through the Goldfields Superpipe to Bendigo and Ballarat. The Waranga Basin, a substantial off-stream storage, is also included in the WWC. It has been divided into three segments because it crosses three river basins: the division facilitates cap reporting to the Murray–Darling Basin Authority.

The water balance, divided into its three segments, is shown in Table 8-5.

Table 8-5 Waranga Western Channel water balance

Waranga Western Channel	Goulburn segment (ML)	Campaspe segment (ML)	Loddon segment (ML)	Eliminations (ML)	Total (ML)
Volumes in store					
Start volume in store (1 July 2013)					
Waranga Basin	165,139	-	-	-	165,139
Greens Lake	-	10,436	-	-	10,436
End volume in store (30 June 2014)					
Waranga Basin	258,807	-	-	-	258,807
Greens Lake	-	20,370	-	-	20,370
Change in storage	**93,668**	**9,934**			**103,602**
Inflows					
From Goulburn River	918,593	-	-	-	918,593
Natural inflows to channel	2,475	-	-	-	2,475
Rainfall on Waranga Basin	24,444	-	-	-	24,444
From WWC Goulburn segment	-	411,152	-	(411,152)	0
From Wanalta Creek	-	605	-	-	605
From Campaspe pumps	-	112	-	-	112
Rainfall on Greens Lake	-	2,327	-	-	2,327
From WWC Campaspe segment	-	-	195,186	(195,186)	0
From Loddon River	-	-	34,857	-	34,857
Total inflows	**945,512**	**414,196**	**230,043**	**(606,338)**	**983,413**
Outflows					
Passed to other systems					
To Central Goulburn Irrigation area	395,420	-	-	-	395,420
To Goldfields Superpipe	207	-	-	-	207
To WWC Campaspe segment	411,152	-	-	(411,152)	0
To Rochester Irrigation Area	-	216,683	-	-	216,683
To WWC Loddon segment	-	195,186	-	(195,186)	0
To Pyramid-Boort Irrigation Area	-	-	202,300	-	202,300
To Loddon River	-	-	27,743	-	27,743
Total passed to other systems	***806,779***	***411,869***	***230,043***	***(606,338)***	***842,353***
Losses					0

Evaporation from Waranga Basin	50,580	-	-	-	50,580
Evaporation from Greens Lake	-	4,750	-	-	4,750
Total losses	***50,580***	***4,750***	-		55,330
Total outflows	**857,359**	**416,619**	**230,043**	**(606,338)**	**897,683**

8.2.3.2 Victorian Mid-Murray Storages

The Victorian Mid-Murray Storages (VMMS) concept was introduced as a means of capturing a portion of the increased unregulated Victorian tributary flows into the Murray River resulting from the decommissioning of Lake Mokoan in the Broken River basin. These unregulated flows occur mainly from May to November.

The VMMS consists of Kow Swamp, Lake Boga, Lake Charm and Kangaroo Lake: these have a combined capacity of nearly 58,000 ML. They are connected by a number of bulk carriers, for which losses are apportioned.

On average, 22,100 ML a year will be harvested into Lake Boga, Lake Charm and Kangaroo Lake, and released. The capture of water will offset the reduction of the Snowy Required Annual Release to the Upper Murray by retaining some unregulated flows within Victoria, which will be available to supplement Victoria's Murray resource.

Table 8-6 shows the water balance for the VMMS.

Table 8-6 Victorian Mid-Murray Storages water balance

Victorian Mid-Murray Storages (VMMS)	Volume (ML)
Volumes in store	
Start volume in store (1 July 2013)	
Total Kow Swamp, Lake Charm, Kangaroo Lake, Lake Boga	104,156
End volume in store (30 June 2014)	
Total Kow Swamp, Lake Charm, Kangaroo Lake, Lake Boga	122,141
Change in storage	**17,985**
Inflows	
Rain on all storages	8,634
Murray to Lake Boga	0
Torrumbarry Irrigation Area to Lake Boga	21,346
Torrumbarry Irrigation Area to Lake Charm	5,387
Torrumbarry Irrigation Area to VMMS	17,295
Unattributed inflow	101,319
Total inflows	**153,981**
Outflows	
Passed to other systems	
Lake Charm to Murray River	1,768
Lake Boga to Murray River	4,010
6/7 channel to Murray River	5,041
Kerang Weir to Murray River	77,755
Total passed to other systems	***88,574***
Losses	
Evaporation on storages	35,980
Distribution losses(1)	11,442
Total losses	***47,422***
Total outflows	**135,996**

Notes:
(1) Fixed allowance for distribution system losses.

8.2.3.3 Other distribution systems

Goulburn–Murray Water's other distribution systems are rural, and are summarised in Table 8-7.

Distribution systems: Northern region

Table 8-7 Goulburn–Murray Water rural distribution systems

System	Customers supplied	Source of supply
Irrigation distribution systems		
Central Goulburn Irrigation Area	Primarily irrigation and domestic and stock (D&S) to irrigators. Also provides bulk supply to seven towns in its area	WWC system – from Stuart Murray Canal, Waranga Basin and WWC
Loddon Valley Irrigation Area	Primarily irrigation and D&S to irrigators. Also provides bulk supply to four towns in its area and small volumes to the Torrumbarry Irrigation Area	WWC, Loddon River supplement and Torrumbarry Irrigation Area
Murray Valley Irrigation Area	Primarily irrigation and D&S to irrigators. Also provides bulk supply to two towns in its area	Murray River via Yarrawonga Main Channel and pumps. Shepparton Irrigation Area via Lower Broken Creek
Nyah Irrigation District	Irrigation and D&S to irrigators	Pumped from Murray River
Rochester Irrigation Area	Primarily irrigation and D&S to irrigators. Also provides bulk supply to four towns in its area	WWC
Shepparton Irrigation Area	Primarily irrigation and D&S. Also provides bulk supply to two towns in its area and to the Murray Valley system via the lower Broken Creek	Goulburn River at Goulburn Weir
Torrumbarry Irrigation Area and Gunbower Creek (excluding Woorinen, Tresco and VMMS)	Primarily irrigation and D&S to irrigators. Also provides bulk supply to VMMS, Tresco Irrigation Area, two towns in its area and significant supplies to environmental sites	National Channel and other minor sources from the Murray River. Unregulated Loddon flows. Small volumes from Pyramid–Boort Irrigation Area
Tresco Irrigation Area	Irrigation and D&S to irrigators	Torrumbarry Irrigation Area
Woorinen Irrigation Area	Irrigation and D&S to irrigators	Pumped from Murray
Other rural distribution systems		
East Loddon D&S	Rural D&S	WWC
Lower Broken Creek	Primarily irrigation and D&S to irrigators. Also provides bulk supply to two towns in its area	Shepparton Irrigation Area. Minor unregulated inflows from upper Broken Creek
Normanville D&S	Rural D&S. Also provides bulk supply to Quambatook urban	WWC
Tungamah D&S	Rural D&S	Shepparton Irrigation Area
Upper Broken Creek	Irrigation diversions	Broken River at Caseys Weir
West Loddon D&S	Rural D&S	WWC

Table 8-8 shows Goulburn–Murray Water's rural distribution systems' water balances.

Table 8-8 Goulburn–Murray Water rural distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)						End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses	Passed to other systems	Total outflows			
			To rural customers	To other						
Irrigation districts										
Central Goulburn Irrigation area	-	395,420	314,075		76,721	4,624	395,420		-	81%
Murray Valley Irrigation area	-	303,784	206,675		41,466	55,643	303,784		-	86%
Nyah Irrigation area	-	5,586	5,025		561		5,586		-	90%
Pyramid-Boort Irrigation area	-	202,300	163,817	1,849	35,014	1,620	202,300		-	83%
Rochester Irrigation area	-	206,749	163,070		41,418	2,262	206,749		-	80%
Shepparton Irrigation area	-	196,356	127,135		25,578	43,643	196,356		-	87%
Torrumbarry Irrigation area	12,547	706,969	302,572	15,621	174,661	215,338	708,192		11,324	75%
Tresco Irrigation area	-	5,699	5,688		11		5,699		-	100%

Woorinen Irrigation area	-	13,350	10,034		3,316		13,350	-	75%
Other rural distribution systems									
East Loddon D&S	-	638	498		140		638	-	78%
Lower Broken Creek	-	122,397	15,752			106,645	122,397	-	n/a
Normanville D&S	69	326	165		88	81	334	61	74%
Tungamah D&S	-	323	272		51		323	-	84%
Upper Broken Creek	-	3,761	739		1,773	1,249	3,761	-	n/a
West Loddon D&S	-	231	231				231	-	100%

n/a: not applicable

The Shepparton Irrigation Area had early take-up of modernisation; that is, lined channels, some closure of spur channels, remotely operated weirs and gates, and accurate metering. This is reflected in the system's 87% efficiency.

On the other hand, the Torrumbarry system efficiency is 75%.This lower efficiency can be explained by it being only in the early stages of modernisation, as well as by the use of natural carriers like Gunbower Creek as part of the system.

8.2.4 Coliban Water

Coliban Water has its head office in Bendigo. It provides water and wastewater services to around 140,000 people in 49 towns across central and northern Victoria. The largest towns it services are Bendigo, Castlemaine, Echuca and Kyneton. Coliban Water also supplies around 1,500 rural licence holders from 500 km of open channels in the Coliban rural water supply system extending from Malmsbury to Bendigo, and to Raywood and surrounding areas.

Coliban Water's service area is within parts of the Campaspe, Loddon, Murray, Goulburn and Avoca basins. It operates two common distribution systems:

- the Goldfields Superpipe, incorporating the Eppalock Pipeline which it jointly operates with Central Highlands Water, and
- the Coliban Main Channel.

Coliban Water operates nine urban water supply systems, including the two separate groundwater systems of Elmore and Trentham, and 11 rural subsystems.

8.2.4.1 Goldfields Superpipe

This pipeline transfers water from the WWC (Goulburn system) and from Lake Eppalock (Campaspe system) for use in the Coliban Water supply system and to supply water to Central Highlands Water's Ballarat system. Table 8-9 shows the superpipe's water balance.

Table 8-9 Goldfields Superpipe water balance

Goldfields Superpipe	Volume (ML)
Volumes in store	
Start volume in store (1 July 2013)	-
End volume in store (30 June 2014)	-
Change in storage	**-**
Inflows	
From Lake Eppalock – Coliban Water	941
From Lake Eppalock – Central Highlands Water	0
From Waranga Western Channel at Colbinabbin – Coliban Water	0
From Waranga Western Channel at Colbinabbin – Central Highlands Water	200
From Sandhurst Reservoir(1)	3,175
Total inflows	**4,316**
Outflows	
Deliveries to customers	
Direct deliveries to rural customers	315
Total deliveries to customers	***315***
Passed to other systems	
To Emu Valley rural channel subsystem	150
To Axe Creek rural channel subsystem	369
To Specimen Hill rural channel subsystem	49

Transfer to Central Highlands Water (to White Swan Reservoir)	200
To Heathcote urban system (Caledonia Reservoir)	441
To Spring Gully Reservoir	2,792
Total passed to other systems	***4,001***
Total outflows	**4,316**
System efficiency	100%

Note:

(1) Flow from Sandhurst Reservoir – Coliban Water is the balancing item in this water balance.

8.2.4.2 Coliban Main Channel

This channel conveys water from the Coliban storages (Upper Coliban, Lauriston and Malmsbury reservoirs) to supply rural subsystems and the Coliban North and Coliban South urban water supply systems. Table 8-10 shows the water balance for the Coliban Main Channel.

Table 8-10 Coliban Main Channel water balance

Coliban Main Channel	Volume (ML)
Volumes in store	
Start volume in store (1 July 2013)	-
End volume in store (30 June 2014)	-
Change in storage	**-**
Inflows	
From Malmsbury reservoir	23,042
Total inflows	**23,042**
Outflows	
Deliveries to customers	
Direct deliveries to rural customers	386
Total deliveries to customers	***386***
Passed to other systems	
To Coliban North system at Sandhurst Reservoir	14,482
To Poverty Gully rural subsystem	2,501
To Harcourt rural subsystem	2,541
To Emu Valley rural subsystem	909
To Spring Gully rural subsystem	305
To Specimen Hill rural subsystem	1,791
Total passed to other systems	***22,529***
Losses	
System losses(1)	127
Total losses	***127***
Total outflows	**23,042**
System efficiency (%)	99%

Note:

(1) System losses are unknown and are represented as the balancing item for this account.

8.2.4.3 Rural distribution systems

Coliban Water's rural distribution system supplies rural licence customers (including stock, domestic and irrigation customers) with entitlements of around 15,800 ML in rural areas extending from Castlemaine to Bendigo, and further north to Raywood. Table 8-11 shows Coliban Water's rural distribution systems' water balances.

Table 8-11 Coliban Water rural distribution systems' water balances

Area/system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)				End volume in store (ML)	Distribution system efficiency (%)
			Deliveries to rural customers	Losses[1]	Passed to other systems	Total outflows		
Ascot	0	1,046	817	229	0	1,046	0	78%
Axe Creek[2]	0	369	165	204	0	369	0	45%
Cockatoo Hill	0	520	303	217	0	520	0	58%
Emu Valley	0	1,059	603	456	0	1,059	0	57%
Harcourt	1,410	2,691	1,058	1,883	0	2,941	1,160	36%
Jackass Flat	0	43	8	35	0	43	0	19%
Lockwood	0	1,086	539	547	0	1,086	0	50%
Poverty Gully[3]	0	2,501	13	406	2,082	2,501	0	84%
Specimen Hill[4]	0	1,840.0	265.0	446.0	1,129.0	1,840.0	0	76%
Spring Gully Reservoir[5]	539	2,244		515	1,566	2,081	702	75%
Spring Gully[6]	0	305	110	87	108	305	0	71%

Notes:
(1) Losses are the balancing item in all cases.
(2) Deliveries include 22 ML delivered to Longlea Reservoir
(3) Passed to other systems represents a transfer to the urban Castlemaine system
(4) Specimen Hill supplied water to Jackass Flat and Lockwood
(5) Spring Gully Reservoir supplied water to Ascot and Cockatoo Hill
(6) Spring Gully rural subsystem supplied water to Spring Gully Reservoir

In some rural distribution systems, customers are relinquishing their licences due to urban encroachment. This is particularly true for Jackass Flat and Axe Creek, and has led to low efficiencies in these channels in 2013–14.

8.2.4.4 Urban distribution systems

Table 8-12 summarises Coliban Water's nine urban distribution systems.

Table 8-12 Coliban Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location/ Comment
Campaspe	Goornong	Campaspe River	Goornong
Coliban Northern	Bendigo, Axedale, Raywood and Sebastian	Coliban storages (via Main Channel), Lake Eppalock and the Goulburn system (Lake Eildon and Waranga Basin via Goldfields Superpipe)	Bendigo and Raywood
	Heathcote and Tooborac	Lake Eppalock and the Goulburn system (via Goldfields Superpipe)	Heathcote
Coliban Southern	Castlemaine system – Castlemaine, Maldon, Campbells Creek, Chewton, Newstead, Elphinstone, Taradale and Harcourt	Coliban storages (via Coliban Main Channel)	Castlemaine
	Kyneton system – Kyneton, Malmsbury and Tylden	Lauriston Reservoir	Kyneton
Elmore Groundwater	Elmore	Lower Campaspe Valley WSPA	Elmore
Goulburn	Towns supplied from Pyramid–Boort Irrigation Area – Boort, Dingee, Macorna, Mitiamo, Mysia and Pyramid Hill	Goulburn system (Lake Eildon and Waranga Basin)	Boort and Pyramid Hill No treatment at Dingee, Macorna, Mitiamo and Mysia
	Towns supplied from Rochester Irrigation Area – Lockington and Rochester	Goulburn system (Lake Eildon and Waranga Basin)	Lockington and Rochester

Distribution systems: Northern region

Loddon	Bridgewater system – Bridgewater and Inglewood	Loddon River	Bridgewater
	Jarklin	Loddon River – Serpentine Creek and tankered	No treatment (not a drinking water supply)
	Laanecoorie system – Laanecoorie, Tarnagulla, Bealiba and Dunolly	Loddon River	Laanecoorie
	Serpentine	Loddon River – Serpentine Creek and tankered	Serpentine
Murray	Cohuna and Cohuna-Mead-Gunbower rural system	Murray River – Gunbower Creek	Cohuna
	Echuca	Murray River	Echuca
	Gunbower	Murray River – Taylors Creek	Gunbower
	Leitchville	Murray River – Gunbower Creek and Cohuna irrigation channel	Leitchville
Trentham Groundwater	Trentham	Spring water and groundwater from Campaspe basin	Trentham
Wimmera	Borung	Wimmera–Mallee Pipeline	No treatment (not a drinking water supply)
	Korong Vale system – Korong Vale and Wedderburn	Wimmera–Mallee Pipeline	Korong Vale
	Wychitella	Wimmera–Mallee Pipeline	No treatment (not a drinking water supply)

Table 8-13 shows Coliban Water's urban distribution systems' water balances.

Table 8-13 Coliban Water urban distribution systems' water balances

Area/system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)					End volume in store (ML)	Distribution system efficiency (%)
			Deliveries						
			To urban residential	*To urban non-residential*	Distribution system losses(1)	Passed to other systems	Total outflows		
Campaspe									
Goornong	0	55	27	7	21	0	55	0	62%
Coliban Northern									
Bendigo system	2,072	11,483	7,642	2,762	1,646	0	12,050	1,505	86%
Heathcote system	119	471	146	76	194	0	416	174	53%
Coliban Southern									
Castlemaine system – McKay Reservoir	1,216	2,180	1,048	715	449	0	2,212	1,184	80%
Kyneton system	0	834	433	337	64	0	834	0	92%
Goulburn system									
Supplied from PH-Boort Irrigation Area(2)	0	380	159	67	154	0	380	0	59%
Supplied from Rochester Irrigation Area(3)	0	1,355	406	664	285	0	1,355	0	79%
Loddon system									
Bridgewater system	0	271	80	55	136	0	271	0	50%
Jarklin	0	1.4	.9	.4	.1	0	1.4	0	93%
Laanecoorie system	0	120	75	21	24	0	120	0	80%
Serpentine	0	26	12	4	10	0	26	0	62%
Murray system									
Cohuna	0	780	290	249	241	0	780	0	69%
Echuca	0	3,192	1,605	1,219	368	0	3,192	0	88%
Gunbower	0	68	34	13	21	0	68	0	69%

Leitchville	0	228	43	121	64	0	228	0	72%
Wimmera system									
Borung	0	3	3	0	0	0	3	0	100%
Koorong Vale – Wedderburn	0	165	82	27	56	0	165	0	66%
Wychitella	0	3.0	1.7	.6	1	0	3.0	0	77%
Supplied by groundwater									
Elmore	0	124	69	37	18	0	124	0	85%
Trentham[(4)]	60	444	64	16	69	286	435	69	84%

Note:
(1) Distribution system losses are the balancing item in all cases.
(2) The Pyramid–Boort Irrigation Area supplies the towns of Macorna, Pyramid Hill, Boort, Mysia, Mitiamo and Dingee.
(3) The Rochester Irrigation Area supplies the towns of Lockington and Rochester (part).
(4) Trentham passed to other systems represents water spilled down Trent Creek.

8.2.5 Lower Murray Water

Lower Murray Water is based in Mildura. Its area of operation extends along the Murray River from Kerang to the South Australian border, taking in the municipalities of Mildura, Swan Hill and Gannawarra. It provides the region with urban water and wastewater services, and supplies river-quality water to stock and irrigation customers. It also operates subsurface irrigation drainage water collection systems.

Lower Murray Water operates four irrigation distribution systems, three other rural distribution systems and 10 urban distribution systems.

Table 8-14 summarises Lower Murray Water's rural distribution systems.

Table 8-14 Lower Murray Water rural distribution systems

System	Customers supplied	Source of supply
Irrigation distribution systems		
First Mildura Irrigation District	Primarily irrigators, both inside and adjacent to its district, who are supplied with irrigation and D&S water	Murray River at Mildura pumps
Merbein Irrigation District	Primarily irrigators, both inside and adjacent to its district, who are supplied with irrigation and D&S water. Also passes water to the Wargan-Yelta part of the Cardross-Yelta waterworks district	Murray River at Merbein pumps
Red Cliffs Irrigation District	Primarily irrigators, both inside and adjacent to its district, who are supplied with irrigation and D&S water. Also supplies environmental water to Cardross Basin and passes water to the Cardross part of the Cardross-Yelta waterworks district	Murray River at Red Cliffs pumps
Robinvale Irrigation District	Primarily irrigators, both inside and adjacent to its district, who are supplied with irrigation and D&S water	Murray River at Robinvale pumps
Other rural distribution systems		
Cardross part of the Cardross–Yelta waterworks district	D&S customers	Red Cliffs Irrigation District
Millewa waterworks district	Primarily piped supply to D&S customers. Also supplies three small towns and irrigation water diverted from Lake Cullulleraine	Murray River at Lake Cullulleraine pumps
Wargan–Yelta part of the Cardross–Yelta waterworks district	D&S customers	Merbein Irrigation District

Table 8-15 shows Lower Murray Water's rural distribution systems' water balances.

Distribution systems: Northern region

Table 8-15 Lower Murray Water rural distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)					End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses	Passed to other systems	Total outflows		
			To rural customers	To other					
Irrigation distribution systems									
First Mildura Irrigation District	-	38,945	33,892	0	5,053	0	38,945	-	87%
Merbein Irrigation District	-	20,684	18,160	0	2,524	0	20,684	-	88%
Red Cliffs Irrigation District	-	32,872	28,266	1,012	3,594	0	32,872	-	89%
Robinvale Irrigation District	-	18,149	18,048	0	101	0	18,149	-	99%
Other rural distribution systems									
Millewa water works district(1)	120	14,223	12,096	0	2,076	51	14,223	119	85%
Yelta water works district	-	2	2	0	0	0	2	-	100%

Note:

(1) For the Millewa waterworks district, the distribution system efficiency includes allowance for evaporation losses from Lake Cullulleraine (off-stream storage).

Table 8-16 summarises Lower Murray Water's urban distribution systems.

Table 8-16 Lower Murray Water urban distribution systems

System/towns supplied	Source of supply	Treatment plant location/ Comment
Kerang	Murray River, Loddon River, Torrumbarry Irrigation Area	Kerang
Koondrook	Murray River	Koondrook
Mildura urban system – Mildura (including Cardross, Koorlong and Nicholls Point), Merbein and Irymple	Murray River	Mildura
Millewa urban system – Werrimull, Meringur and Cullulleraine	Millewa waterworks district	Millewa
Murrabit	Murray River	Murrabit
Mystic Park	Victorian Mid-Murray Storage (Lake Kangaroo)	Raw water supply only (no treatment plant)
Piangil	Murray River	Piangil
Red Cliffs	Murray River	Red Cliffs
Robinvale	Murray River	Robinvale
Swan Hill urban system – Swan Hill, Lake Boga, Nyah, Nyah West, Woorinen South and Wakool Shire (NSW)	Murray River	Swan Hill

Table 8-17 shows Lower Murray Water's urban distribution systems' water balances.

Table 8-17 Lower Murray Water urban distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)				End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses[1]	Total outflows		
			To urban residential	To urban others				
Kerang	6	996	698	154	144	996	6	86%
Koondrook	3	204	146	20	38	204	3	82%
Mildura system	48	12,278	8,544	2,332	1,401	12,278	48	89%
Millewa system	-	51	51	0	0	51	-	100%
Murrabit	2	37	17	5	15	37	2	60%
Mystic Park[2]	-	5	5	1	(1)	5	-	120%
Piangil	1	108	42	43	23	108	1	79%
Red Cliffs	7	1,176	604	475	97	1,176	7	92%
Robinvale	5	551	345	153	53	551	5	90%
Swan Hill system	14	3,866	2,580	880	406	3,866	14	89%

Notes:

(1) Distribution system losses are used as the balancing item.

(2) An unaccounted-for inflow (reported as a negative distribution system loss) explains the efficiency of 120%.

8.3 Gippsland region

8.3.1 East Gippsland Water

East Gippsland Water's service area spans 21,000 km^2. It extends east from Lindenow, through to the region's capital Bairnsdale, the holiday centres of Paynesville and Lakes Entrance, and on to the Wilderness Coast and Mallacoota near the New South Wales border. The corporation also serves as far north as Dinner Plain in the High Country of the Victorian Alps. Water services are provided to more than 23,000 customers via nine separate water supply systems.

Table 8-18 summarises East Gippsland Water's urban distribution systems.

Table 8-18 East Gippsland Water urban distribution systems

System/towns supplied	Source of supply	Treatment plant location
Bemm River	Bemm River	Bemm River
Buchan	Buchan River	Buchan
Cann River	Cann River	Cann River
Dinner Plain	Groundwater	Dinner Plain
Mallacoota	Betka River and groundwater	Mallacoota
Mitchell system – Bairnsdale, Paynesville, Lindenow, Lindenow South, Eagle Point, Newlands Arm, Raymond Island, Banksia Peninsula, Granite Rock, Wy Yung, Bruthen, Sarsfield, Nicholson, Johnsonville, Swan Reach, Metung, Lakes Entrance, Lake Bunga, Lake Tyers, Lake Tyers Beach and Nowa Nowa	Mitchell River at Glenaladale	Woodglen
Omeo	Butchers Creek	Omeo
Orbost system – Orbost, Newmerella and Marlo	Rocky and Brodribb rivers	Orbost
Swifts Creek	Tambo River	Swifts Creek

Table 8-19 shows East Gippsland Water's urban distribution systems' water balances.

Table 8-19 East Gippsland Water urban distribution systems' water balances

Area/system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)				End volume in store (ML)	Distribution system efficiency (%)
			Deliveries					
			To urban residential	To urban non-residential	Distribution system losses	Total outflows		
Bemm River	5	18	9	5	4	18	5	79%
Buchan	.2	23	11	9	3	23	.2	88%
Cann River	2	41	19	16	4	39	3	89%
Dinner Plain	1	39	16	9	14	39	1	64%
Mallacoota	55	169	96	47	25	168	56	85%
Mitchell system	1,192	4,908	2,536	1,229	868	4,633	1,467	81%
Omeo	5	60	25	19	14	58	6	75%
Orbost system	50	679	238	341	102	681	47	85%
Swifts Creek	3	39	16	17	6	39	2	84%

8.3.2 Gippsland Water

Gippsland Water services an area of just over 5,000 km^2 in the Latrobe Valley. The area has a population of more than 130,000 and major industries including dairy, energy, and pulp and paper.

Table 8-20 summarises Gippsland Water's urban distribution systems.

Table 8-20 Gippsland Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location/ Comment
Macalister/ Thomson	Maffra system – Boisdale, Maffra and Stratford	Macalister River	Maffra
	Coongulla system – Coongulla and Glenmaggie	Lake Glenmaggie	Coongulla
	Heyfield	Thomson River	Heyfield
	Briagalong	Groundwater	Briagalong
Moe	Moe system – Moe, Newborough, Yallourn North, Trafalgar, Darnum and Yarragon	Narracan Creek and Tanjil River	Moe
Moondarra Reservoir	Moondarra system – Boolarra, Churchill, Cowwarr, Glengarry, Hazelwood North, Jumbuck, Morwell, Rosedale, Toongabbie, Traralgon, Tyers and Yinnar	Moondarra Reservoir	Morwell, Traralgon and Tyers
Sale	Sale and Wurruk	Groundwater	Sale
Warragul/Drouin	Warragul system – Buln Buln, Drouin, Nilma, Warragul and Warragul South	Tarago River	Warragul
Small towns in Latrobe and South Gippsland basins	Willow Grove	Blue Rock Reservoir	Willow Grove
	Neerim South and Noojee	Tarago Reservoir	Neerim South
	Boolarra	Walkleys/O'Gradys Creek	Boolarra (to be decommissioned)
	Erica and Rawson	Trigger Creek	Rawson
	Mirboo North	Little Morwell River	Mirboo North
	Thorpdale	Easterbrook Creek	Thorpdale
	Seaspray	Merrimans Creek	Seaspray

Table 8-21 shows Gippsland Water's urban distribution systems' water balances.

Table 8-21 Gippsland Water urban distribution systems' water balances

Area/system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)					Unattributed inflow / (outflow) (ML) (2)	End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses					
			To urban residential	To urban non-residential (1)	From treatment plants	From distribution systems	Total outflows			
Erica/Rawson	13	96	36	22	1	38	96	21	33	60%
Macalister/Thomson area	37	1,555	784	480	119	142	1,524	(27)	41	83%
Mirboo North	2	185	108	28	0	48	183	(2)	2	74%
Moe system	52	3,627	1,620	1,380	89	528	3,616	(19)	44	83%
Moondara Reservoir system	732	48,740	4,386	43,023	109	1,588	49,106	370	735	97%
Neerim South/Noojee	4	239	134	35	4	25	198	(41)	3	85%
Sale system	16	1,910	1,153	557	103	96	1,909	(1)	15	90%
Seaspray	3	32	20	5	0	4	29	(3)	3	88%
Thorpdale	2	15	8	2	4	.2	15	(.1)	2	69%
Warragul/Drouin system	87	3,286	1,870	729	266	399	3,264	(18)	91	80%
Willow Grove	.1	54	31	1	1	17	50	(4)	.1	64%

Notes:

(1) Urban non-residential use includes major industry users in some systems.

(2) A separate balancing item has been included in these accounts as the unaccounted-for flows have not been able to be attributed to any particular line item in the accounts.

8.3.3 Southern Rural Water (Macalister system)

Southern Rural Water is based in Maffra. It is responsible for rural water supplies across the whole of southern Victoria (except for water supplied by Wannon Water to its rural customers) from the Great Divide to the coast, and from the South Australian to the New South Wales border. Most of Southern Rural Water's customers are direct diverters from streams or groundwater, however it also operates three irrigation districts.

The largest of these is the Macalister Irrigation District, which is supplied principally from Lake Glenmaggie on the Macalister River and also from Cowwarr Weir on the Thomson River. The other two (Werribee and Bacchus Marsh irrigation districts) are reported in the Central region section.

Table 8-22 shows the water balance for the Macalister Irrigation District.

Table 8-22 Southern Rural Water Macalister Irrigation District water balance

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)				End volume in store (ML)	Distribution system efficiency (%)
			Irrigation deliveries(1)	Passed to other systems(2)	Losses	Total outflows		
Macalister Irrigation District	-	189,068	149,631	26,556	12,881	189,068	-	93%

Notes:

(1) Deliveries to irrigation include supply to domestic and stock customers.

(2) Passed to other systems includes water returned to the Thomson/Macalister Rivers (outfalls) as well as deliveries to Gippsland Water urbans.

8.3.4 South Gippsland Water

South Gippsland Water supplies 21 rural centres in South Gippsland, from Wonthaggi in the west to Yarram and Alberton in the east. It operates 10 separate urban distribution systems and covers a total area of around 4,000 km^2.

Table 8-23 summarises South Gippsland Water's urban distribution systems.

Table 8-23 South Gippsland Water urban distribution systems

System/towns supplied	Source of supply	Treatment plant location
Dumbalk	Tarwin River – east branch	Dumbalk
Fish Creek	Battery Creek	Fish Creek
Foster	Deep Creek/Foster Dam	Foster
Korrumburra	Coalition Creek storage network	Korrumburra
Leongatha and Koonwarra	Ruby Creek storage network	Leongatha
Loch system – Loch, Nyora and Poowong	Little Bass River	Poowong
Meeniyan	Tarwin River – west branch	Meeniyan
Toora system – Toora, Port Franklin, Welshpool and Port Welshpool	Agnes River	Toora
Wonthaggi system – Wonthaggi, Inverloch and Cape Patterson	Lance Creek and Lance Creek Reservoir	Lance Creek
Yarram system – Devon North, Alberton, Yarram and Port Albert	Tarra River	Devon North

Table 8-24 shows South Gippsland Water's urban distribution systems' water balances.

Table 8-24 South Gippsland Water urban distribution systems' water balances

Area/system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)					End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses		Total outflows		
			To urban residential	To urban non-residential	Reticulation losses	Other system losses(1)			
Dumbalk	-	20	10	6	4	0	20	-	80%
Fish Creek	-	115	12	47	56	0	115	-	51%
Foster	-	168	75	61	24	8	168	-	81%
Korrumburra	-	685	227	369	85	4	685	-	87%
Leongatha	-	1,626	358	1,102	163	3	1,626	-	90%
Loch system	-	254	68	127	58	1	254	-	77%
Meeniyan	-	59	31	11	16	1	59	-	71%
Toora system	-	537	77	237	221	2	537	-	58%
Wonthaggi system	-	1,750	910	563	263	14	1,750	-	84%
Yarram system	-	425	147	191	84	3	425	-	80%

Notes:

(1) Other system losses are the balancing item in these accounts.

8.4 Central region

8.4.1 Westernport Water

Westernport Water supplies the towns and adjacent properties on Phillip Island, as well as the eastern shore of Westernport Bay from The Gurdies to Dalyston. Water is sourced from:

- Candowie Reservoir, a storage on Tennant Creek in the South Gippsland basin
- direct diversion from the Bass River
- the Corinella aquifer, via three groundwater bores.

Water is treated at Candowie Reservoir and passed to the San Remo storage basin, from which it is delivered via a single integrated distribution system. A permanent population of about 16,000 is supplied, with the population swelling to about 60,000 in peak holiday periods.

Table 8-25 summarises Westernport Water's distribution system's water balance.

Table 8-25 Westernport Water distribution system's water balance

Westernport Water	Volume (ML)
Volumes in store	
Start volume in store (1 July 2013)	-
End volume in store (30 June 2014)	-
Change in storage	-
Inflows	
From Candowie Reservoir	1,199
From Bass River	579
Recycled water	59
Unaccounted-for inflows (balancing item)	66
Total inflows	**1,903**
Outflows	
Deliveries	
To residential customers	1,117
To non-residential customers	579
Owners corporations	56
Westernport Water operations	50
Total deliveries	***1,802***
Losses	
System losses	101
Total losses	***101***
Total outflows	**1,903**
System efficiency	**95%**

8.4.2 Melbourne Water

Melbourne Water operates a 'common' or wholesale distribution system for the greater Melbourne metropolitan area as well as for connected regional water authorities. It spans four river basins (Bunyip, Yarra, Maribyrnong and Werribee). Water is harvested from the Bunyip, Yarra, Thomson and Goulburn basins. The distribution system draws from several on-stream storages and includes four significant off-stream storages (Silvan, Cardinia, Sugarloaf and Greenvale reservoirs).

Melbourne Water supplies the three Melbourne retail water corporations (South East Water, Yarra Valley Water and City West Water). It also supplies Western Water and Gippsland Water and will in future supplement supplies to Barwon Water, South Gippsland Water and Westernport Water.

Most of the inflow comes from protected catchments in the Yarra, Bunyip and Thomson basins, and minimal treatment (chlorination) is required. However, about 20% comes from unprotected catchments and is fully treated by treatment plants at the Sugarloaf, Tarago and Yan Yean storages.

Table 8-26 summarises Melbourne Water's distribution system's water balance.

Table 8-26 Melbourne Water distribution system's water balance

Melbourne Water	Volume (ML)
Volumes in store[1]	
Start volume in store (1 July 2013)	
Silvan Reservoir	33,146
Cardinia Reservoir	208,916
Sugarloaf Reservoir	68,584
Greenvale Reservoir	20,112
Total start volume	***330,758***
End volume in store (30 June 2014)	
Silvan Reservoir	35,652
Cardinia Reservoir	184,284
Sugarloaf Reservoir	83,817
Greenvale Reservoir	17,472
Total end volume	***321,225***
Change in storage	**(9,533)**
Inflows	
From Yarra basin to Silvan	292,060
From Yarra basin to Sugarloaf	88,233
From Goulburn River to Sugarloaf	0
From Tarago Reservoir	4,773
Rainfall on four main storages	17,302
Unaccounted-for inflow[2] (balancing item)	9,194
Total inflows	**411,562**
Outflows	
Passed to other systems	
To South East Water	142,987
To Yarra Valley Water	149,100
To City West Water	103,397
To Western Water	3,442
To Gippsland Water	420
To Cardinia Creek from Cardinia	1,825
To Stonyford Creek from Silvan	730
Total passed to other systems	***401,901***
Losses	
Evaporation from four main storages	16,029
System losses[3]	3,165
Total losses	***19,194***
Total outflows	**421,095**
System efficiency	95%

Notes:

(1) Storage figures do not include service reservoirs and tanks.

(2) Factors contributing to the unaccounted-for inflow include ungauged runoff from the catchments of reservoirs, as well as outflows passed to other systems being more accurately metered than inflows to the distribution system.

(3) System losses included treatment plant losses, but exclude aqueduct leaks as that is outside of the common distribution system.

8.4.3 South East Water

South East Water is one of Melbourne's three retail water corporations. It obtains treated bulk water from Melbourne Water and operates a single integrated distribution system covering south-east Melbourne, the Mornington Peninsula and part of South Gippsland.

Table 8-27 shows South East Water's urban distribution system's water balance.

Table 8-27 South East Water urban distribution system's water balance

South East Water	Volume (ML)
Volumes in store	
Start volume in store (1 July 2013)	523
End volume in store (30 June 2014)	523
Change in storage	**0**
Inflows	
From Melbourne Water	143,047
Recycled water – imported from bulk supplier	1,246
Recycled water – imported from local treatment plant	2,964
Total inflows	**147,257**
Outflows	
Deliveries	
To residential customers	95,296
To non-residential customers	30,981
To authorised non-metered	720
Recycled water used	3,453
Total deliveries	***130,450***
Losses	
System losses(1)	16,807
Total losses	***16,807***
Total outflows	**147,257**
System efficiency (%)	89%

Note:

(1) The balancing item in this account is system losses (back-calculated from total inflows).

8.4.4 Yarra Valley Water

Yarra Valley Water is one of Melbourne's three retail water corporations. It obtains treated bulk water from Melbourne Water and operates a single integrated distribution system covering the part of greater Melbourne that is in the Yarra basin, extending to Warburton in the east and Wallan in the north. Table 8-28 shows Yarra Valley Water's urban distribution system's water balance.

Table 8-28 Yarra Valley Water urban distribution system's water balance

Yarra Valley Water	Volume (ML)
Volumes in store	
Start volume in store (1 July 2013)	-
End volume in store (30 June 2014)	-
Change in storage	**-**
Inflows	
From Melbourne Water	149,094
Total inflows	**149,094**
Outflows	
Deliveries	
To residential customers	104,671
To non-residential customers	27,245
Non-revenue consumptive delivery	2,550
Total deliveries	***134,466***
Losses	
System losses	14,628
Total losses	***14,628***
Total outflows	**149,094**
System efficiency	90%

8.4.5 City West Water

City West Water is one of Melbourne's three retail water corporations. It obtains treated bulk water from Melbourne Water and operates a single integrated distribution system covering Melbourne's central business district and its inner and western suburbs. Table 8-29 shows City West Water's urban distribution system's water balance.

Table 8-29 City West Water urban distribution system's water balance

City West Water	Volume (ML)
Volumes in store	
Start volume in store (1 July 2013)	-
End volume in store (30 June 2014)	-
Decrease in storages	-
Inflows	
From Melbourne Water	103,381
Recycled water – imported from bulk supplier(1)	392
Total inflows	**103,773**
Outflows	
Deliveries	
To residential customers	52,974
To non-residential customers	40,771
Recycled water used	421
Total deliveries	***94,166***
Losses	
System losses(2)	9,607
Total losses	***9,607***
Total outflows	**103,773**
System efficiency	91%

Notes:

(1) The recycled/imported inflow amount represents a bulk purchase from Melbourne Water.

(2) The balancing item in this account is system losses (back-calculated from total inflows).

8.4.6 Western Water

Western Water is based in Sunbury and services a rapidly growing area to the west of, and adjacent to, Melbourne.

It operates a main integrated distribution system, with somewhat separate supplies to Woodend, Lancefield and Myrniong. While Woodend can be indirectly supplemented from the main integrated system, Lancefield and Myrniong cannot. Romsey is similar to Woodend: it utilises local water for most of the time but can be supplemented from the main integrated system in times of drought.

Table 8-30 summarises Western Water's urban distribution systems.

Table 8-30 Western Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location
Main integrated system	Sunbury, Gisborne, Bacchus Marsh, Diggers Rest, Riddles Creek, Macedon, Melton, Mount Macedon, Romsey and Myrniong (*Myrniong is separate and not connected to the integrated system)*	Bulk supply from Melbourne Water, Rosslynne Reservoir system, Pykes Creek Reservoir, Merrimu Reservoir, Djerriwarrh Reservoir and Kerrie Reservoir	Melton, Gisborne, Romsey, Myrniong
Lancefield	Lancefield	Garden Hut Reservoir and groundwater	Lancefield
Woodend	Woodend	Campaspe Reservoir and Campaspe River tributaries, Mount Macedon storages and tributaries *(indirectly supplemented from integrated system in times of drought)*	Woodend

Table 8-31 shows Western Water's urban distribution systems' water balances.

Table 8-31 Western Water urban distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)						End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses		Passed to other systems	Total outflows		
			To urban residential	To urban other	Reticulation[1]	Other system losses[2]				
Main integrated system	145	12,563	9,300	1,630	1,109	283	166	12,488	220	89%
Lancefield	44	177	138	24	16	16		194	27	84%
Woodend	182	557	355	62	41	108		566	173	74%

Note:
(1) Reticulation losses represent the losses in the reticulation system.
(2) Other system losses represent the loss of water from the point of extraction from the source and the reticulation system (and are balancing item).

8.4.7 Barwon Water

Barwon Water supplies the Greater Geelong region (including the Bellarine Peninsula and towns as far west as Birregurra and Forrest) and the Colac, Aireys Inlet, Lorne and Apollo Bay areas.

Table 8-32 summarises Barwon Water's urban distribution systems.

Table 8-32 Barwon Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location/Comment
Aireys Inlet	Aireys Inlet and Fairhaven	Painkalac Reservoir on the Painkalac Creek	Aireys Inlet
Apollo Bay	Apollo Bay, Marengo and Skenes Creek	Diversion weir on the West Barham River in the Otway Ranges	Treatment plant near Marengo
Colac system	Colac urban and rural areas and towns including Gellibrand, Pirron Yallock, Irrewarra, Coragulac, Alvie, Beeac and Cressy	Olangolah and West Gellibrand reservoirs, which are fed by streams in the Otway Ranges	Colac
Greater Geelong and Bellarine Peninsula	Greater Geelong urban (includes Anakie, Avalon, Balliang, Bamganie, Bannockburn, Batesford, Birregurra, Fyansford, Gheringhap, Inverleigh, Leopold, Lethbridge, Little River, Marshall, Maude, Meredith, Modewarre, Moorabool, Moriac, Mount Moriac, Murgheboluc, She Oaks, Shelford, Staughton Vale, Sutherlands Creek, Teesdale, Thompson, Winchelsea and Wurdiboluc) Bellarine Peninsula (includes Barwon Heads, Bellarine, Breamlea, Clifton Springs, Curlewis, Drysdale, Indented Head, Mannerim, Marcus Hill, Ocean Grove, Point Lonsdale, Portarlington, Queenscliff, St Leonards, Swan Bay and Wallington)	Barwon River system – West Barwon Reservoir on the West Barwon River	Wurdee Boluc
		Moorabool River system – various streams in the Moorabool basin	Moorabool treatment plant at She Oaks
		Barwon Downs borefield – Barwon Downs aquifer	At bores
		Anglesea borefield – Lower Eastern View formation	At bores
Lorne	Lorne township	Allen Reservoir on the St George River, just west of Lorne	Lorne

Table 8-33 shows Barwon Water's urban distribution systems' water balances.

Table 8-33 Barwon Water urban distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)					End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses		Total outflows		
			To urban residential	To urban other	Reticulation (1)	Other system losses (2)			
Aireys Inlet	0	198	132	10	14	42	198	0	72%
Apollo Bay	109	364	186	101	83	1	371	102	77%
Colac system	504	3,611	1,575	1,132	83	698	3,487	628	78%
Geelong/Bellarine	30,858	39,355	18,101	7,874	2,232	5,823	34,031	36,182	76%
Lorne	0	450	219	88	35	109	450	0	68%

Note:
(1) Reticulation losses represent the losses in the reticulation system.
(2) Delivery losses represent the loss of water from the point of extraction from the source and the reticulation system (and are balancing item).

8.4.8 Central Highlands Water

Central Highlands Water is based in Ballarat. It supplies water to the Greater Ballarat region and to numerous other towns and districts, ranging from Ballan in the east to Landsborough and Navarre in the north-west and Rokewood in the south. Its supply and distribution systems spread across seven river basins, both north and south of the Great Dividing Range.

Table 8-34 summarises Central Highlands Water's urban distribution systems.

Distribution systems: Central region

Table 8-34 Central Highlands Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location/ Comment
Greater Ballarat (multiple basins)	Supplies suburbs and towns including Alfredton, Ballan, Ballarat, Black Hill, Brown Hill, Bungaree, Buninyong, Corindhap, Creswick, Golden Point, Gordon, Linton, Mt Clear, Scarsdale, Smythesdale, Snake Valley, Skipton and Wallace	White Swan Reservoir in the Barwon basin, Lal Lal Reservoir in the Moorabool basin, Ballarat West groundwater bores and the Goldfields Superpipe which extracts water from the Goulburn basin	
Maryborough and district (Loddon basin)	The second-largest system managed by Central Highlands Water; supplies the towns and villages of Adelaide Lead, Alma/Moonlight, Betley, Carisbrook, Craigie, Daisy Hill, Havelock, Majorca, Maryborough, Rodborough, Simson/Bet Bet, Talbot and Timor/Bowenvale	Evansford and Talbot reservoirs (which source water from McCallums Creek) and Tullaroop Reservoir on the Loddon River	Single treatment plant at the central holding basin (Centenary Reservoir)
Individual or small groups of towns	Amphitheatre (Avoca basin)	Small reservoir on Forest Creek	None (non-potable supply)
	Avoca (Avoca basin)	Sugarloaf Reservoir in the Avoca basin	Avoca
	Beaufort and Raglan (Hopkins basin)	Musical Gully Reservoir, which captures water via diversion weirs from streams in the Hopkins basin	Supply to Raglan is untreated; supply to Beaufort is chlorinated at Musical Gully
	Blackwood and Barrys Reef (Werribee basin)	Blackwood basin, which is supplied by diversion from Kyneton Gully Creek and Long Gully Creek; supplemented by emergency groundwater bore	Non-chemical (UV) disinfection at Blackwood basin
	Clunes (Loddon basin)	Groundwater bore	Hardness removed and disinfected; treatment plant is adjacent to the bore
	Daylesford system – supplies Daylesford, Hepburn and Hepburn Springs (Loddon basin)	Three small storages supplied from various streams	Single treatment plant for the three towns
	Dean (Loddon basin)	Groundwater bore	Chlorine disinfection
	Forest Hill system (Loddon basin) – supplies Allendale, Newlyn, Smeaton, Kingston, Springmount, Broomfield and rural homes in the district	Three groundwater bores at Forest Hill	Hardness removed and disinfected; treatment plant is adjacent to the bores
	Landsborough and Navarre (Wimmera basin)	Landsborough Reservoir, which is supplied by diversions from several streams; supplemented by a drought-relief bore	None (non-potable supply)
	Learmonth (Loddon basin)	Groundwater bore	High quality supply, little treatment is required
	Lexton (Loddon basin)	Lexton Reservoir, which captures water from springs in its catchment	Treatment plant at the reservoir
	Redbank (Avoca basin)	Redbank Reservoir on the upper Avoca River, with a supplementary groundwater bore	None (non-potable supply)
	Waubra (Loddon basin)	Two groundwater bores	Disinfected with chlorine at storage tanks

Table 8-35 shows Central Highlands Water's urban distribution systems' water balances. All Central Highlands Water reservoirs are on-stream and hence not included in water balance calculations. Furthermore, White Swan Reservoir is treated in the basin chapters of the accounts as an on-stream storage and thus is not covered here. The headworks system; that is, the channels connecting Moorabool Reservoir to White Swan, is also not covered in this account.

Table 8-35 Central Highlands Water urban distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML) [1]	Outflows (ML)					End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses				
			To urban residential	To urban other	Reticulation[2]	Other system losses[3]	Total outflows		
Amphitheatre	-	11	10	1		()	11	-	102%
Avoca	-	178	79	32	31	36	178	-	63%
Beaufort & Raglan	-	147	97	34	16	0	147	-	89%
Blackwood & Barrys Reef	-	43	24	5	3	11	43	-	69%
Clunes	-	192	125	34	31	3	192	-	82%
Daylesford system	-	660	340	151	151	18	660	-	74%
Dean[4]	-	21	4	2		16	21	-	27%
Forest Hill system	-	166	102	10	47	7	166	-	68%
Greater Ballarat	-	11,418	7,286	3,118		1,013	11,418	-	91%
Landsborough & Navarre	-	30	16	5	10	(1)	30	-	71%
Learmonth	-	48	24	16		7	48	-	85%
Lexton	-	24	13	1	8	2	24	-	59%
Maryborough and District	-	1,337	792	273	113	159	1,337	-	80%
Redbank	-	8	4			4	8	-	49%
Waubra	-	29	17	1		11	29	-	63%

Notes:
(1) Total inflow represents the flow measured into the distribution system, generally this represents the volume leaving the treatment plant.
(2) Reticulation losses represent the losses in the reticulation system.
(3) Delivery losses represent the loss of water from the point of extraction from the source and the reticulation system (and are balancing item).
(4) Metering issues have been identified by Central Highlands Water and these may explain the large losses in this system.

8.4.9 Southern Rural Water (Werribee and Bacchus Marsh systems)

Southern Rural Water operates the Werribee and Bacchus Marsh irrigation districts. Both are in the Werribee basin and are supplied from the Werribee River and its tributaries. Werribee is also supplied with recycled water from Melbourne Water's Western Treatment Plant.

Table 8-36 shows Southern Rural Water's Werribee and Bacchus Marsh irrigation districts' water balances.

Table 8-36 Southern Rural Water Werribee and Bacchus Marsh irrigation districts' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)				End volume in store (ML)	Distribution system efficiency (%)
			Irrigation deliveries	Passed to other systems[1]	Losses	Total outflows		
Bacchus Marsh Irrigation district	-	4,134	2,845	61	1,228	4,134	-	70%
Werribee Irrigation district	-	14,969	8,170	348	6,451	14,969	-	57%

Notes:
(1) Passed to other systems represent outfalls from the systems. BMID returns into the Lerderderg River, the WID returns to the bay or a lower estuary.

8.5 Western region

8.5.1 Wannon Water

Wannon Water's region extends more than 24,500 km^2 from the South Australian border in the west to Lismore in the east, and from Balmoral in the north to the lower Gellibrand River catchment on the south coast. The Warrnambool City, Corangamite Shire, Glenelg Shire, Moyne Shire and Southern Grampians Shire councils are all within its service area.

Most of Wannon Water's distribution systems supply both towns and rural customers and are shown as consolidated systems. Table 8-37 summarises Wannon Water's combined distribution systems.

Table 8-37 Wannon Water combined distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location
Balmoral	Balmoral	Rocklands Reservoir	Balmoral
Dilwyn aquifer	Portland, Heywood, Dartmoor, Port Fairy, Port Campbell, Peterborough and Timboon	Groundwater flow – numerous bores in localities serviced	Portland, Heywood, Dartmoor, Port Fairy and Port Campbell
Glenthompson	Glenthompson	Local surface water catchments into Glenthompson and Railway reservoirs, bulk supply from GWMWater	Glenthompson
Grampians	Hamilton, Cavendish, Dunkeld and Tarrington	Victoria Ranges catchment (small streams and groundwater flow extracted from bores) and Rocklands Reservoir	Hamilton, Cavendish and Dunkeld
Konongwootong	Rural customers only	Local surface water catchment into Konongwootong Reservoir	None
Newer Volcanic Aquifer	Darlington, Caramut, Penshurst, Macarthur and Mortlake	Groundwater flow extracted at bores in localities serviced	Darlington, Caramut, Penshurst and Macarthur
Otways (Otway system)	Warrnambool, Simpson, Cobden, Camperdown, Glenormiston, Lismore, Derrinallum, Terang, Mortlake, Purnim, Allansford and Koroit	Arkins Creek catchment, Gellibrand River catchment, groundwater flow extracted from bores near Carlisle River and at Albert Park, Warrnambool	Warrnambool, Simpson, Cobden, Camperdown, Terang and Purnim
Port Campbell Limestone aquifer	Casterton, Coleraine, Sandford, Merino and Warrnambool	Groundwater flow extracted at Tullich borefield and at Albert Park, Warrnambool	Casterton

Table 8-38 shows Wannon Water's combined distribution systems' water balances. The volume of water in storage and total inflow volumes are calculated at the system level, hence data for these items is not available for individual towns. Similarly, reticulation system loss volumes are not available for individual townships for the Otway system and as such are presented at the system level.

Table 8-38 Wannon Water combined distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)							End volume in store (ML)	Distribution system efficiency (%)
			Deliveries			Losses		Passed to other systems	Total outflows		
			To urban residential	To urban other	To rural customers	Reticulation [1]	Other system losses [2]				
Balmoral	0	58	13	9	12	2	21	0	58	0	59%
Dilwyn Aquifer	0	2,998	1,138	1,279	91	393	97	0	2,998	0	84%
Glenthompson	68	29	8	1	16	1	7	0	33	64	77%
Grampians System (excl Balmoral)	1,802	2,237	736	232	113	220	170	48	1,518	2,521	74%
Konongwootong	0	104			44		60	0	104	0	42%
Newer Volcanic Aquifer	0	181	67	23	7	15	37	32	181	0	71%
Otway System	2,097	8,134	2,858	2,332	2,091	804	37	0	8,123	2,108	90%
Port Campbell Limestone Aquifer	0	897	181	73	36	125	42	441	897	0	81%

Notes:
(1) Reticulation losses represent the losses in the reticulation system.
(2) Delivery losses represent the loss of water from the point of extraction from the source and the reticulation system (and are balancing item).

8.5.2 Grampians Wimmera Mallee Water

Grampians Wimmera Mallee Water (GWMWater) is based in Horsham and supplies water to urban and rural customers via the extensive Wimmera–Mallee pipeline system. It supplies the larger urban areas in the south (Ararat, Stawell and Horsham) via separate distribution systems. It supplies many towns from groundwater.

GWMWater services a large area – about 25% of Victoria – in the north-west of the state. It sources most of its water from a complex system of storages in the Grampians, but the northern part of the rural pipeline system is supplied from the Murray.

The rural pipeline system has been divided for reporting purposes into seven distribution systems, each of which supplies several towns. These are presented for simplicity as consolidated reports for the urban and rural systems.

Table 8-39 summarises GWMWater's combined distribution systems.

Table 8-39 Grampians Wimmera Mallee Water combined distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location/ Comment
Northern Mallee Pipeline	Supplies rural customers around Ouyen and urban customers in Chillingollah, Chinkapook, Ouyen, Manangatang, Nandaly, Nullawil, Patchewollock, Speed, Tempy, Underbool, Waitchie and Walpeup	Murray River at Wemen, Piangil, Nyah and Swan Hill	Treatment plants at Ouyen and Underbool; chlorinators at Manangatang, Nullawil and Walpeup; untreated at Chillingollah, Chinkapook, Nandaly, Patchewollock, Speed, Tempy and Waitchie
Wimmera Mallee Pipeline Supply Systems 1 and 7	Supplies rural customers in the south-west Wimmera and urban customers in Pimpinio, Dimboola, Antwerp, Yaapeet, Jeparit, Rainbow and Tarranyurk	Wimmera headworks at Lake Bellfield and/or Taylors Lake	Treatment plants at Dimboola and Rainbow; untreated at Pimpinio, Antwerp, Yaapeet, Jeparit and Tarranyurk
Wimmera Mallee Pipeline Supply System 2	Supplies rural customers as far north as Lascelles, and urban customers in Jung, Murtoa, Warracknabeal, Brim, Beulah, Hopetoun, Woomelang and Lascelles	Wimmera headworks at Lake Bellfield and/or Taylors Lake	Treatment plants at Warracknabeal, Murtoa and Hopetoun; chlorinators at Jung, Brim, Beulah and Woomelang; untreated at Lascelles
Wimmera Mallee Pipeline Supply System 3	Supplies rural customers to the north-east of Horsham and urban customers in Birchip, Glenorchy, Marnoo, Minyip, Rupanyup and Watchem	Wimmera headworks at Lake Bellfield and/or Taylors Lake	Treatment plants at Birchip and Rupanyup; chlorinator at Minyip; Glenorchy, Marnoo and Watchem are untreated
Wimmera Mallee Pipeline Supply System 4	Supplies rural customers to the north-east of Horsham and urban customers in Charlton, Donald, St Arnaud and Wycheproof	Wimmera headworks at Lake Bellfield and/or Taylors Lake	Treatment plants at Charlton and St Arnaud; chlorinator at Donald; chlorinator at Wycheproof
Wimmera Mallee Pipeline Supply System 5	Supplies rural customers to the south and west of Swan Hill and urban customers in Berriwillock, Sea Lake, Culgoa, Lalbert and Ultima	Murray River at Swan Hill	Chlorinators at Sea Lake, Lalbert and Ultima; untreated at Berriwillock and Culgoa
Wimmera Mallee Pipeline Supply System 6	Supplies rural customers to the west and south of Horsham	Wimmera headworks on Moora Channel supplied from either Lake Wartook or Moora Moora Reservoir into the Brimpaen storages	Raw water supply only; untreated at Clear Lake and Noradjuha

GWMWater also operates 18 urban distribution systems, summarised in Table 8-40.

Distribution systems: Western region

Table 8-40 Grampians Wimmera–Mallee Water urban distribution systems

Area	System/towns supplied	Source of supply	Treatment plant location/ Comment
Ararat system	Ararat and surrounds	Mount Cole Reservoir and Lake Fyans	Ararat
Halls Gap system	Halls Gap and Pomonal	Lake Bellfield	Halls Gap
Horsham system	City of Horsham and surrounds, including Haven and Natimuk	Lake Wartook and Laharum groundwater bores	Mount Zero
Loddon Basin	Quambatook	Normanville D&S system	Chlorinated
Stawell system	Stawell, Great Western	Fyans Creek and Lake Fyans	Stawell and Great Western
Willaura system	Willaura, Lake Bolac, Moyston and Wickliffe	Mt William, Stony and Masons creeks; groundwater bores (unincorporated area)	Willaura serves Willaura and Lake Bolac; untreated at Moyston and Wickliffe
Towns supplied from groundwater	Apsley	West Wimmera	Untreated
	Cowangie	Murrayville	Untreated
	Goroke	West Wimmera	Untreated
	Edenhope	West Wimmera	Treatment plant at Edenhope
	Harrow	West Wimmera	Untreated
	Kaniva	West Wimmera	Untreated
	Kiata	West Wimmera	Untreated
	Lillimur	West Wimmera	Untreated
	Miram	Murrayville	Untreated
	Murrayville	West Wimmera	Untreated
	Nhill	West Wimmera	Untreated
	Serviceton	Glenelg Catchment Unit	Untreated
	Streatham & Westmere	West Wimmera	Untreated

Table 8-41 shows GWMWater's combined distribution systems' water balances.

Table 8-41 Grampians Wimmera Mallee Water combined distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)					End volume in store (ML)	Distribution system efficiency (%)
			Deliveries						
			To urban residential	To urban other	To rural customers	Distribution system losses[1]	Total outflows		
Northern Mallee Pipeline	185	2,709	479	259	1,446	530	2,714	180	71%
Wimmera Mallee Pipeline Supply Systems 1	0	1,646	525	379	448	293	1,646	0	59%
Wimmera Mallee Pipeline Supply System 2	0	2,849	596	176	1,570	507	2,849	0	76%
Wimmera Mallee Pipeline Supply System 3	0	1,885	108	22	1,420	336	1,885	0	81%
Wimmera Mallee Pipeline Supply System 4	0	2,420	612	336	1,042	431	2,420	0	68%
Wimmera Mallee Pipeline Supply System 5	0	609	40	15	256	299	609	0	49%
Wimmera Mallee Pipeline Supply System 6	96	507	1	0	364	132	497	107	73%
Wimmera Mallee Pipeline Supply Systems 7	0	202	69	88	8	36	202	0	38%

Notes:
(1) Distribution system losses are used as the balancing item in these accounts.

Table 8-42 shows GWMWater's urban distribution systems' water balances.

Table 8-42 Grampians Wimmera Mallee Water urban distribution systems' water balances

Distribution system	Start volume in store (ML)	Total inflows (ML)	Outflows (ML)						End volume in store (ML)	Distribution system efficiency (%)
			Deliveries		Losses					
			To urban residential	To urban other	Reticulation[1]	Other system losses[2]	Passed to other systems	Total outflows		
Surface water systems										
Ararat system[3]	197	1,467	715	600	139	(23)	0	1,431	232	92%
Buangor	28	13	12	2	0	4	0	17	24	77%
East Grampians system (Willaura)	96	318	115	74	0	94	24	307	107	62%
Elmhurst	11	32	15	3	0	2	0	19	23	89%
Horsham system	222	2,841	1,707	455	558	120	0	2,840	223	76%
Quambatook	110	86	32	21	0	32	0	86	110	63%
Stawell system[3]	235	1,475	611	859	54	(32)	0	1,492	218	99%
Groundwater systems										
Apsley	0	29	23	5	0	1	0	29	0	96%
Cowangie	0	8	1	3	0	5	0	8	0	39%
Edenhope	0	158	80	24	53	2	0	158	0	66%
Goroke	0	51	33	8	0	11	0	51	0	79%
Harrow	0	35	21	4	0	11	0	35	0	70%
Kaniva	0	248	127	76	0	45	0	248	0	82%
Kiata	0	4	3		0	1	0	4	0	68%
Lillimur	0	8	6	0	0	2	0	8	0	80%
Miram	0	2	2	0	0		0	2	0	100%
Murrayville	0	116	61	50	0	5	0	116	0	95%
Serviceton	0	9	4	1	0	4	0	9	0	58%
Streatham & Westmere	7	38	8	5	0	26	0	38	6	32%

Note:

(1) Reticulation losses can include treatment plant losses where they are known, where this is zero losses are not able to be attributed to the reticulation system itself.

(2) Other losses represent all other losses and where reticulation losses equal zero they represent the entire loss in the system (they are the balancing item in these accounts).

(3) Unattributed inflows or metering errors explain the negative losses in the Ararat and Stawell systems

Appendix A: Storage levels

Basin	Reservoir	On-stream/ Off-stream	Storage capacity (ML)	% full at 1 July 2013	% full at 30 June 2014
Murray	Lake Victoria (Victoria's share only)	On-stream	338,500	72%	69%
	Menindee Lakes (Victoria's share only)	On-stream	785,000	69%	0%
	Lake Hume (Victoria's share only)	On-stream	1,502,579	74%	67%
	Lake Dartmouth (Victoria's share only)	On-stream	1,928,116	97%	100%
	Lake Cullulleraine	On-stream	5,270	91%	84%
Kiewa	Rocky Valley	On-stream	28,294	73%	38%
	Lake Guy	On-stream	1,416	27%	67%
	Clover Pondage	Off-stream	255	101%	75%
	Pretty Valley Basin	Off-stream	500	100%	100%
Ovens	Lake William Hovell	On-stream	13,690	101%	104%
	Lake Buffalo	On-stream	23,900	53%	68%
Broken	Lake Nillahcootie	On-stream	40,400	62%	82%
	Loombah-McCall Say	On-stream	1,747	67%	100%
Goulburn	Lake Eildon	On-stream	3,334,158	70%	72%
	Goulburn Weir	On-stream	25,500	98%	95%
	Sunday Creek Reservoir	On-stream	1,700	97%	89%
	Greens Lake	Off-stream	32,440	32%	63%
	Waranga Basin	Off-stream	432,362	38%	60%
Campaspe	Upper Coliban Reservoir	On-stream	37,770	100%	68%
	Lauriston Reservoir	On-stream	19,790	77%	80%
	Malmsbury Reservoir	On-stream	12,034	46%	51%
	Lake Eppalock	On-stream	304,651	76%	74%
	Campaspe Weir	Off-stream	2,624	100%	100%
Loddon	Newlyn Reservoir	On-stream	3,012	46%	54%
	Tullaroop Reservoir	On-stream	72,950	60%	54%
	Cairn Curran Reservoir	On-stream	147,130	66%	57%
	Laanecoorie Reservoir	On-stream	7,940	61%	33%
	Hepburn Lagoon	On-stream	2,457	40%	59%
	Evansford Reservoir	Off-stream	1,346	66%	78%
	Sandhurst Reservoir	Off-stream	2,590	51%	58%
	Spring Gully Reservoir	Off-stream	1,680	13%	42%
East Gippsland	None	-	-	-	-
Snowy	None	-	-	-	-
Tambo	None	-	-	-	-
Mitchell	None	-	-	-	-
Thomson	Lake Glenmaggie	On-stream	177,640	59%	61%
	Thomson Reservoir	On-stream	1,068,000	74%	76%
Latrobe	Blue Rock	On-stream	208,188	99%	100%
	Lake Narracan	On-stream	7,230	67%	52%
	Moondarra Reservoir	On-stream	30,300	100%	96%
South Gippsland	Lance Creek Reservoir	On-stream	4,200	100%	79%
	Hyland Reservoir	On-stream	671.1	100%	75%

	Western Reservoir	On-stream	1,137	100%	66%
	Candowie Reservoir	On-stream	4,463	28%	77%
Bunyip	Tarago Reservoir	On-stream	37,580	83%	101%
Yarra	Upper Yarra Reservoir	On-stream	200,579	48%	52%
	O'Shannassy Reservoir	On-stream	3,123	75%	104%
	Maroondah Reservoir	On-stream	22,179	33%	44%
	Yan Yean Reservoir	On-stream	30,266	88%	89%
	Cardinia Reservoir	Off-stream	286,911	73%	64%
	Greenvale Reservoir	Off-stream	26,839	75%	65%
	Silvan Reservoir	Off-stream	40,445	82%	88%
	Sugarloaf Reservoir	Off-stream	96,253	71%	87%
Maribyrnong	Rosslynne Reservoir	On-stream	25,368	86%	75%
Werribee	Melton Reservoir	On-stream	14,364	20%	9%
	Merrimu Reservoir	On-stream	32,516	83%	62%
	Pykes Creek Reservoir	On-stream	22,119	77%	81%
	Djerriwarrh Reservoir	On-stream	1014	81%	61%
Moorabool	Korweinguboora Reservoir	On-stream	2,091	10%	9%
	Bostock Reservoir	On-stream	7,455	82%	23%
	Lal Lal Reservoir	On-stream	59,549	84%	75%
	Wilsons Reservoir	On-stream	1,010	30%	13%
	Moorabool Reservoir	On-stream	6,192	65%	50%
	Upper Stony Creek Reservoir	Off-stream	9,494	55%	70%
Barwon	West Barwon Dam	On-stream	21,504	66%	86%
	White Swan Reservoir	On-stream	14,107	67%	61%
	Gong Gong Reservoir	On-stream	1,902	93%	27%
	Wurdee Boluc Reservoir	Off-stream	40,431	61%	71%
Corangamite	None	-	-	-	-
Otway Coast	West Gellibrand Reservoir	On-stream	1,856	100%	100%
Hopkins	None	-	-	-	-
Portland Coast	None	-	-	-	-
Glenelg	Rocklands Reservoir	On-stream	348,300	23%	24%
	Moora Moora Reservoir	On-stream	6,300	31%	62%
	Konongwootong Reservoir	On-stream	1,920	32%	70%
	Hamilton System Reservoirs	On-stream	2,654	64%	90%
Millicent Coast	None	-	-	-	-
Wimmera	Taylors Lake	On-stream	27,060	28%	36%
	Lake Lonsdale	On-stream	65,480	9%	11%
	Wartook Reservoir	On-stream	29,300	52%	56%
	Lake Bellfield	On-stream	78,560	78%	74%
	Fyans Lake	On-stream	18,460	67%	85%
	Batyo Lake	On-stream	2,250	1%	0%
	Dock Lake	On-stream	4,420	0%	0%
	Green Lake	On-stream	5,350	51%	56%
	Pine Lake	On-stream	62,000	7%	0%
	Toolondo Reservoir	On-stream	92,430	19%	17%
Mallee	None	-	-	-	-
Avoca	None	-	-	-	-

Appendix B: Groundwater entitlement and use

GMU	PCV	Allocation limit at 30/06/14 (ML)	Licences				Domestic and stock		Total use (licensed + domestic and stock) (ML)
			Licensed entitlements (ML)	No. of licences	No. of metered bores	Metered volume (ML)	No. of domestic and stock bores(1)	Estimated use (ML)(2)	
Goulburn–Murray Water									
WSPA (approved plan)									
Katunga WSPA(3)	60,577	42,312	60,446	256	175	25,123	734	1,468	26,591
Upper Ovens WSPA	-	3,672	3,672	105	121	743	283	566	1,309
WSPA (draft plan)									
Loddon Highlands WSPA	20,697	20,697	20,694	185	254	6,229	663	1,326	7,555
Lower Campaspe Valley WSPA	56,381	56,381	55,874	140	150	26,534	461	922	27,456
GMA									
Alexandra GMA(4)	-	-	-	-	-	-	-	-	-
Barnawartha GMA	1,111	1,111	375	4	0	39	23	46	85
Central Victorian Mineral Springs GMA(5)	6,024	6,024	4,932	130	134	464	1,591	3,182	3,646
Kinglake GMA(4)	-	-	-	-	-	-	-	-	-
Lower Ovens GMA	25,200	25,200	20,042	265	249	5,104	1,745	3,490	8,594
Mid Goulburn GMA	14,900	14,900	12,470	65	50	2,989	145	290	3,279
Mid Loddon GMA	34,037	34,037	34,037	106	115	12,654	343	686	13,340
Mullindolingong GMA(6)	6,980	6,980	1,604	43	15	0	53	106	106
Shepparton Irrigation GMA(7)	-	196,468	196,468	1138	1051	35,510	1426	2852	38,362
Strathbogie GMA(5)	1,660	1,660	1,539	67	72	135	274	548	683
Upper Goulburn GMA(5)	8,462	8,462	6,084	114	73	699	536	1072	1,771
Unincorporated areas									
Goulburn–Murray UAs	-	-	23,277	365	267	2,442	2,222	4,444	6,886
GWMWater									
WSPA (approved plan)									
Murrayville WSPA	10,883	10,883	9,634	32	46	3,586	117	234	3,820
West Wimmera GMA	55,659	55,659	53,327	175	243	16,965	619	1,238	18,203
Unincorporated areas									
GWMWater UAs	-	-	15,669	45	54	5,089	435	870	5,959
Southern Rural Water									
WSPA (approved plan)									
Koo Wee Rup WSPA	12,915	12,915	12,612	370	253	3,277	1,126	1,689	4,966
Nullawarre WSPA	22,741	22,741	22,733	230	161	9,067	898	1,347	10,414
Warrion WSPA	14,086	14,086	14,081	137	143	3,426	286	429	3,855
Yangery WSPA	14,352	14,352	14,343	155	174	2,815	805	1,208	4,023

Yarram WSPA	25,690	25,690	25,689	90	90	10,077	285	428	10,505
WSPA (draft plan)									
Bungaree WSPA	5,334	5,334	5,293	104	147	3,094	203	305	3,399
Condah WSPA	7,475	7,475	7,475	40	44	2,148	54	81	2,229
Denison WSPA(8)	18,502	18,502	18,501	122	126	7,609	180	270	7,879
Deutgam WSPA	5,100	5,100	5,082	147	194	802	122	183	985
Glenelg WSPA	33,262	33,262	33,261	83	98	4,904	1,126	1,689	6,593
Sale WSPA	21,238	21,238	21,218	113	113	10,037	341	512	10,549
Wandin Yallock WSPA	3,008	3,008	3,005	194	210	366	74	111	477
Wy Yung WSPA(6)	7,463	7,463	7,462	60	72	765	30	45	810
GMA									
Colongulac GMA	4,695	4,695	4,257	69	35	1,134	110	165	1,299
Cardigan GMA	3,967	3,967	3,878	22	23	462	93	140	602
Corinella GMA	2,550	2,550	662	14	10	76	69	104	180
Cut Paw Paw GMA	3,650	3,650	514	4	4	424	0	0	424
Frankston GMA	3,200	3,200	1,671	30	23	122	110	165	287
Gellibrand GMA	-	0	0	0	0	0	1	2	2
Gerangamete GMA(9)	20,000	20,000	20,000	1	6	0	3	5	5
Giffard GMA	5,689	5,689	5,689	17	19	1,436	72	108	1,544
Glenormiston GMA	2,698	2,698	2,630	41	27	1,210	79	119	1,329
Hawkesdale GMA	16,161	16,161	12,451	115	100	4,540	1,097	1,646	6,186
Heywood GMA	8,500	8,500	7,011	92	69	1,359	1,168	1,752	3,111
Jan Juc GMA(10)	39,250	39,250	11,250	3	7	3,577	4	6	3,583
Lancefield GMA	1,485	1,485	1,378	15	20	623	61	92	715
Leongatha GMA	6,500	6,500	1,841	34	13	209	75	113	322
Merrimu GMA	451	451	440	14	19	124	8	12	136
Moe GMA	8,200	8,200	3,991	96	32	797	129	194	991
Moorabbin GMA	2,700	2,700	2,624	58	71	1,132	264	396	1,528
Nepean GMA(6)	6,110	6,110	6,110	77	79	3,004	1,958	1,958	4,962
Newlingrook GMA	1,977	1,977	1,958	6	6	44	3	5	49
Orbost GMA	1,217	1,217	1,217	4	5	257	3	5	262
Paaratte GMA	4,606	4,606	3,212	6	1	323	3	5	328
Portland GMA	7,795	7,795	7,794	8	7	2,645	2	3	2,648
Rosedale GMA(6)(11)	22,372	22,372	22,372	67	50	9,698	56	84	9,782
Stratford GMA(6)(11)	27,645	27,645	27,645	9	7	22,270	647	971	23,241
Tarwin GMA	1,300	1,300	38	3	1	21	659	989	1,010
Wa De Lock GMA(6)(8)	30,795	30,795	29,286	252	192	5,960	355	533	6,493
Unincorporated areas									
Southern Rural Water UAs	-	-	72,345	1,537	871	12,639	7,582	11,373	24,012
Total	**727,250**	**909,125**	**963,163**	**7,674**	**6,591**	**276,778**	**31,811**	**52,582**	**329,360**

Notes:

(1) The number of domestic and stock bores includes all bores from the groundwater management system that are less than 30 years old. Bore depths (where recorded) have been taken into account to ensure that domestic and stock bores are assigned to the appropriate GMU where management units overlap.

(2) Domestic and stock use is estimated as 2 ML per bore except for the Southern Rural Water GMUs, where 1.5 ML per bore has been used (unless otherwise noted) and the Nepean GMA, where 1 ML per bore is a more accurate estimate.

(3) Extractions from Katunga WSPA were restricted to 70% allocation.

(4) Alexandra GMA and Kinglake GMA were revoked during the year. The licences in these areas are now in the new Upper Goulburn GMA.

(5) Central Victorian Mineral Springs GMA, Strathbogie GMA and Upper Goulburn GMA Groundwater Management Plans were approved in August 2014.

(6) Mullindolingong GMA, Wy Yung WSPA, Nepean GMA, Rosedale GMA, Stratford GMA and Wa De Lock GMA PCVs consist of the sum of the PCV for all zones within the GMU.

(7) The Minister for Water has abolished the Shepparton Irrigation WSPA and revoked the Groundwater Management Plan in February 2014. Interim management arrangements are in place until the new plan is completed and approved (this is forecast to be early 2015).

(8) The volume of use in Denison WSPA and Wa De Lock GMA includes metered extractions for salinity control (Denison WSPA 1,725 ML and Wa De Lock GMA 413 ML).

(9) The PCV for the Gerangamete GMA is aligned with Barwon Water's groundwater licence which allows extraction from the Gerangamete GMA of a maximum of 20,000 ML in any one year, 80,000 ML over a consecutive 10-year period and 400,000 ML over a 100-year period.

(10) The PCV for Jan Juc GMA is: Zone 1 all formations 250 ML; Zone 2 Upper Eastern View formation 4,000 ML; and Zone 2 Lower Eastern View formation 35,000 ML in any five-year period. The Jan Juc bulk entitlement, which applies to Zone 2 Lower Eastern View formation, 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 ML includes 4,250 ML and the five-year bulk entitlement of 35,000 ML.

(11) The use volume reported in Rosedale and Stratford GMA includes metered extractions from Latrobe Valley mines (Rosedale GMA 9,304 ML and Stratford GMA 26,809 ML).

Appendix C: Evapotranspiration estimates

Evapotranspiration is modelled as the sum of transpiration by plants, evaporation from soil and open water surfaces, and evaporation from the wet surfaces of plants soon after rainfall. This appendix presents modelled basin estimates of evapotranspiration.

Evapotranspiration amounts vary considerably across Victoria depending on a range of factors, including water availability. Averaged across Victoria as a whole, evapotranspiration in 2013–14 was estimated to be 532 mm, which is about 3% less than the long-term average from 1961 to 1990. Modelled estimates of basin evapotranspiration are presented in Figure C-1, which shows that basins in the far north-west and south-east of Victoria have evapotranspiration estimates for 2013–14 that are lower than the long-term average, in contrast with other basins that have evapotranspiration estimates similar to or higher than the long-term average. In Figure C-1, evapotranspiration is expressed as millimetres per unit area to allow easy comparison between catchments of different sizes.

The difference between the modelled evapotranspiration volumes for 2013–14 and the long-term averages varied between basins. The difference was greatest in the north-west, where evapotranspiration was up to 12% below the long-term average, whereas in the south-west evaporation was up to 8% above the long-term average (Figure C-1). These differences broadly reflect rainfall over the year, with some areas of Victoria receiving below-average rainfall but other areas receiving above-average rainfall.

Figure C-1 Modelled evapotranspiration per unit area (mm) in 2013–14

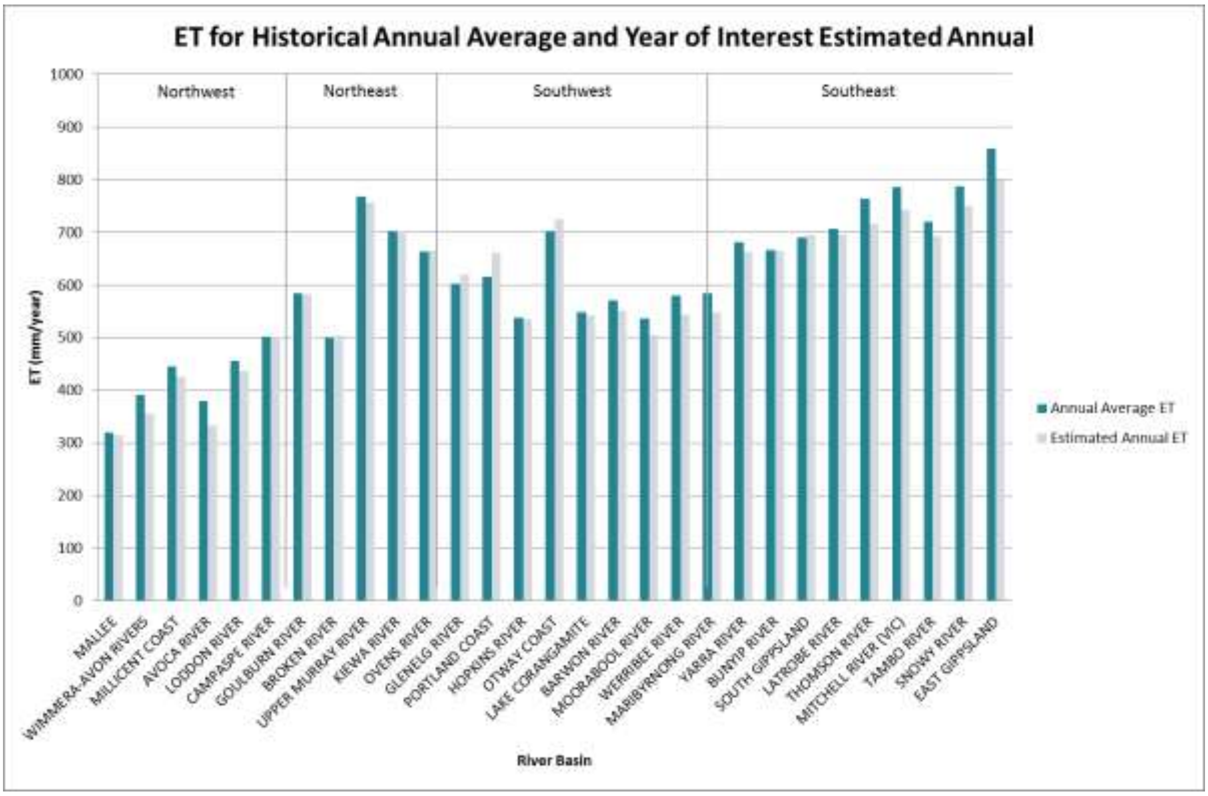
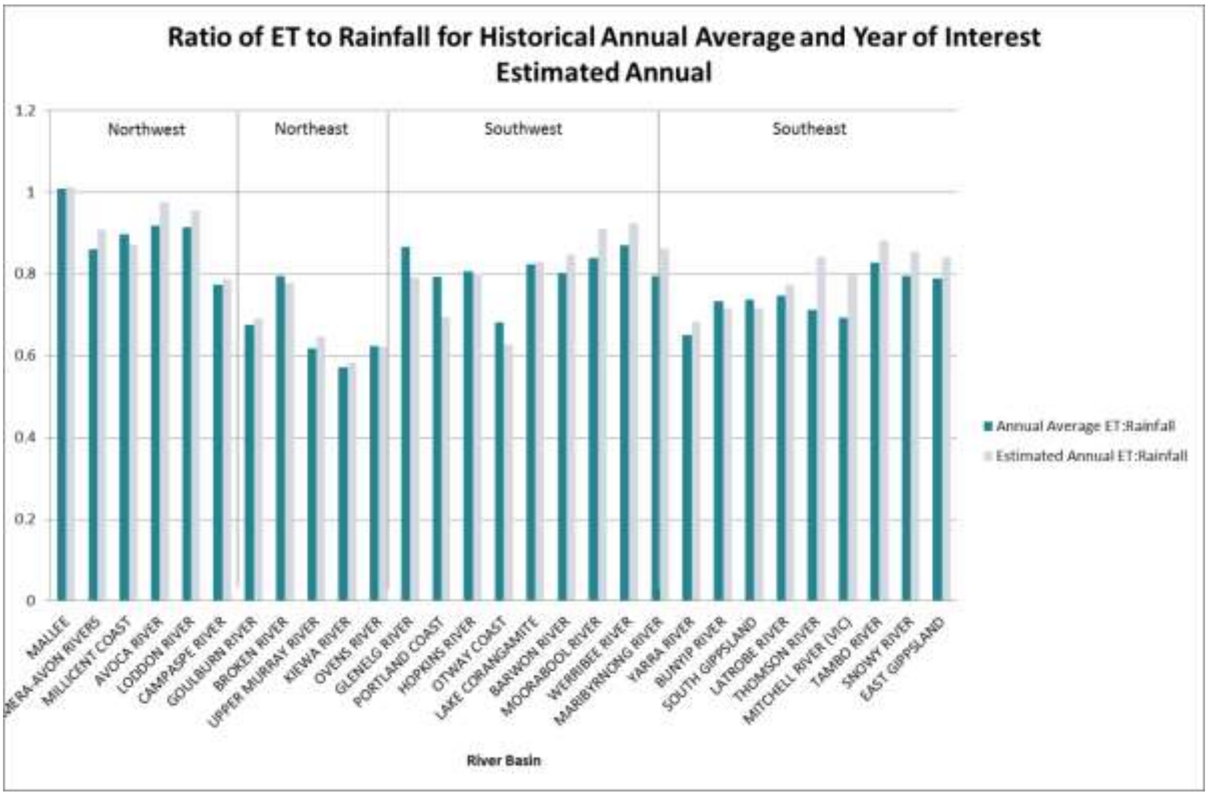


Figure C-2 illustrates evapotranspiration as a proportion of rainfall in Victoria’s basins. In 2013–14, the proportion of evapotranspiration to rainfall was generally similar to or higher than the long-term average in most basins except some areas in the south-west. This is consistent with below-average rainfall across most parts of the state for 2013–14, because the proportion of evapotranspiration to rainfall generally increases as rainfall decreases. As a result, significantly less rainfall remained for streamflow and groundwater recharge in 2013–14 than would be the case in an average year.

Figure C-2 Modelled evapotranspiration as a percentage of rainfall in 2013–14



North-east Victoria (Goulburn to Upper Murray basins)

Near-average rainfall over north-east Victoria in 2013–14 resulted in estimates of evapotranspiration that were near average for the north-eastern basins. The estimated evapotranspiration ranged from 503 mm in the Broken basin to 756 mm in the Murray basin, and comparisons with the long-term average ranged from 2% below average in the Murray basin to 1% above average in the Broken basin (Figure C-1).

In 2013–14, evapotranspiration as a proportion of rainfall in the north-eastern basins was within 5% of the long-term average. The Broken basin was estimated to have the north-east region's highest evapotranspiration as a proportion of the year's rainfall (78%, compared with the long-term average of 79%), and the lowest was in the Kiewa basin (58%, compared with the long-term average of 57%) (Figure C-2).

South-east Victoria (East Gippsland to Yarra basins)

Below-average rainfall over most of south-east Victoria except South Gippsland resulted in estimates of evapotranspiration that were generally slightly below average for the south-eastern basins. In 2013–14, the estimated evapotranspiration ranged from 663 mm in the Yarra basin to 799 mm in the East Gippsland basin, and comparisons with the long-term average ranged from 7% below average in the East Gippsland basin to 4% above average in the South Gippsland basins (Figure C-1).

In 2013–14, evapotranspiration as a proportion of rainfall in the south-eastern basins varied between 3% below average to 18% above average. The Tambo basin was estimated to have the south-east region's highest evapotranspiration as a proportion of the year's rainfall (88%, compared with the long-term average of 83%), and the lowest was in the Yarra basin (68%, compared with the long-term average of 65%) (Figure C-2).

South-west Victoria (Maribyrnong to Glenelg basins)

Rainfall over south-west Victoria varied between above average and below average, resulting in varying estimates of evapotranspiration for the south-western basins. In 2013–14, the estimated evapotranspiration ranged from 504 mm in the Moorabool basin to 725 mm in the Otway basin, and comparisons with the long-term average ranged from 6% below average in the Moorabool, Werribee and Maribyrnong basins to 8% above average in the Portland Coast basin (Figure C-1).

In 2013–14, evapotranspiration as a proportion of rainfall in the south-western basins varied between 12% below average to 9% above average. The Werribee basin was estimated to have the south-west region's highest evapotranspiration as a proportion of rainfall in 2013–14 (92%, compared with the long-term average of 87%) and the Otway basin the lowest (63%, compared with the long-term average of 68%) (Figure C-2).

North-west Victoria (Mallee to Campaspe River basins)

Slightly below-average rainfall in north-west Victoria resulted in estimates of evapotranspiration that were below average for the north-western basins. In 2013–14, the estimated evapotranspiration ranged from 315 mm in the Mallee basin to 501 mm in the Campaspe basin, and comparisons with the long-term average ranged from 12% below average in the Avoca basin to exactly average in the Campaspe basin (Figure C-1).

In 2013–14, evapotranspiration as a proportion of rainfall was within 5% of the long-term average for the north-western basins. The Mallee basin was estimated as having the north-west region's highest evapotranspiration as a proportion of rainfall (101%, the same as the long-term average) and the lowest was in the Campaspe basin (79%, compared with the average of 77%) (Figure C-2).

Key assumptions and data limitations

The estimates of evapotranspiration presented in this appendix are based on results from the SoilFlux model, which is a one-dimensional water balance model. Modelling evapotranspiration requires many approximations and assumptions, which limit the accuracy of the estimates. Major assumptions and limitations of the method used to derive the estimates of evapotranspiration include:

- not accounting for water applied by irrigation
- not allowing for changes in water storage (i.e. rises and falls in the water table and soil moisture) or lateral flow
- using land use information from 2009, which has been condensed from the Victorian Land Use Information System into 10 representative land use types to facilitate water balance modelling
- using one-kilometre gridded data for land use, geology, depth to groundwater, and rainfall.

The basin areas used to report evapotranspiration estimates are slightly different from those used for reporting in the basin water accounts in Chapter 6. In the basin water accounts, the Murray basin captures information about Murray River irrigation districts in the Mallee, Avoca, Loddon, Campaspe, Goulburn and Broken basins. For evapotranspiration reporting, these irrigation districts are included within their host river basin (e.g. the Mildura Irrigation District is in the Mallee basin). However, as noted above, the evapotranspiration estimates do not account for water applied by irrigation.

Appendix D: Bulk entitlement holders

River basin	Entitlements	Holder
Murray	*Bulk Entitlement (Corryong) Conversion Order 2000*	North East Water
	Bulk Entitlement (Cudgewa) Conversion Order 2000	North East Water
	Bulk Entitlement (Dartmouth) Conversion Order 2000	North East Water
	Bulk Entitlement (Omeo) Conversion Order 2008	East Gippsland Water
	Bulk Entitlement (River Murray – City West Water) Order 2012	City West Water
	Bulk Entitlement (River Murray – Coliban Water) Conversion Order 1999	Coliban Water
	Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999	Victorian Environmental Water Holder
	Bulk Entitlement (River Murray – Goulburn Valley Water) Conversion Order 1999	Goulburn Valley Water
	Bulk Entitlement (River Murray – Goulburn Murray Water) Conversion Order 1999	Goulburn–Murray Water
	Bulk Entitlement (River Murray – Grampians Wimmera Mallee Water) Conversion Order 1999	Grampians Wimmera Mallee Water
	Bulk Entitlement (River Murray – Lower Murray Urban and Rural Water – Irrigation) Conversion Order 1999	Lower Murray Water
	Bulk Entitlement (River Murray – Lower Murray Urban and Rural Water – Urban) Conversion Order 1999	Lower Murray Water
	Bulk Entitlement (River Murray – North East Water) Conversion Order 1999	North East Water
	Environmental Entitlement (River Murray – NVIRP Stage 1) 2012	Victorian Environmental Water Holder
	Bulk Entitlement (River Murray – Snowy Environmental Reserve) Conversion Order 2004	Victorian Environmental Water Holder
	Bulk Entitlement (River Murray – South East Water) Order 2012	South East Water
	Bulk Entitlement (River Murray – Yarra Valley Water) Order 2012	Yarra Valley Water
	Bulk Entitlement (Walwa) Conversion Order 2000	North East Water
Kiewa	*Bulk Entitlement (Kiewa – Hydro) Conversion Order 1997*	AGL Hydro Ltd
	Bulk Entitlement (Kiewa – Tangambalanga) Conversion Order 2000	North East Water
	Bulk Entitlement (Mount Beauty – Tawonga) Conversion Order 1997	North East Water
	Bulk Entitlement (Yackandandah) Conversion Order 2001	North East Water
Ovens	*Bulk Entitlement (Beechworth) Conversion Order 2001*	North East Water
	Bulk Entitlement (Bright) Conversion Order 2000	North East Water
	Bulk Entitlement (Chiltern) Conversion Order 2000	North East Water
	Bulk Entitlement (Glenrowan) Conversion Order 1999	North East Water
	Bulk Entitlement (Harrietville) Conversion Order 1999	North East Water
	Bulk Entitlement (Myrtleford) Conversion Order 2001	North East Water
	Bulk Entitlement (Ovens System – Goulburn Murray Water) Conversion Order 2004	Goulburn–Murray Water
	Bulk Entitlement (Ovens System – Moyhu, Oxley and Wangaratta – North East Water) Conversion Order 2004	North East Water
	Bulk Entitlement (Porepunkah) Conversion Order 1999	North East Water
	Bulk Entitlement (Springhurst) Conversion Order 1999	North East Water
	Bulk Entitlement (Whitfield) Conversion Order 1999	North East Water
Broken	*Bulk Entitlement (Broken System Goulburn Murray Water) Conversion Order 2004*	Goulburn–Murray Water
	Bulk Entitlement (Broken System – Tungamah Devenish and St James – North East Water) Conversion Order 2004	North East Water
	Bulk Entitlement (Loombah-McCall Say) Conversion Order 2001	North East Water

River basin	Entitlements	Holder
Goulburn	*Bulk Entitlement (Broadford, Kilmore and Wallan) Conversion and Augmentation Order 2003*	Goulburn Valley Water
	Bulk Entitlement (Buxton) Conversion Order 1995	Goulburn Valley Water
	Bulk Entitlement (Eildon – Goulburn Weir) Conversion Order 1995	Goulburn–Murray Water
	Environmental Entitlement (Goulburn System – Living Murray) 2007	Victorian Environmental Water Holder
	Bulk Entitlement (Euroa System) Conversion Order 2001	Goulburn Valley Water
	BE (Goulburn Channel System – CW) Order 2012	Coliban Water
	BE (Goulburn Channel System – GVW) Order 2012	Goulburn Valley Water
	BE (Goulburn River – GVW) Order 2012	Goulburn Valley Water
	Goulburn River Environmental Entitlement 2010	Victorian Environmental Water Holder
	Bulk Entitlement (Goulburn System – City West Water) Order 2012	City West Water
	Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012	Victorian Environmental Water Holder
	Bulk Entitlement (Goulburn System – Snowy Environmental Reserve) Order 2004	Victorian Environmental Water Holder
	Bulk Entitlement (Goulburn System – South East Water) Order 2012	South East Water
	Bulk Entitlement (Goulburn System – Yarra Valley Water) Order 2012	Yarra Valley Water
	Bulk Entitlement (Longwood) Conversion Order 1995	Goulburn Valley Water
	Bulk Entitlement (Mansfield) Conversion Order 1995	Goulburn Valley Water
	Bulk Entitlement (Marysville) Conversion Order 1995	Goulburn Valley Water
	Bulk Entitlement (Pyalong) Conversion Order 1997	Goulburn Valley Water
	Bulk Entitlement (Quambatook – Grampians Wimmera Mallee Water) Order 2006	Grampians Wimmera Mallee Water
	Bulk Entitlement (Rubicon – Southern Hydro Ltd) Conversion Order 1997	AGL Hydro Ltd
	Silver and Wallaby Creeks Environmental Entitlement 2006	Victorian Environmental Water Holder
	Bulk Entitlement (Silver & Wallaby Creeks – Melbourne Water for City West Water Limited) Conversion Order 2006	City West Water
	Bulk Entitlement (Silver & Wallaby Creeks – Melbourne Water for South East Water Limited) Conversion Order 2006	South East Water
	Bulk Entitlement (Silver & Wallaby Creeks – Melbourne Water for Yarra Valley Water Limited) Conversion Order 2006	Yarra Valley Water
	Bulk Entitlement (Strathbogie) Conversion Order 2012	Goulburn Valley Water
	Bulk Entitlement (Thornton) Conversion Order 1995	Goulburn Valley Water
	Bulk Entitlement (Upper Delatite) Conversion Order 1995	Goulburn Valley Water
	Bulk Entitlement (Violet Town) Conversion Order 1997	Goulburn Valley Water
	Bulk Entitlement (Woods Point) Conversion Order 1995	Goulburn Valley Water
	Bulk Entitlement (Yea) Conversion Order 1997	Goulburn Valley Water
Campaspe	*Bulk Entitlement (Axedale Goornong and Rochester) Conversion Order 1999*	Coliban Water
	Campaspe River Environmental Entitlement 2013	Victorian Environmental Water Holder
	Bulk Entitlement (Campaspe System – Coliban Water) Conversion Order 1999	Coliban Water
	Bulk Entitlement (Campaspe System – Goulburn Murray Water) Conversion Order 2000	Goulburn–Murray Water
	Environmental Entitlement (Campaspe River – Living Murray Initiative) 2007	Victorian Environmental Water Holder
	Bulk Entitlement (Trentham) Conversion Order 2012	Coliban Water
	Bulk Entitlement (Woodend) Conversion Order 2004	Western Water
Loddon	*Environmental Entitlement (Birch Creek – Bullarook System) 2009*	Victorian Environmental Water Holder
	Bulk Entitlement (Bullarook System – Central Highlands Water) Conversion Order 2009	Central Highlands Water
	Bulk Entitlement (Bullarook System – Goulburn Murray Water) Conversion Order 2009	Goulburn–Murray Water
	Bulk Entitlement (Creswick) Conversion Order 2004	Central Highlands Water
	Bulk Entitlement (Daylesford – Hepburn Springs) Conversion Order 2004	Central Highlands Water

Appendix D: Bulk entitlement holders

River basin	Entitlements	Holder
	Bulk Entitlement (Evansford-Talbot System – Part Maryborough – Central Highlands Water) Conversion Order 2006	Central Highlands Water
	Bulk Entitlement (Lexton) Conversion Order 2004	Central Highlands Water
	Bulk Entitlement (Loddon River – Environmental Reserve) Order 2005	Victorian Environmental Water Holder
	Bulk Entitlement (Loddon System – Coliban Water) Conversion Order 2005	Coliban Water
	Bulk Entitlement (Loddon System – Goulburn Murray Water) Conversion Order 2005	Goulburn–Murray Water
	Bulk Entitlement (Loddon System – Part Maryborough – Central Highlands Water) Conversion Order 2005	Central Highlands Water
East Gippsland	*Bulk Entitlement (Bemm River) Conversion Order 1997*	East Gippsland Water
	Bulk Entitlement (Cann River) Conversion Order 1997	East Gippsland Water
	Bulk Entitlement (Mallacoota) Conversion Order 1997	East Gippsland Water
Snowy	*Bulk Entitlement (Buchan) Conversion Order 1997*	East Gippsland Water
	Bulk Entitlement (Orbost System) Conversion Order 1997	East Gippsland Water
Tambo	*Bulk Entitlement (Nowa Nowa) Conversion Order 1997*	East Gippsland Water
	Bulk Entitlement (Swifts Creek) Conversion Order 1997	East Gippsland Water
Mitchell	*Bulk Entitlement (Bairnsdale) Conversion Order 2000*	East Gippsland Water
Thomson	*Macalister River Environmental Entitlement 2010*	Victorian Environmental Water Holder
	Bulk Entitlement (Thomson Macalister – Southern Rural Water) Conversion Order 2001	Southern Rural Water
	Bulk Entitlement (Thomson Macalister Towns – Gippsland Water) Conversion Order 2005	Gippsland Water
	Transfer of Bulk Entitlement (Thomson River – Melbourne Water Corporation) Conversion Order 2001 to City West Water Limited 2006	Melbourne Water
	Transfer of Bulk Entitlement (Thomson River – Melbourne Water Corporation) Conversion Order 2001 to South East Water Limited 2006	Melbourne Water
	Transfer of Bulk Entitlement (Thomson River – Melbourne Water Corporation) Conversion Order 2001 to Yarra Valley Water Limited 2006	Melbourne Water
	Bulk Entitlement (Thomson River – Environment) Order 2005	Victorian Environmental Water Holder
Latrobe	*Blue Rock Environmental Entitlement 2013*	Victorian Environmental Water Holder
	Bulk Entitlement (Boolarra) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Gippsland Water – Blue Rock) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Erica) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Latrobe – Southern Rural) Conversion Order 1996	Southern Rural Water
	Latrobe Lower Wetlands Environmental Entitlement 2010	Victorian Environmental Water Holder
	Bulk Entitlement (Mirboo North) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Moe – Narracan Creek) Conversion Order 1998	Gippsland Water
	Bulk Entitlement (Moondarra Reservoir) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Noojee) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Thorpdale) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Latrobe – Loy Yang B) Conversion Order 1996	Southern Rural Water
	Bulk Entitlement (Latrobe – Loy Yang A) Conversion Order 1996	AGL Loy Yang Partnership
	Bulk Entitlement (Latrobe – Loy Yang 3/4 Bench) Conversion Order 1996	Minister for Environment and Climate Change (on behalf of Victorian Government)
	Bulk Entitlement (Latrobe – Yallourn) Conversion Order 1996	TRUEnergy
	Bulk Entitlement (Latrobe Reserve) Order 2013	Gippsland & Southern Rural Water
South Gippsland	*Bulk Entitlement (Devon North Alberton – Yarram and Port Albert) Conversion Order 1997*	South Gippsland Water
	Bulk Entitlement (Dumbalk) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Fish Creek) Conversion Order 1997	South Gippsland Water

River basin	Entitlements	Holder
	Bulk Entitlement (Foster) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Korumburra) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Leongatha) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Loch, Poowong and Nyora) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Meeniyan) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Desalinated Water – City West Water Limited) Order 2010	Melbourne Water
	Bulk Entitlement (Desalinated Water – South East Water Limited) Order 2010	Melbourne Water
	Bulk Entitlement (Desalinated Water – Yarra Valley Water Limited) Order 2010	Melbourne Water
	Bulk Entitlement (Seaspray) Conversion Order 1997	Gippsland Water
	Bulk Entitlement (Toora Port Franklin – Welshpool and Port Welshpool) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Westernport) Conversion Order 1997	Westernport Water
	Bulk Entitlement (Westernport – Bass River) Order 2009	Westernport Water
	Bulk Entitlement (Wonthaggi – Inverloch) Conversion Order 1997	South Gippsland Water
Bunyip	*Tarago and Bunyip Rivers Environmental Entitlement 2009*	Victorian Environmental Water Holder
	Bulk Entitlement (Tarago River – Gippsland Water) Conversion Order 2009	Gippsland Water
	Bulk Entitlement (Tarago River – Southern Rural Water) Conversion Order 2009	Southern Rural Water
	Bulk Entitlement (Tarago and Bunyip Rivers – Melbourne Water for City West Water Limited) Conversion Order 2009	Melbourne Water
	Bulk Entitlement (Tarago and Bunyip Rivers – Melbourne Water for South East Water Limited) Conversion Order 2009	Melbourne Water
	Bulk Entitlement (Tarago and Bunyip Rivers – Melbourne Water for Yarra Valley Water Limited) Conversion Order 2009	Melbourne Water
Yarra	*Bulk Entitlement (Melbourne Headworks System – Barwon Water) Order 2010*	Barwon Water
	Bulk Entitlement (Melbourne Headworks System – South Gippsland Water) Order 2010	South Gippsland Water
	Bulk Entitlement (Melbourne Headworks System – Western Water) Order 2010	Western Water
	Bulk Entitlement (Melbourne Headworks System – Westernport Water) Order 2010	Westernport Water
	Bulk Entitlement (Yarra River – Melbourne Water for City West Water Limited) Conversion Order 2006	Melbourne Water
	Bulk Entitlement (Yarra River – Melbourne Water for South East Water Limited) Conversion Order 2006	Melbourne Water
	Bulk Entitlement (Yarra River – Melbourne Water for Yarra Valley Water Limited) Conversion Order 2006	Melbourne Water
	Bulk Entitlement (Yarra Environment Entitlement) 2006	Victorian Environmental Water Holder
Maribyrnong	*Bulk Entitlement (Gisborne – Barringo Creek) Conversion Order 2004*	Western Water
	Bulk Entitlement (Lancefield) Conversion Order 2001	Western Water
	Bulk Entitlement (Macedon and Mount Macedon) Conversion Order 2004	Western Water
	Bulk Entitlement (Maribyrnong – Melbourne Water) Conversion Order 2000	Melbourne Water
	Bulk Entitlement (Maribyrnong – Southern Rural Water) Conversion Order 2000	Southern Rural Water
	Bulk Entitlement (Maribyrnong – Western Water) Conversion Order 2000	Western Water
	Bulk Entitlement (Riddells Creek) Conversion Order 2001	Western Water
	Bulk Entitlement (Romsey) Conversion Order 2001	Western Water
Werribee	*Bulk Entitlement (Ballan) Conversion Order 1998*	Central Highlands Water
	Bulk Entitlement (Blackwood and Barry's Reef) Conversion Order 1998	Central Highlands Water
	Bulk Entitlement (Myrniong) Conversion Order 2004	Western Water
	Werribee River Environment Entitlement 2011	Victorian Environmental Water Holder
	Bulk Entitlement (Werribee System – Irrigation) Conversion Order 1997	Southern Rural Water
	Bulk Entitlement (Werribee System – Western Water) Conversion Order 2004	Western Water
Moorabool	*Bulk Entitlement (Lal Lal – Barwon) Conversion Order 1995*	Barwon Water

Appendix D: Bulk entitlement holders

River basin	Entitlements	Holder
	Bulk Entitlement (Lal Lal – Central Highlands) Conversion Order 1995	Central Highlands Water
	Bulk Entitlement (Meredith) Conversion Order 1995	Barwon Water
	Moorabool River Environment Entitlement 2010	Victorian Environmental Water Holder
	Bulk Entitlement (She Oaks) Conversion Order 1995	Barwon Water
	Bulk Entitlement (Upper East Moorabool System) Conversion Order 1995	Barwon Water
	Bulk Entitlement (Upper West Moorabool System) Conversion Order 1995	Central Highlands Water
Barwon	*Barwon River Environmental Entitlement 2011*	Victorian Environmental Water Holder
	Bulk Entitlements (Upper Barwon System) Conversion Order 2002	Barwon Water
	Bulk Entitlement (Yarrowee-White Swan System) Conversion Order 2002	Central Highlands Water
Otway Coast	*Bulk Entitlement (Aireys Inlet) Conversion Order 1997*	Barwon Water
	Bulk Entitlement (Apollo Bay) Order 2010	Barwon Water
	Bulk Entitlement (Colac) Amendment Order 2003	Barwon Water
	Bulk Entitlement (Gellibrand) Conversion Order 1997	Barwon Water
	Bulk Entitlement (Lorne) Conversion Order 1997	Barwon Water
	Bulk Entitlement (Otway System) Conversion Order 1998	Wannon Water
Hopkins	*Bulk Entitlement (Beaufort) Conversion Order 2005*	Central Highlands Water
	Bulk Entitlement (Skipton) Conversion Order 2005	Central Highlands Water
Glenelg	*Bulk Entitlement (Coleraine, Casterton, Sandford) Conversion Order 1997*	Wannon Water
	Bulk Entitlement (Dunkeld System) Conversion Order 1997	Wannon Water
	Bulk Entitlement (Glenthompson) Conversion Order 1997	Wannon Water
	Bulk Entitlement (Hamilton) Conversion Order 1997	Wannon Water
Wimmera	*Bulk Entitlement (Landsborough – Navarre) Conversion Order 2003*	Central Highlands Water
	Bulk Entitlement (Willaura, Elmhurst and Buangor Systems – GWMWater) Conversion Order 2012	Grampians Wimmera Mallee Water
	Bulk Entitlement (Willaura System – Wannon Water) Conversion Order 2012	Wannon Water
	Bulk Entitlement (Wimmera and Glenelg Rivers – Coliban Water) Conversion Order 2010	Coliban Water
	Bulk Entitlement (Wimmera and Glenelg Rivers – GWMWater) Conversion Order 2010	Grampians Wimmera Mallee Water
	Bulk Entitlement (Wimmera and Glenelg Rivers – Wannon Water) Conversion Order 2010	Wannon Water
	Bulk Entitlement (Wimmera and Glenelg Rivers Environmental Entitlement 2010)	Victorian Environmental Water Holder
Avoca	*Bulk Entitlement (Amphitheatre) Conversion Order 2003*	Central Highlands Water
	Bulk Entitlement (Avoca) Conversion Order 2003	Central Highlands Water
	Bulk Entitlement (Redbank) Conversion Order 2003	Central Highlands Water
Jan Juc GMA	*Bulk Entitlement (Anglesea Groundwater) Order 2009*	Barwon Water

Abbreviations

AWRC	Australian Water Resources Council
CEWH	Commonwealth Environmental Water Holder
CMA	Catchment management authority
DELWP	Department of Environment, Land, Water and Planning
ESC	Essential Services Commission
EWR	Environmental Water Reserve
FMID	First Mildura Irrigation District
GL	Gigalitre
GMA	Groundwater Management Area
GMU	Groundwater management unit
MDBA	Murray–Darling Basin Authority
ML	Megalitre
PCV	Permissible consumptive volume
PWSR	Permanent water saving rules
REALM	Resource allocation model
TCSA	Tertiary confined sand aquifer
UA	Unincorporated area
VEWH	Victorian Environmental Water Holder
WSPA	Water Supply Protection Area

Glossary

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.

Aquitard: An underground layer of clay, silt or rock with low permeability which restricts the movement of groundwater between aquifers.

Basin (river basin): The area of land into which a river and its tributaries drain. In the Victorian Water Accounts, river basins are consistent with those defined by the 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 Murray River downstream of Lake Hume. See also 'river basin'.

Blackwater: Occurs when accumulations of organic matter, such as leaves, twigs and nutrients, decay in wetlands or waterways after being washed in by a flood, drawing oxygen from the water. The water turns to a black colour and can have a very low level of dissolved oxygen, which can cause stress to fish, crayfish and other animals.

Bulk entitlement: The right to water held by water and other authorities defined in the *Water Act 1989*. A 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 a 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.

Cap: A limit placed on the amount of water that can be taken from a system within a given timeframe.

Carryover: Provides the right to take unused allocations at the end of one season into the subsequent season. Carryover 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 runoff 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* for river health; regional and catchment planning and coordination; and waterway, floodplain, salinity and water quality management.

Declared systems: A water system that has been declared in accordance with section 6A of the *Water Act 1989*. Water rights and take and use licences in declared water systems have been converted into unbundled entitlements.

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 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 depend on the environmental condition of the system.

Evaporation: The process by which water changes from a liquid to a gas or vapour.

Evapotranspiration: The sum of transpiration by plants, evaporation from soil and open water surfaces, and evaporation from the wet surfaces of plants soon after rainfall.

Floodplain: Land adjacent to rivers which is subject to overflow during flood events. Floodplains are often valuable for their ecological assets.

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* that is supplied with water by channels and pipelines used mainly for irrigation purposes.

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 by 25 km.

Living Murray: A program to improve the health of the Murray River, 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.

Order (ordering of water): The advance notification given by an entitlement holder to a storage operator to enable the storage operator to regulate water flows so that all entitlement holders' needs can be met at a particular 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 their compliance with these requirements.

Percent full: The volume of water in storage as a percentage of the accessible storage capacity. Note that the percentage full may exceed 100%, for example due to floods.

Permissible consumptive volume (PCV): The total amount of water that can be taken in a GMA under a ministerial declaration.

Potable: Suitable for drinking.

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 EWR.

Ramsar Convention: An international treaty that aims to conserve wetlands which have been listed for their international significance, to ensure they are managed wisely. It was agreed in Ramsar, Iran, in 1971.

REALM model: A computer-based water supply system model used by DELWP to aid the allocation of Victoria's water resources. It is an abbreviation of REsource ALlocation Model.

Recycled water: Water (derived from sewerage systems or industry processes) that is treated to a standard 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 the sea, a lake, a marsh or another river.

River basin: The land into which a river and its tributaries drain. See also 'basin'.

Seasonal allocation: An irrigator's share of the water available for an irrigation season, determined by a water corporation and expressed as a percentage of the irrigator's water share. It is sometimes shortened to 'allocation'.

Sewage: The waterborne wastes of a community.

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.

Snowy Water Inquiry: The Snowy Water Inquiry was established under *Snowy Hydro Corporatisation Act 1997* (NSW). This inquiry identified and analysed a number of options to mitigate the impact of the Snowy Scheme on environmental flows.

South Australia/Victoria Designated Area: Area extending 20 km either side of the border between South Australia and Victoria, as set out under the *Groundwater (Border Agreement) Act 1985*, established for the cooperative management and equitable sharing of groundwater resources between the states.

Spill: An uncontrolled flow of water past a reservoir or a weir.

Stream: A body of water flowing in a bed, river or brook.

Stream Flow Management Plan: A management plan prepared for a WSPA 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.

Take and use licence: A fixed-term entitlement to take and use water from a waterway, catchment dam, spring, soak or aquifer. Each licence is subject to conditions set by the Minister and specified on the licence.

Terminal lakes: Lakes which form the end point of all surface water flow within a basin.

Transpiration: The process by which water that is absorbed by plants, usually through the roots, is evaporated from the plant surface into the atmosphere.

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 GMA or a WSPA.

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 the same as 'use' by the end consumer of the water.

Wastewater: 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. They were 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 share: A legally recognised, secure share of the water available to be taken from a declared water system. Water shares were created as part of the unbundling reforms. Water shares may be high reliability or low reliability, and are specified as a maximum volume of seasonal allocation that may be made against that share.

Water Supply Protection Area (WSPA): 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.