Victorian Water Accounts

2014—2015

A statement of Victorian water resources

VICTORIA State Government | Environment, Land, Water and Planning

Victorian Water Accounts 2014–2015

A statement of Victorian water resources

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

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Foreword

Our water resources are precious but fragile. Climate change, drought and population growth all impact water supply, potentially affecting Victoria's environment and liveability.

Over the past twenty years many catchments in Victoria have recorded large reductions in streamflow. Over the same period there have been significant reductions in the amount of rainfall we have received during the cooler months of the year, a trend that climate scientists have linked to increasing greenhouse gas concentrations in the atmosphere. Our climate is changing, and climate scientists expect that climate change will result in an increase in the occurrence of drier than average years in Victoria. For the 2014–15 year, both rainfall and streamflow were below average across most of Victoria.

The Victorian Government is committed to ensuring our water resources are managed efficiently to meet these challenges. Knowing how water is supplied, stored and used helps us to plan for effective management. It is important that Victorians have the information they need to manage their own water use.

That is why the annual Victorian Water Accounts are such an important resource. The accounts have documented key water management data since 2003, providing an insight into water availability, entitlement, distribution and use across Victoria.

This valuable information helps ensure we 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 show the volume of surface water, groundwater and recycled water available in 2014–15 was 17,300 GL, compared to 21,300 GL in the previous year. Of the water available in 2014–15, 4,000 GL of surface water was taken for consumptive purposes, while 4,400 GL was taken in 2013–14. Lower water availability was observed in most parts of the state, for example, in the Goulburn river basin, where total streamflow was 1,700 GL compared to 2,400 GL in the previous year.

Victoria's water resources are limited and highly variable in response to seasonal conditions and climatic trends. Clear water entitlements, proper water accounting and a robust water market are critical for providing water users with certainty in investment and flexibility in water management. The water market was particularly active in 2014–15, with the highest volume of allocation trade on record.

The information collected for the Victorian Water Accounts is taken from the Victorian Water Register (waterregister.vic.gov.au), which tracks water from where it is extracted to its end use.

Victoria already has a strong water market and entitlement framework. By collecting and sharing the information we have about our water supplies we can be sure these frameworks remain strong throughout the challenges of the future.

THE HON LISA NEVILLE

Minister for Water

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About the Victorian Water Accounts 2014–2015

The *Victorian Water Accounts 2014–2015* is the twelfth report 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 2014–2015* 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 2014–2015* 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.

Dry conditions across Victoria

The 2014–15 year was drier than average, with below average rainfall across most of the state, and some average to above average conditions in the easternmost regions. Winter and spring of 2014 were warmer and drier than usual. The following summer was warm, with some rainfall relief in the east of the state but dry conditions in the west, and the autumn of 2015 was cooler than average but also had reduced rainfall.

The warm, dry conditions led to a higher than average proportion of rainfall leaving the catchments by evapotranspiration. This combination of low rainfall and high evapotranspiration led to reduced streamflow, with Victoria's total streamflow for the year reaching only 61% of the long term average.

Despite lower rainfall, it was not necessary for water corporations to apply any urban water restrictions during the year, and no water carting was recorded.

In groundwater catchments, water level trends in 2014–15 remained similar to those in 2013–14. Generally, groundwater systems respond more slowly to short term climate conditions, compared to surface water systems.

Water availability was reduced

A total of 17,239,478 ML of surface water, groundwater and recycled water was available during the 2014–15 year. This is lower than the 21,328,836 ML available in 2013–14. The reduction in available water is mainly due to reduced surface water volumes, attributable to below average rainfall conditions.

Storage levels began the year at 68% of capacity, but the use during the year was not completely compensated for by rainfall, leaving storages at the end of the year lower than they began at 56%. The storages remained above the low levels experienced during the driest years of the past decade.

Water recycled, both in terms of the volume of water recycled and that volume as a proportion of total wastewater, has been gradually increasing in Victoria since 2010-11. However, it has not reached the levels seen during the last drought, when extremely low water availability increased the demand for recycled water dramatically.

Water share holders in northern Victoria received similar allocations in 2014–15 to those in 2013–14, with all systems reaching 100% allocation against high-reliability water shares, and 100% allocation to low-reliability water shares in the Broken and Bullarook systems. The Campaspe system was an exception, receiving no allocation against low-reliability water shares compared to 46% for 2013–14.

Surface water use increased

Statewide, 4,426,512 ML of water was taken for consumptive applications in 2014–15. This volume represents approximately 27% of the total water available during the year, higher than the 21% in 2013–14. The increase in volume taken is likely a result of lower rainfall this year, resulting in higher demand for irrigation water.

Groundwater use increased in 2014–15, with Victorian water users extracting 404,974 ML of groundwater during 2014–15, compared to 329,360 ML in 2013–14. Recycled water use was also similar, with 91,257 ML taken in 2014–15 compared to 90,612 ML in 2013–14. The main increase was in surface water consumption, where 4,001,971 ML was taken in 2014–15, compared to 3,961,489 ML in 2013–14.

In 2014–15, the Victorian Environmental Water Holder (VEWH) oversaw the delivery of 645,767 ML of water to 73 river reaches and 56 wetlands, providing significant benefit to a wide range of water-dependent plants and animals. This is fewer sites than the 2013–14 year, because the environmental watering program was adapted to meet the generally dry conditions. A number of wetlands had entered a drying regime and did not require watering in the 2014–15 year.

Updated surface water entitlements

There were significant changes to the bulk entitlement arrangement supplied by the Greater Yarra System – Thomson River Pool. Under the new arrangements, Melbourne Water holds the right to harvest water for its headworks system from the Thomson River, Yarra River, Silver and Wallaby Creeks and Tarago and Bunyip Rivers. Water is then provided via seasonal determinations to Primary Entitlement Holders (Barwon Water, City West Water, South East Water, South Gippsland Water, Western Water, Westernport Water and Yarra Valley Water).

A further six bulk entitlement amendments took effect during the year. Gippsland Water's entitlement in Blue Rock Reservoir increased from 15,150 ML to 20,000 ML. Grampians Wimmera Mallee Water's recreational water entitlement increased by 500 ML. North East Water's Porepunkah bulk entitlement was repealed and its volume transferred to the Bright entitlement, to reflect the construction of a new off stream storage at Freeburgh. South Gippsland water's bulk entitlements for supply to Korrumburra and Leongatha were amended, allowing South Gippsland Water to have access to up to 1,800 ML of water from the Tarwin River for Korumburra.

Lower Murray Water's irrigation bulk entitlement was amended to reflect the transfer of the second instalment of water shares for Sunraysia Modernisation Project to the Commonwealth Environmental Water Holder. Goulburn Murray Water also had two bulk entitlements amended, to enable the transfer of the fifth instalment of water shares to be transferred to the Commonwealth Environmental Water Holder.

Groundwater management changes

A number of Groundwater Management Units (GMUs) were abolished or approved during the 2014–15 year. The Nullaware and Yangery Water Supply Protection Areas (WSPAs) were revoked during the year, as were the Hawkesdale and Heywood GMAs. In their place, the South West Limestone Groundwater Management Area (GMA) was approved. The revoked GMUs were originally designed based on surface attributes rather than the groundwater system, while the new South West Limestone GMA is based on the aquifer system and will provide a more consistent approach to the groundwater resources in the area.

In the 2013–14 year, the Shepparton Irrigation WSPA was revoked, with the new plan for the Shepparton Irrigation GMA approved in June 2015.

Part 1:
Overview of Victorian water resources 2014–15

Part 1 of the *Victorian Water Accounts 2014–15 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.

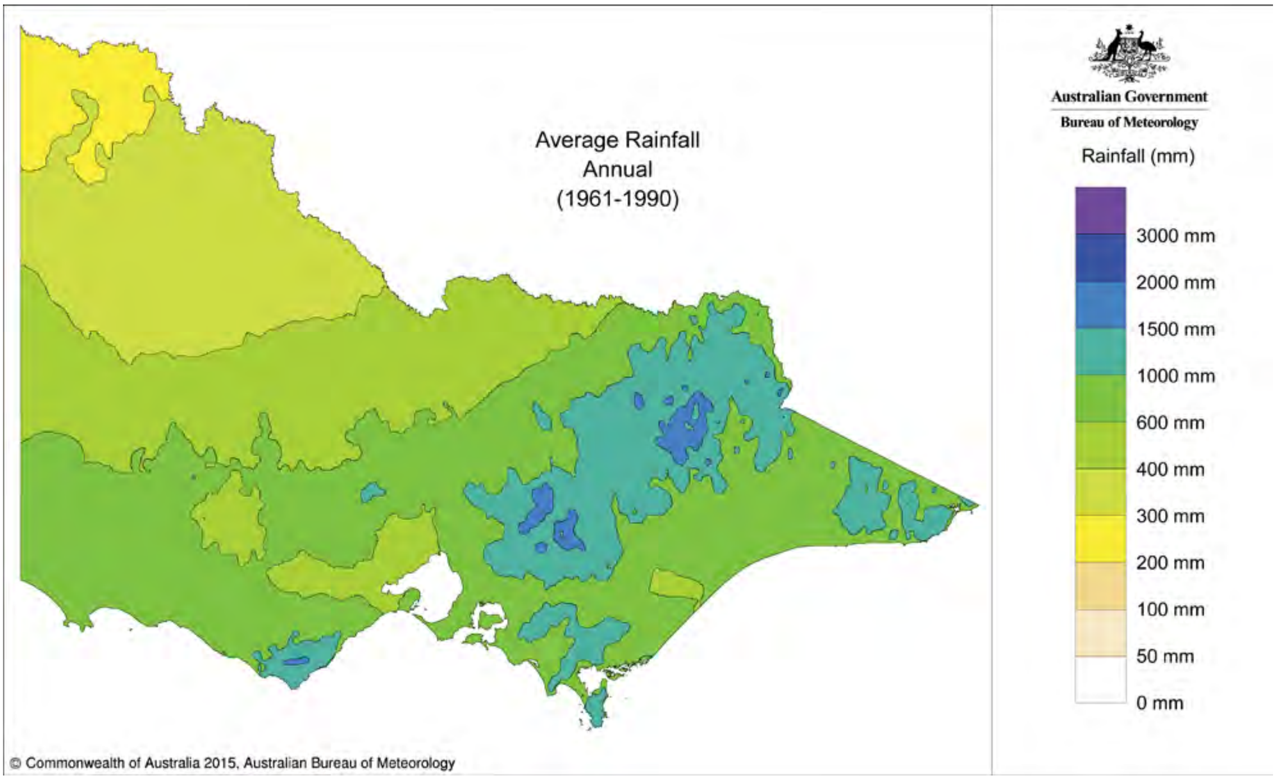
1 Water availability

This chapter presents an overview of surface water and groundwater availability in Victoria in 2014–15. 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 (GMAs) and Water Supply Protection Areas (WSPAs).

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, 2014–15 saw below-average rainfall conditions for much of Victoria. Total annual rainfall ranged from 100 to 200 mm in the north-west to 1,200 to 1,800 mm in parts of the Highlands, East Gippsland and Cape Otway (Figure 1-2).

Rainfall for 2014–15 was categorised as below average across most of Victoria (Figure 1-3), generally ranging between 40% and 100% of the long-term average (Figure 1-4). Rainfall in East Gippsland and parts of central Gippsland were above average (Figure 1-3), with up to 125% of the long term average (Figure 1-4). Large areas in the south west of the state were very dry, with the lowest rainfall on record (Figure 1-3).

Below average rainfall across the state was reflected in the statewide evapotranspiration rate, which was 469 mm in 2014–15. This is about 14% below the long term average evapotranspiration rate (1961 to 1990). The difference between the long term average and modelled evapotranspiration for 2014–15 was greatest in the north west of the state, where evapotranspiration was up to 35% below the long term average. In the south east of the state, where rainfall deficiencies were not as severe, the evapotranspiration estimates were more similar to the long term average. Across the state, evapotranspiration represented a higher than average proportion of rainfall. As a result, less rainfall was available for streamflow and groundwater recharge (Appendix A).

Figure 1-2 Victorian rainfall in 2014–15 (mm)

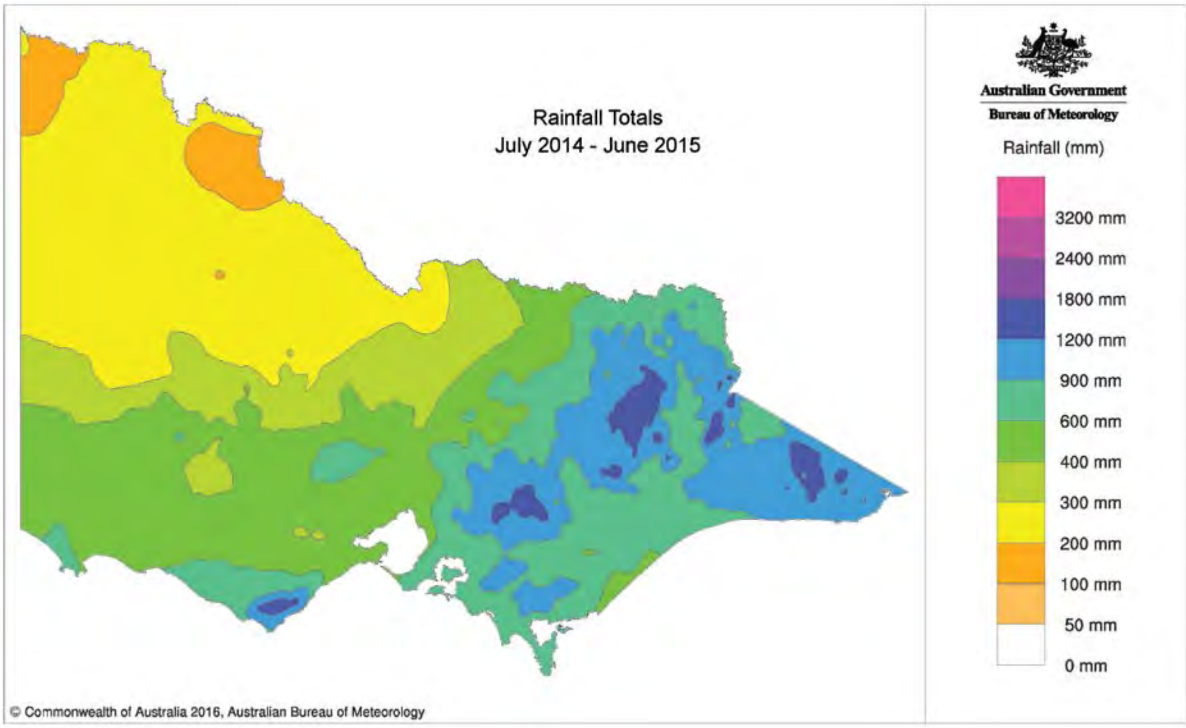


Figure 1-3 Victorian rainfall deciles in 2014–15

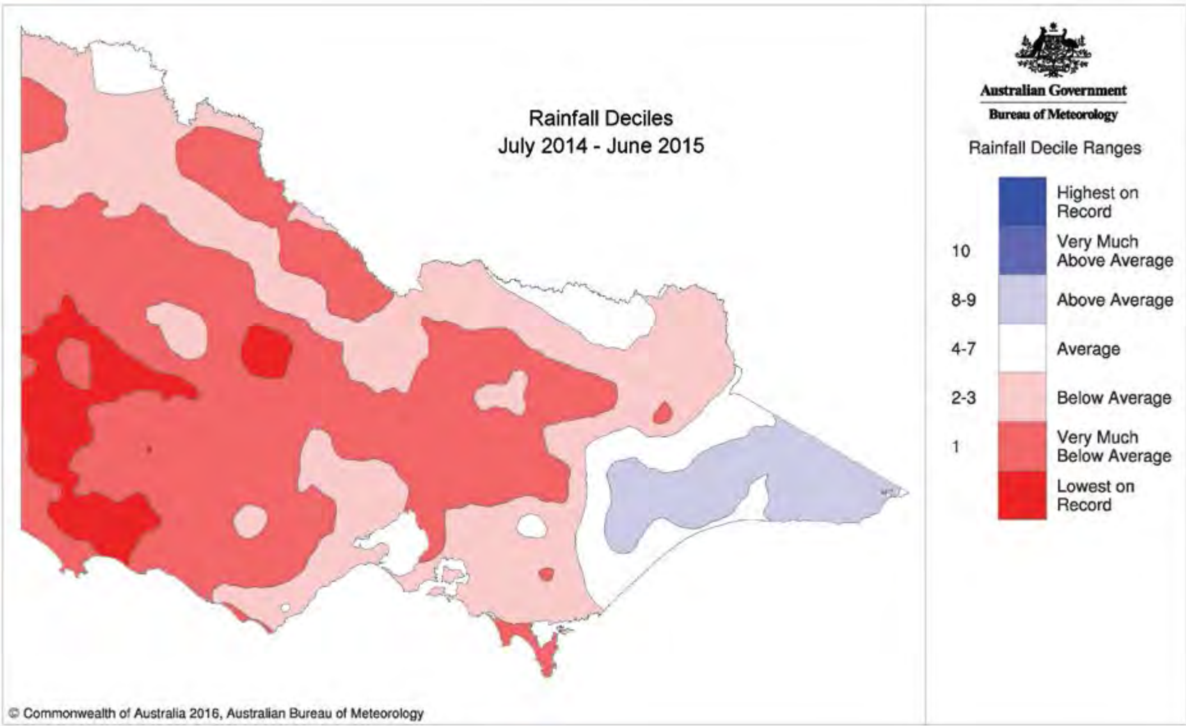
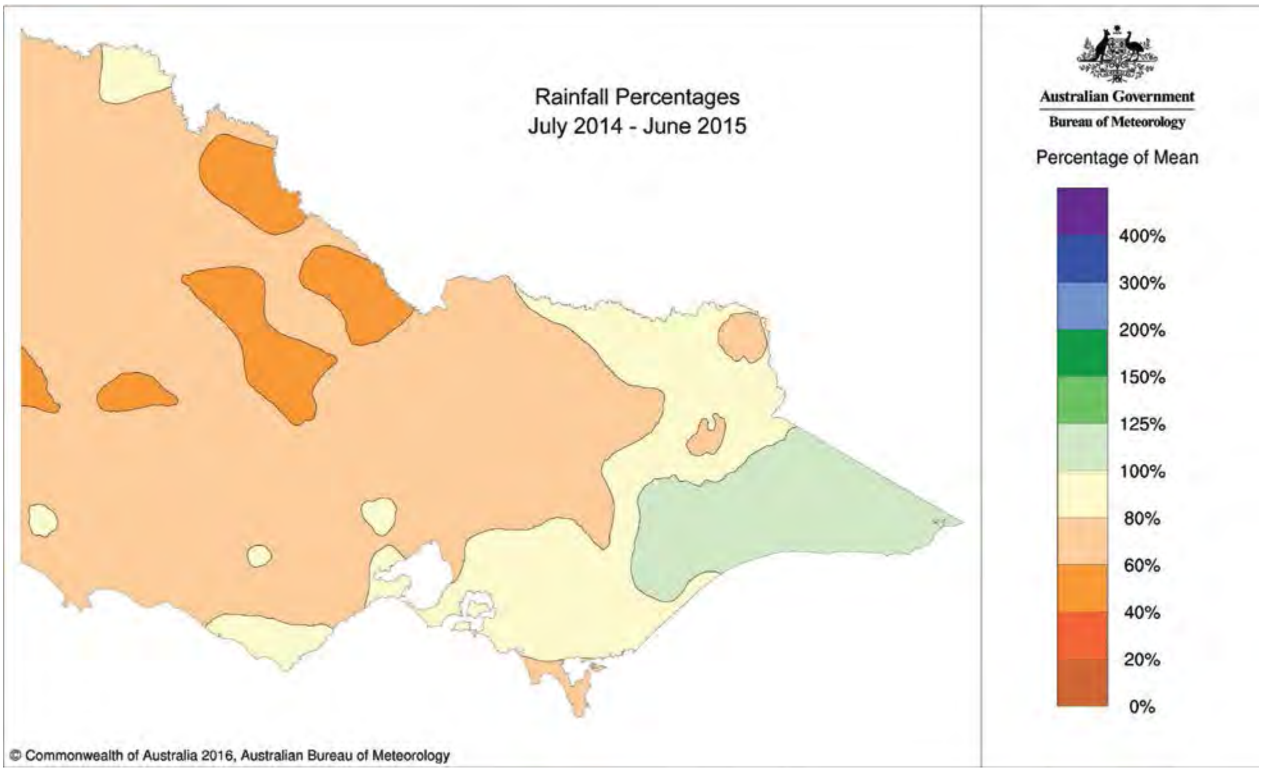


Figure 1-4 Victorian rainfall in 2014–15 as a percentage of long-term average rainfall



Victoria's below-average rainfall for 2014–15 was reflected in winter and spring 2014 and autumn 2015 rainfall totals. Summer 2014–15 was the exception with most of the state receiving average rainfall totals.

Rainfall in the winter of 2014 (Figure 1-5 A) was average to above-average across the south west of Victoria and Gippsland. In the northern parts of the state, most areas received below average or very much below average rainfall. Rainfall deficiencies were the most severe in the Mallee and North Central regions.

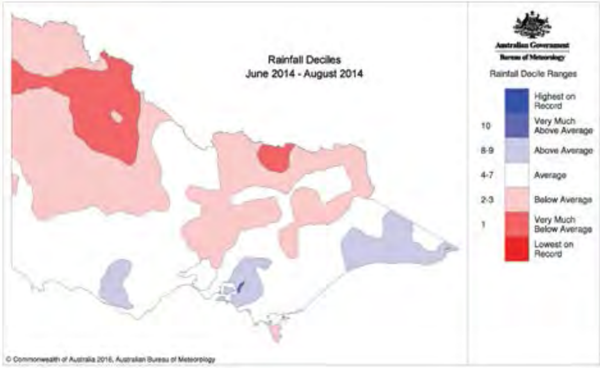
Spring rainfall (Figure 1-5 B) was below average to very much below average for the western half of the state. Most of the east was average to below average, though East Gippsland received above average rainfall. For 2014–15 many stations recorded the driest spring in 20 years or more.

Summer rainfall (Figure 1-5 C) across most of the state was average to above average. Small areas in the central and lower Murray regions received below average rainfall, while East Gippsland received very much above average rainfall. Rainfall varied greatly over the summer months. In December, the east of the state received some very high daily rainfall totals while the west remained dry. January began very dry, but severe thunderstorms delivered above average rainfall to the western and central regions. Rainfall for February was close to or below average, but severe thunderstorms towards the end of the month delivered some high rainfall across the state.

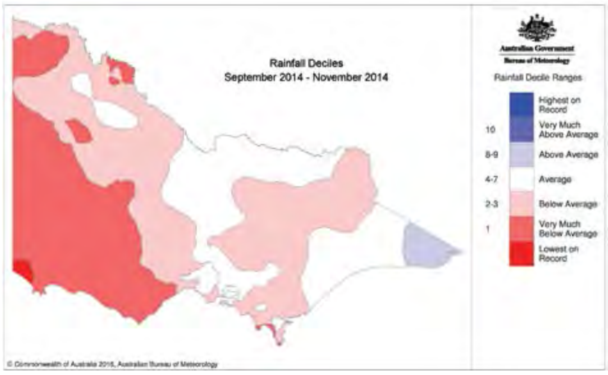
Conditions in autumn 2015 (Figure 1-5 D) were average to drier than average for most of the state. Cape Otway, East Gippsland, and small parts of the north east and north west were the exception receiving above average rainfall. In East Gippsland, three sites recorded their highest daily autumn rainfall totals during heavy rain on 8 April. Overall, state wide rainfall was 19.3% below the long term average for autumn.

Figure 1-5 Victorian seasonal rainfall deciles in 2014–15

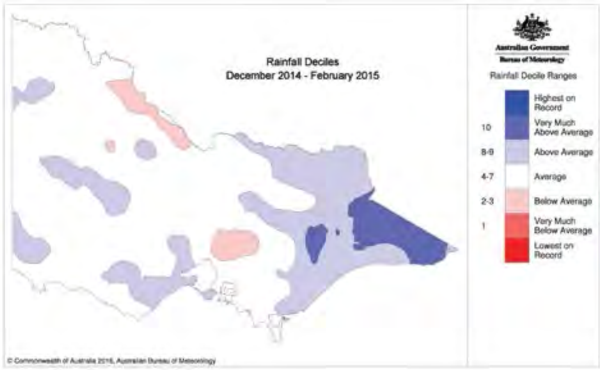
A. Rainfall deciles for winter 2014



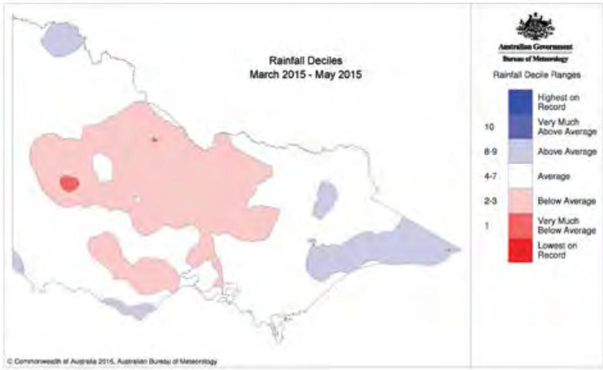
B. Rainfall deciles for spring 2014



C. Rainfall deciles for summer 2014–15



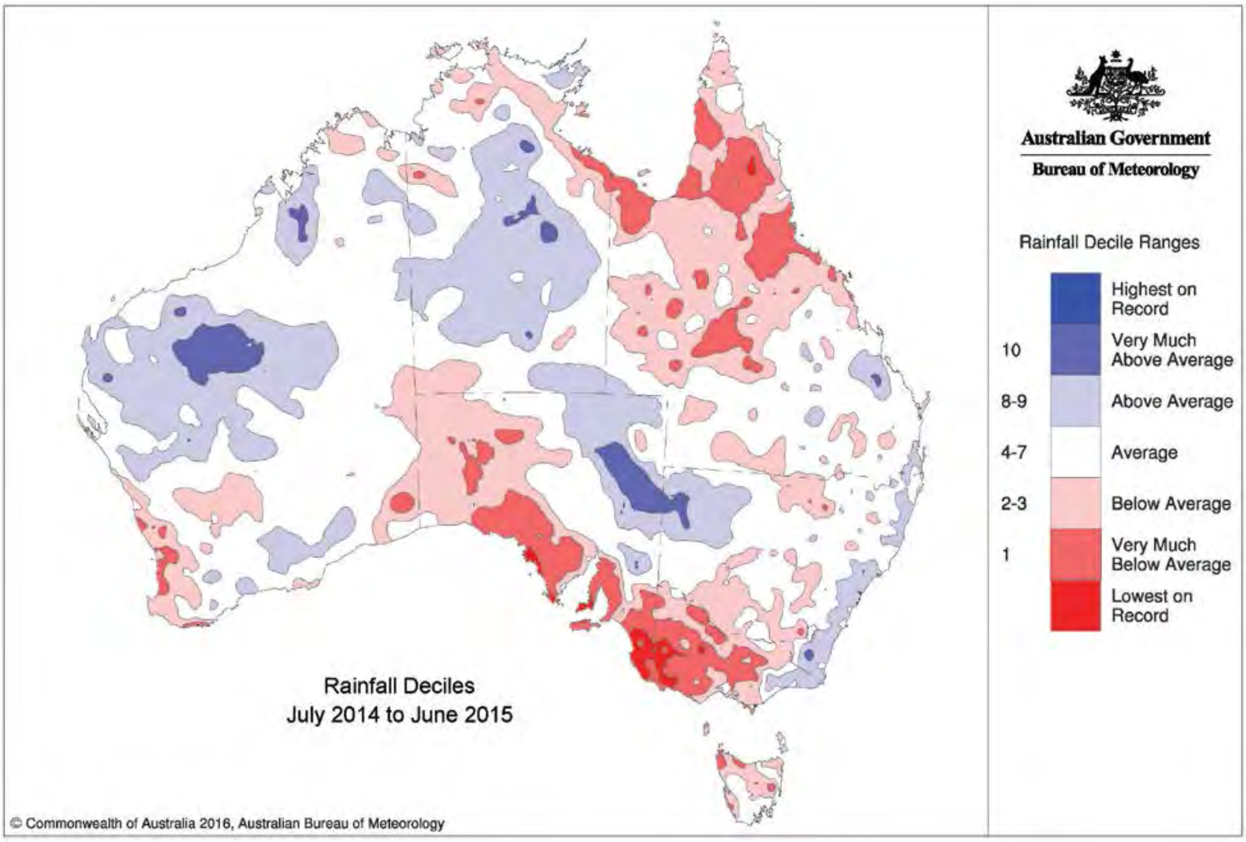
D. Rainfall deciles for autumn 2015



Victoria's below-average year of rainfall was also received by much of South Australia and Queensland. While Victoria generally received very much below-average rainfall in 2014–15, the average across Australia was closer to the long term average in 2014–15 (Figure 1-6).

The El Niño-Southern Oscillation (ENSO) was neutral through 2014, with the Bureau of Meteorology declaring the development of an El Niño event in late Autumn 2015. The Bureau of Meteorology categorised weather patterns in eastern Australia to be El Niño-like for spring 2014, with warmer and drier than average conditions, spring heatwaves, and early fire weather conditions in the southeast. At this time, conditions in the tropical Pacific Ocean were presenting signs of a developing El Niño, however weak coupling with the atmosphere occurred, leading to a "near miss" rather than an El Niño event. In autumn 2015, atmospheric indicators consolidated and an El Niño event developed.

Figure 1-6 Australian rainfall deciles, 1 July 2014 to 30 June 2015



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 2014–15, 23 out of 29 surface water basins had annual streamflow volumes lower than those received in 2013–14 (Table 1-1). When compared to the long term annual average streamflow, 26 basins had below average streamflow for 2014–15. Overall, the total annual streamflow volume for Victoria was 61% of the long-term average (Table 1-1). This a significant drop from the 76% of the long term average reported for 2013–14.

The driest basins for 2014–15 were the Wimmera and Avoca receiving only 16% and 17% of the long term average streamflow respectively. Other basins in the north of the state, including, the Loddon, Campaspe, Goulburn. Broken, Murray, Ovens and Kiewa, received between 26% (Campaspe) and 70% (Kiewa) of the long term average annual streamflow.

The highest yielding river basins relative to their long-term annual averages were all in the east, with East Gippsland recording 190%, Snowy 151% and Tambo 113%. Other Gippsland basins, the Mitchell, Thomson, South Gippsland, Latrobe and Bunyip, had between 66% (Thomson) and 92% (Bunyip) of the long term annual average streamflow.

The central and south western basins, the Yarra, Maribyrnong, Werribee, Moorabool, Barwon, Corangamite, Otway Coast, Hopkins, Portland Coast, and Glenelg basins, had similar streamflow to the northern basins, receiving between 20% (Maribyrnong) and 75% (Portland Coast) of annual long term average streamflow.

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

Basin	Average annual streamflow (ML)	2014–15 streamflow[1]		2013–14 streamflow[1]	
		(ML)	(% of average)	(ML)	(% of average)
Murray	7,618,000	3,436,013	45%	4,562,480	60%
Kiewa	689,000	482,118	70%	605,828	88%
Ovens	1,758,000	948,433	54%	1,450,612	83%
Broken	308,000	141,401	46%	210,402	68%
Goulburn[2]	3,363,000	1,686,933	50%	2,399,347	71%
Campaspe	352,000	90,292	26%	161,438	46%
Loddon	373,000	120,217	32%	157,132	42%
East Gippsland	714,000	1,359,269	190%	666,465	93%
Snowy[3]	1,022,000	1,544,877	151%	1,110,316	109%
Tambo	297,800	337,832	113%	144,683	49%
Mitchell	884,500	660,176	75%	782,716	88%
Thomson	1,101,760	740,389	67%	718,366	65%
Latrobe	847,400	703,080	83%	789,922	93%
South Gippsland	911,500	726,782	80%	1,361,864	149%
Bunyip	541,000	497,668	92%	854,730	158%
Yarra	1,054,000	597,405	57%	699,325	66%
Maribyrnong	113,000	22,282	20%	43,563	39%
Werribee	102,000	23,922	23%	41,588	41%
Moorabool	97,000	50,588	52%	51,988	54%
Barwon	360,000	106,398	30%	198,475	55%
Corangamite	316,000	147,447	47%	307,353	97%
Otway Coast	884,000	574,875	65%	962,890	109%
Hopkins	635,000	222,928	35%	280,650	44%
Portland Coast	361,000	273,021	76%	571,317	158%
Glenelg	964,000	349,327	36%	599,750	62%
Millicent Coast[4]	0	4	-	4	-
Wimmera	316,400	42,143	13%	92,907	29%
Mallee[4]	0	0	-	0	-
Avoca	136,200	22,507	17%	24,253	18%
Total	**26,119,560**	**15,908,327**	**61%**	**19,850,362**	**76%**

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%
2014-15	**15,908,327**	**61%**

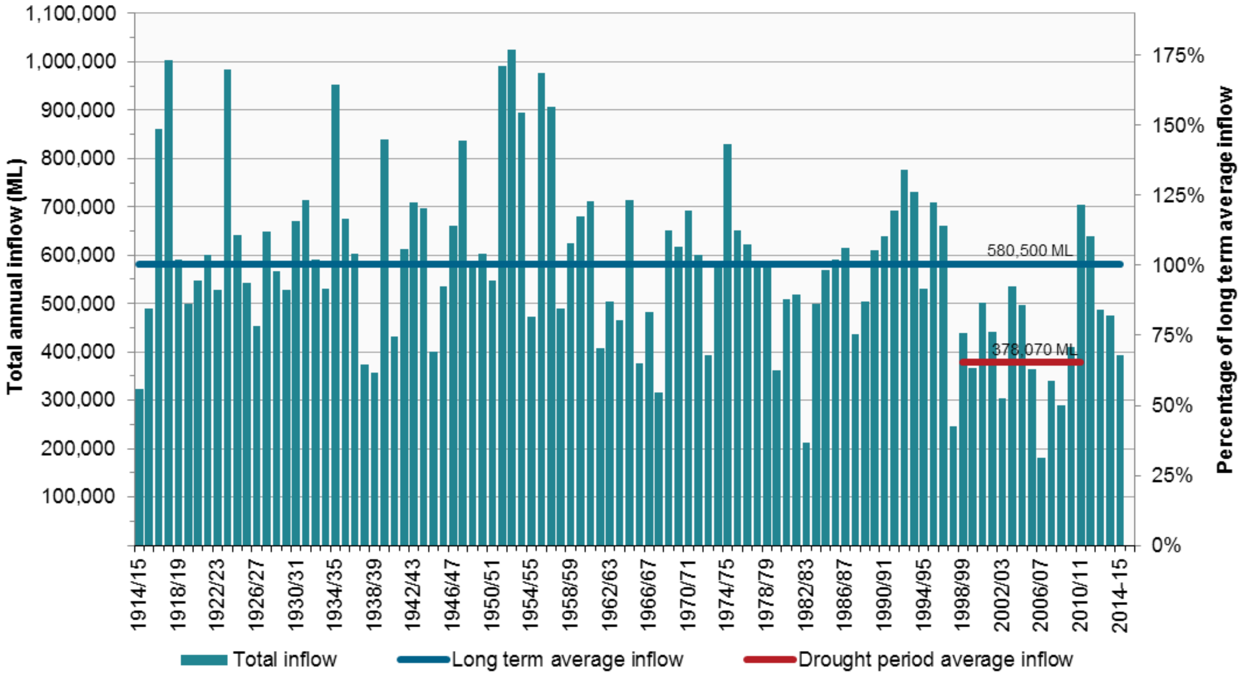
Note:

(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.

Water availability

Streamflows have a major influence on Victoria's water storages (Section 1.3). In line with the below-average annual streamflows presented in Table 1-1 and Table 1-2, the annual inflows to Melbourne's harvesting reservoirs in the Yarra and Thomson basins in 2014–15 were also below the long-term average of the available period of record, and similar to the average inflows of the last drought (Figure 1-7).

Figure 1-7 Annual inflows to Melbourne's main harvesting reservoirs[1]



Note:

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

1.3 Storages

Victoria's major water storages are capable of holding around 12,330,298 ML.The method used to calculate the total capacity of the regional storages, and the state's total storage capacity, has changed in this edition of the *Victorian Water Accounts* compared to the *Victorian Water Accounts 2013-2014*. Using the 2014–2015 method, the capacity in 2013–14 was 12,294,861 ML for the state, 10,482,686 for the regional storages and 1,812,175 ML for Melbourne's storages. Of this, Melbourne's storage capacity is 1,812,175 ML and the combined capacity of the state's major regional storages is 10,518,123 ML.

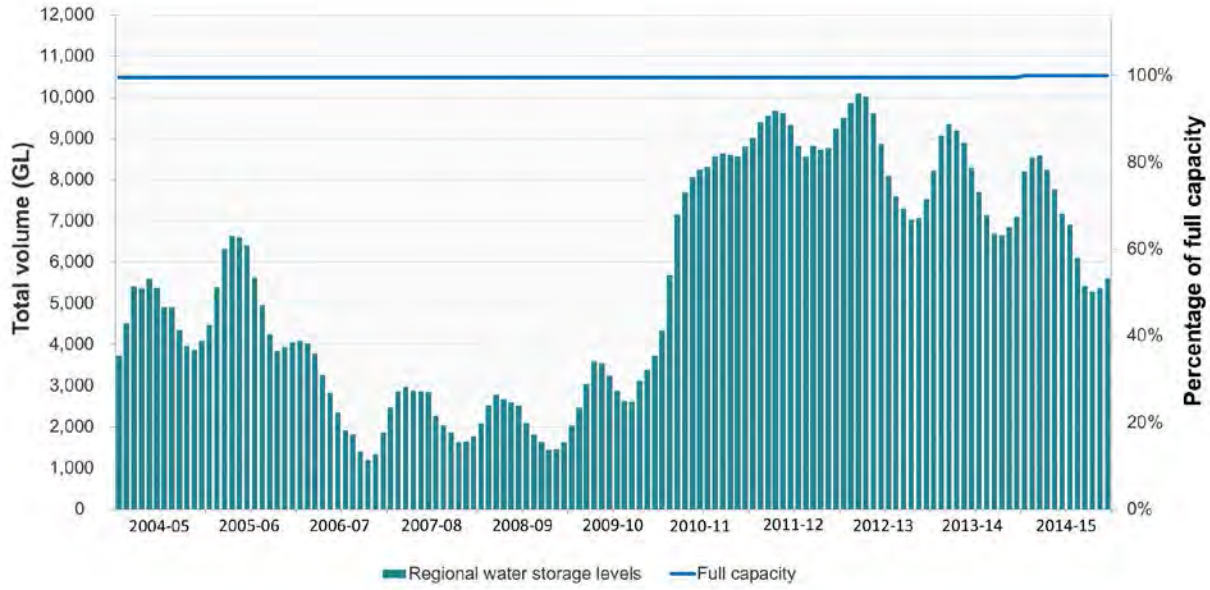
In 2014–15, Victoria's total storage levels started the year at 8,406,534 ML (68% of capacity) and ended at 6,843,461 ML (56.0%). The combined volume of water stored in Victoria's reservoirs varies both within a given year and between years (Figure 1-7 and Figure 1-8).

Storage levels in Victoria's regional reservoirs started the year at 7,090,550 ML (68% of capacity) and ended at 5,605,000 ML (53% of capacity). Storage levels increased during spring, reaching a peak of 82% of capacity in September, and declined through the summer to a minimum of 50% of capacity by April 2015 (Figure 1-8). During the 2014–15 year, the operating capacity of, Rocklands Reservoir, was recalculated and increased by 34,490 ML. Minor revisions were also made to the operating capacities of other storages. This is reflected in the increased total capacity of the regional storages (Figure 1-8).

Melbourne's water storages started the year at 1,315,984 ML (73% of total capacity) and ended at 1,238,461 ML (68% of total capacity), after reaching a peak of 80% in September 2014 (Figure 1-9). Ending the year with lower storage levels than at the start of the year, 2014–15 is in contrast to the four years prior, when Melbourne's storage levels were higher at the end of the year than they were at the start. During the latter years of the Millennium Drought, between 2006 and 2009, storages consistently ended each year at lower levels than they had begun (Figure 1-8).

A subset of about 60 major storages was used to provide the summary information in Figure 1-17 and Figure 1-8. Information on levels held in all major storages across Victoria's surface water basins is set out in Appendix B and in the water balances presented in Chapter 6.

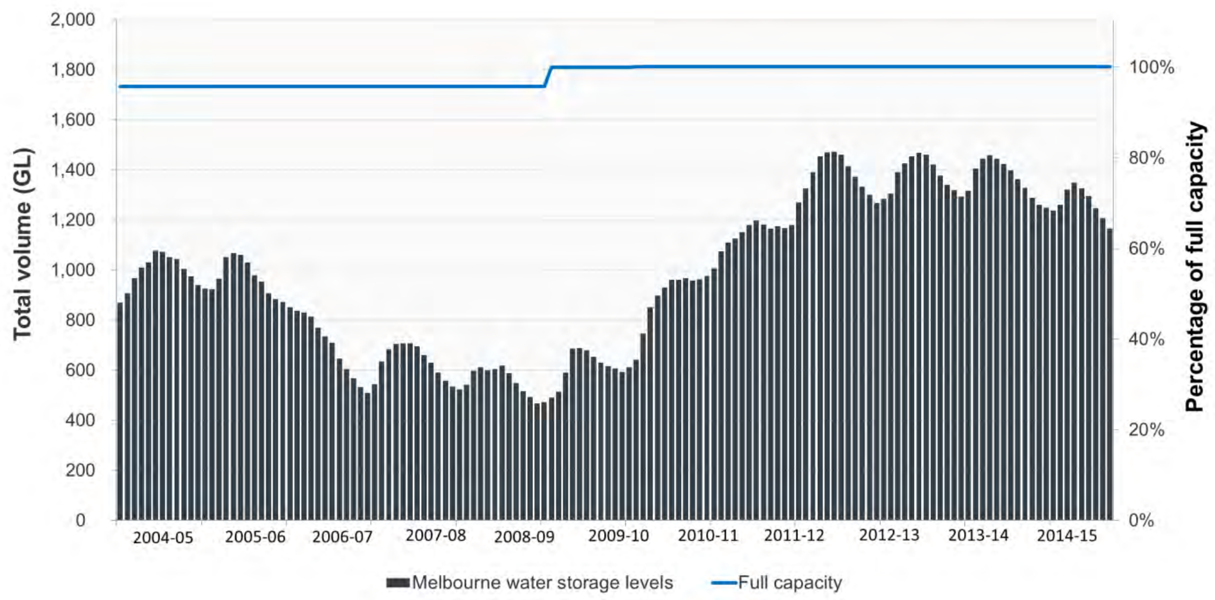
Figure 1-8 Volume in major regional water storages, 1 July 2004 to 30 June 2015[1]



Notes:

(1) During the 2014–15 year, the volume of one major storage, Rocklands Reservoir, was recalculated and increased by 34,490 ML. This is reflected in the increased total operating capacity of the regional storages.

Figure 1-9 Volume in Melbourne Water Corporation storages, 1 July 2004 to 30 June 2015[1]



Notes:

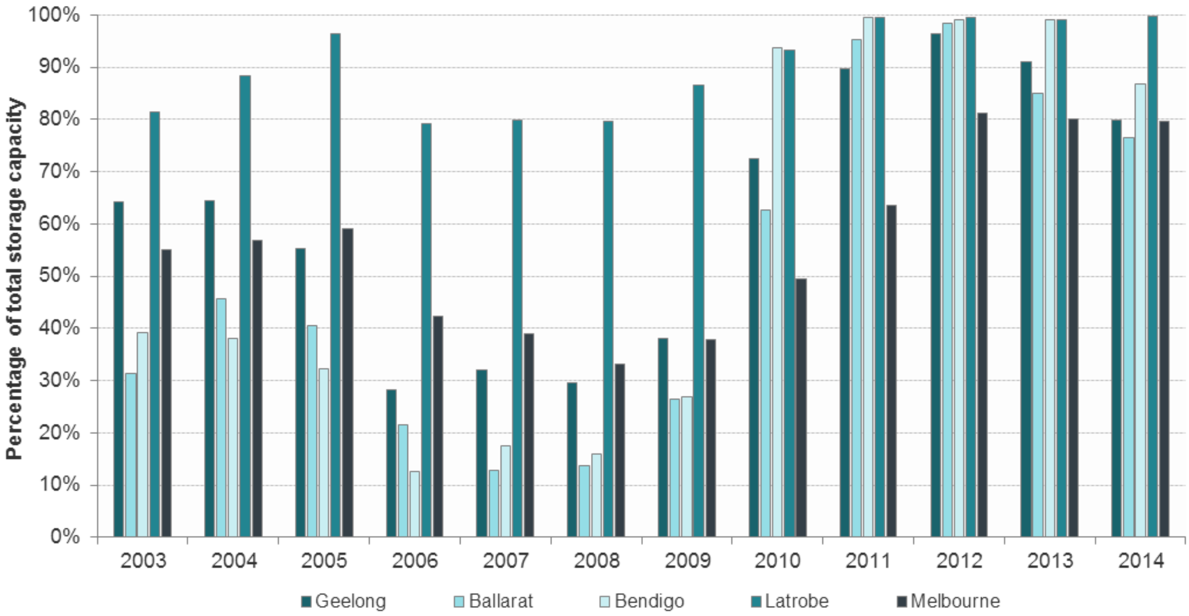
(1) The Tarago Reservoir became an active storage in 2010, adding 37,500 ML of storage volume to the Melbourne system operating capacity.

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 1-10 presents October storage levels as a percentage of storage capacity for Melbourne and selected major regional centres from October 2003 to October 2014.

During the drought, October storage levels generally declined from 2003 to 2007 (Figure 1-10) 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 1-10). By October 2010, storage levels had recovered significantly, with further recovery during 2011–12 across all major centres (Figure 1-10). At the end of October 2014, storages in Melbourne and the selected regional centres was between 76% and 100%. The regional storages were between 76% and 100%, on average lower than the previous year when all regional storages were above 85%. Melbourne storages in October 2014 were at 80% of capacity, the same as the previous year (Figure 1-10).

Figure 1-10 Water in reservoirs for major urban centres at the end of October in each year between 2003 and 2014, 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 WSPA or a 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 2014–15, groundwater level trends in Victoria's WSPAs remained similar to those observed in 2013–14 (Table 1-3 and Figure 1-11). In the state's GMAs, nine areas were categorised as increasing compared with 10 areas in 2013–14 (Table 1-4 and Figure 1-12).

Table 1-3 Groundwater level trends in Water Supply Protection Areas

Water Supply Protection Area	Groundwater level trend 2014–15				Groundwater level trend June 2014
	September 2014	December 2014	March 2015	June 2015	
Bungaree	Rising	Stable	Stable	**Stable**	Rising
Condah	Stable	Declining	Declining	**Declining**	Stable
Denison(1)	Stable	Stable	-	**-**	-
Deutgam	Stable	Stable	Stable	**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	**Stable**	Rising
Murrayville	Stable	Stable	Stable	**Stable**	Stable
Nullaware	Rising	Rising	Rising	**Stable**	Rising
Sale	Stable	Stable	Stable	**Stable**	Stable
Shepparton Irrigation Region(1)	Stable	Stable	-	**-**	-
Upper Ovens	Stable	Stable	Stable	**Stable**	Stable
Wandin Yallock	Rising	Rising	Rising	**Rising**	Rising
Warrion	Rising	Rising	Rising	**Rising**	Rising
Wy Yung	Stable	Stable	Stable	**Rising**	Rising
Yangery	Rising	Rising	Stable	**Rising**	Rising
Yarram	Declining	Declining	Rising	**Stable**	Stable

Note:

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

Figure 1-11 Groundwater trends in Water Supply Protection Areas

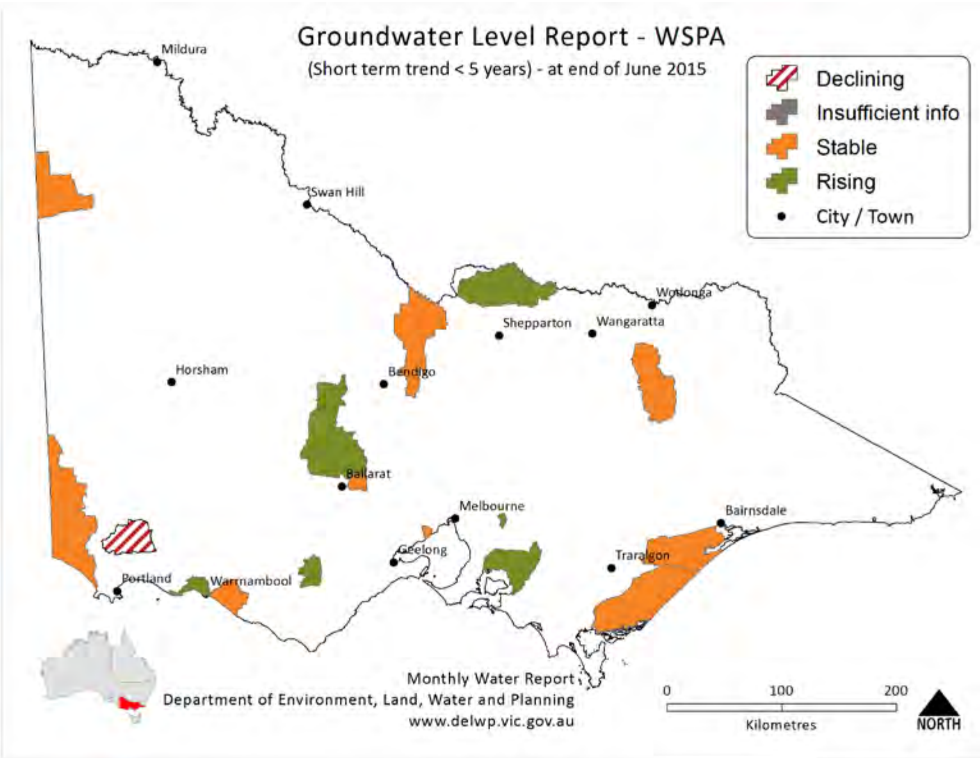


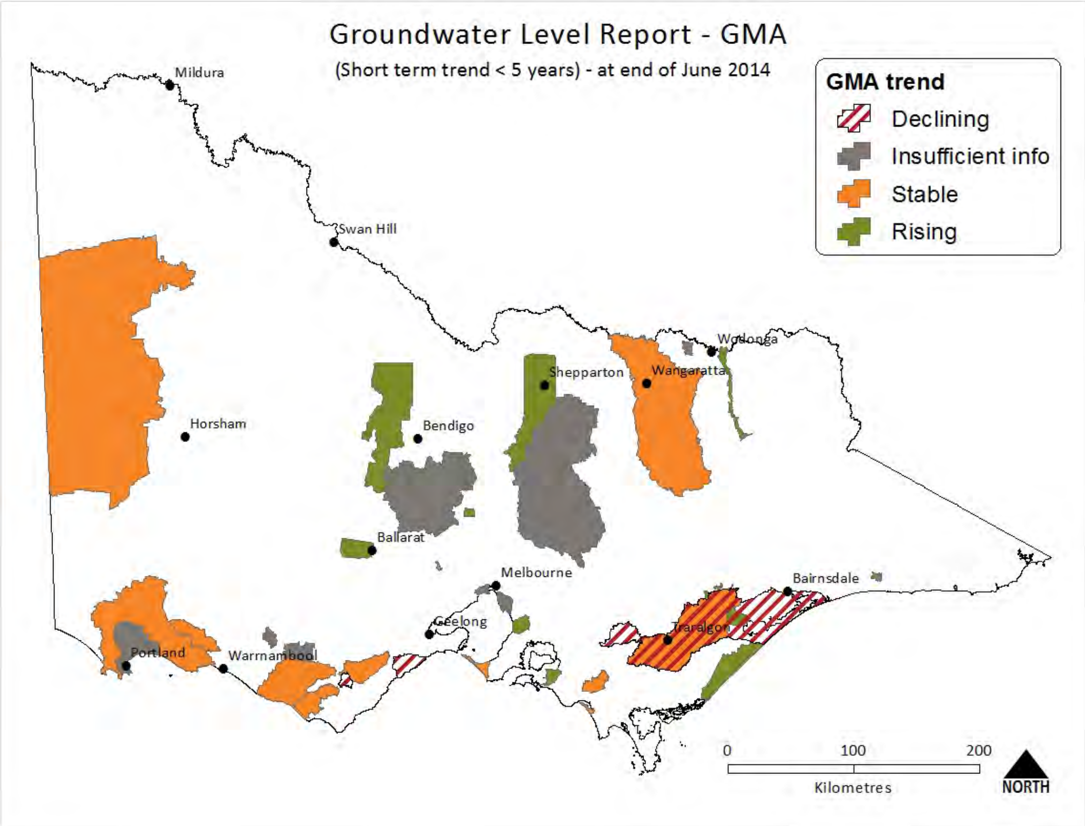
Table 1-4 Groundwater level trends in Groundwater Management Areas

Groundwater Management Area(1)	Groundwater level trend 2014–15				Groundwater level trend June 2014
	September 2014	December 2014	March 2015	June 2015	
Cardigan	Rising	Rising	Rising	**Rising**	Increasing
Corinella	Rising	Rising	Rising	**Rising**	Increasing
Frankston	Stable	Rising	Rising	**Rising**	Increasing
Gellibrand	Declining	Declining	Stable	**Declining**	Declining
Gerangamete	Declining	Declining	Stable	**Stable**	Stable
Giffard	Stable	Rising	Stable	**Stable**	Increasing
Hawksdale	Stable	Stable	Stable	**Stable**	Stable
Jan Juc	Declining	Declining	Declining	**Declining**	Declining
Lancefield	Rising	Rising	Rising	**Rising**	Increasing
Leongatha	Stable	Stable	Stable	**Declining**	Stable
Lower Ovens	Rising	Stable	Stable	**Stable**	Stable
Merrimu	Stable	Stable	Stable	**Stable**	Stable
Mid-Goulburn	Stable	Rising	Stable	**Rising**	Increasing
Mid-Loddon	Rising	Rising	Rising	**Rising**	Increasing
Moe	Declining	Declining	Stable	**Declining**	Declining
Mullindolingong	Rising	Rising	Stable	**Rising**	Increasing
Nepean	Stable	Stable	Stable	**Stable**	Stable
Newlingrook	Stable	Stable	Stable	**Stable**	Stable
Orbost	Stable	Rising	Rising	**Rising**	Increasing
Paaratte	Stable	Stable	Stable	**Stable**	Stable
Portland	Stable	Declining	Stable	**Stable**	Stable
Rosedale	Stable	Stable	Stable	**Stable**	Stable
Stratford	Declining	Declining	Declining	**Declining**	Declining
Tarwin	Stable	Stable	Stable	**Stable**	Stable
Wa De Lock	Rising	Stable	Stable	**Rising**	Increasing
West Wimmera	Stable	Stable	Stable	**Stable**	Stable

Note:

(1) The following Groundwater Management Areas 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, Kiewa, Kinglake, Moorabbin and Upper Murray

Figure 1-12 Groundwater trends in Groundwater Management Areas



2 Management of Victoria’s water resources

Victoria’s *Water Act 1989* (the Act) 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:

Water 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.

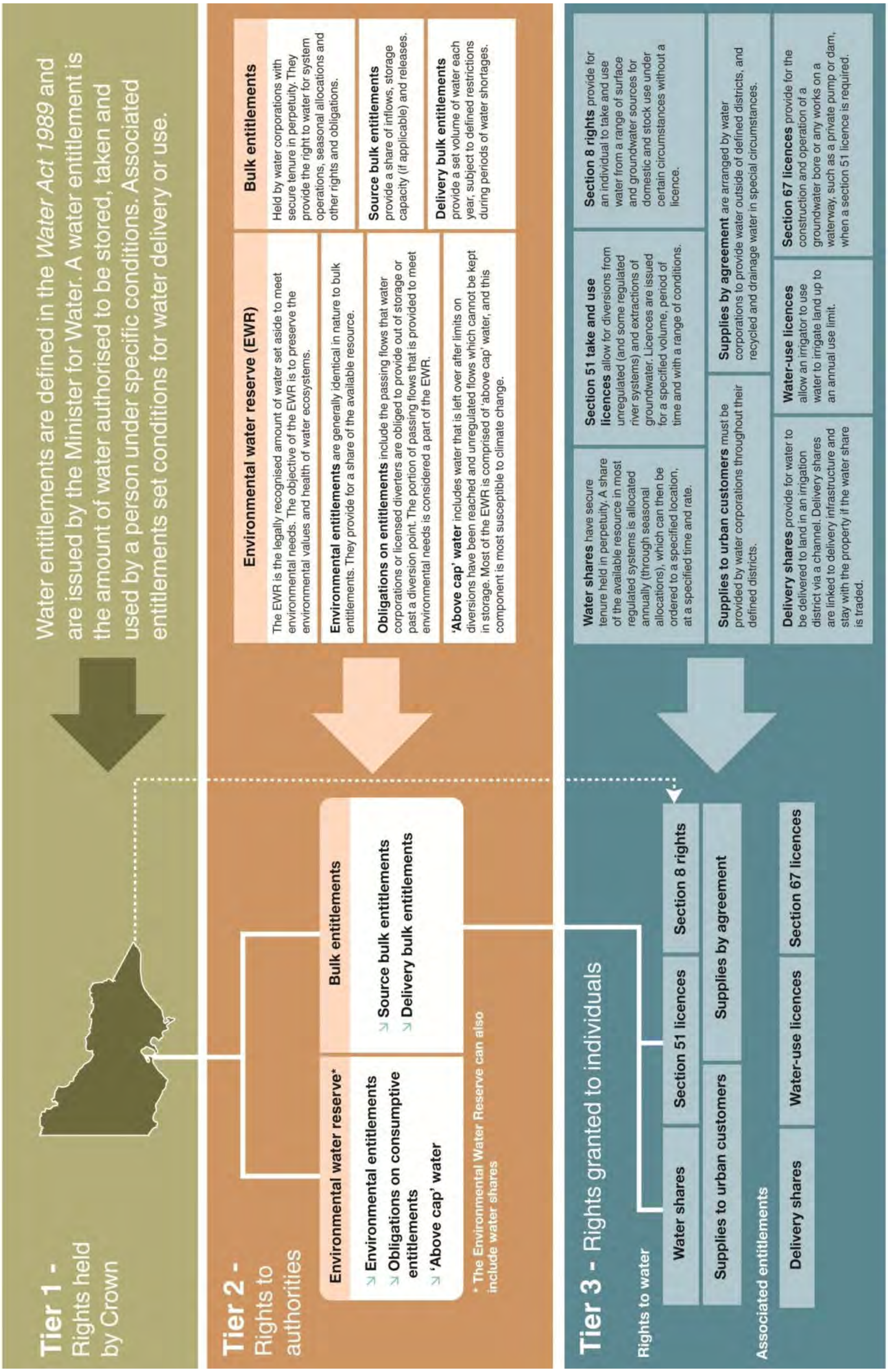
Annual processes to allocate water to entitlements: The framework provides the ability to restrict annual water use in response to seasonal variability. Annual use can be restricted through seasonal allocations, urban water restrictions and rosters, and restrictions or bans on licence holders in unregulated 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 2014–15).

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 1989* 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 2014–15.

Water markets are also an important mechanism for individual entitlement holders to manage seasonal variation in water availability and facilitate the sharing of available resources. Information on trade in 2014–15 is presented in Chapter 5.

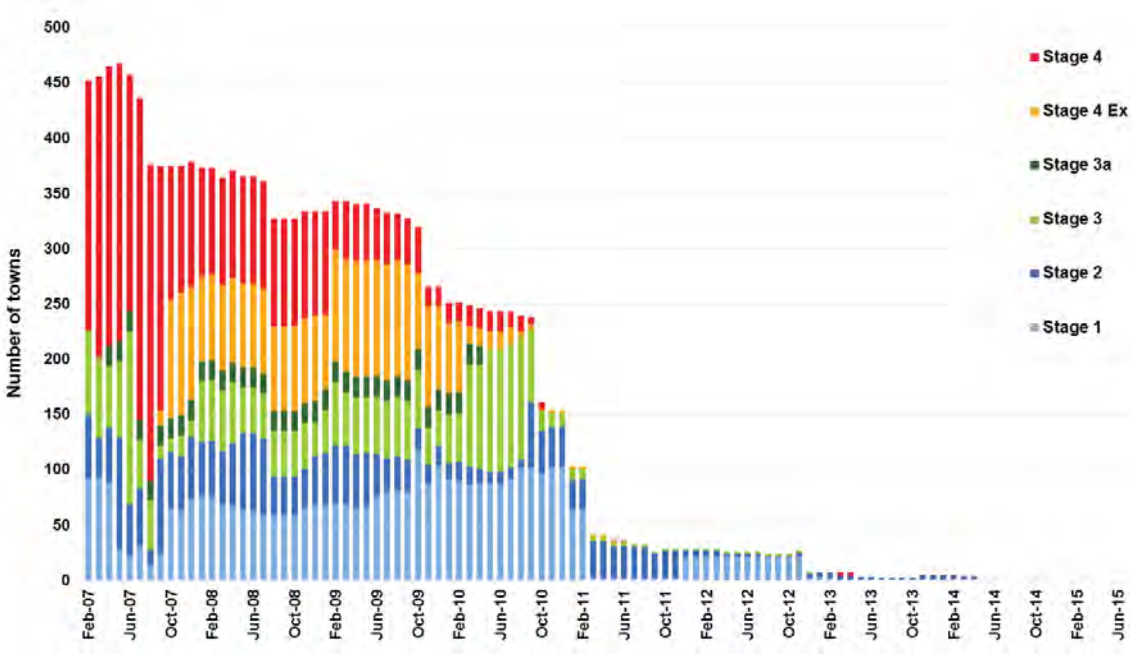
2.2.1 Urban water restrictions

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.

At the start of the 2014–15 year, only the town of Harrow, in the Wimmera, remained on water restrictions. By the end of December 2015, the restrictions in Harrow were lifted and no townships were subject to water restrictions for the remainder of the year. More than 450 towns were subject to restrictions at the peak of the drought in 2007 (Figure 2-2).

Figure 2-2 Number of Victorian towns on restrictions, February 2007 to June 2015



2.2.1.1 Central region and Melbourne metropolitan area

Metropolitan Melbourne and all other townships in the Central region remained on permanent water saving rules. No townships were subject to water restrictions.

2.2.1.2 Northern region

All townships in the Northern region were subject to permanent water saving rules throughout 2014–15, but no water restrictions were applied.

2.2.1.3 Western region

Long-standing restrictions were lifted at Harrow in the Wimmera region, during December 2014. This was made possible following the construction of a second bore to secure supply to Harrow. 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 2014–15.

Table 2-1 Urban water restrictions in 2014–15

Water corporation	Water system and towns	Level and duration of restrictions in 2013–14
Central region		
Barwon Water	All towns	PWSR applied all year
Central Highlands Water	All 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 until December 2014
	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 2014–15 (Table 2-2). Low-reliability entitlement allocations reached 100% of allocation in the Bullarook system in September and the Broken system in December. No other systems received low-reliability water allocation.

In southern Victoria, high-reliability entitlement allocations reached 100% in the Thomson–Macalister and 70% in the Werribee and Bacchus Marsh systems in 2014–15. Low-reliability entitlement allocations reached 20% in the Thomson–Macalister system. There were no allocations to low-reliability entitlements in the Werribee and Bacchus Marsh system.

Table 2-2 Seasonal water allocations in declared water systems

Water system	Water shares	2014–15			2013–14
		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	90	100	**100**	100
	Low reliability	0	0	**0**	0
Goulburn	High reliability	100	100	**100**	100
	Low reliability	0	0	**0**	0
Broken	High reliability	52	100	**100**	100
	Low reliability	0	100	**100**	100
Campaspe	High reliability	100	100	**100**	100
	Low reliability	0	0	**0**	46
Loddon	High reliability	100	100	**100**	100
	Low reliability	0	0	**0**	0
Bullarook	High reliability	100	100	**100**	100
	Low reliability	0	100	**100**	100
Southern Systems					
Thomson–Macalister	High reliability	100	100	**100**	100
	Low reliability	0	0	**20**	5
Werribee and Bacchus Marsh	High reliability	60	70	**70**	100
	Low reliability	0	0	**0**	15

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.

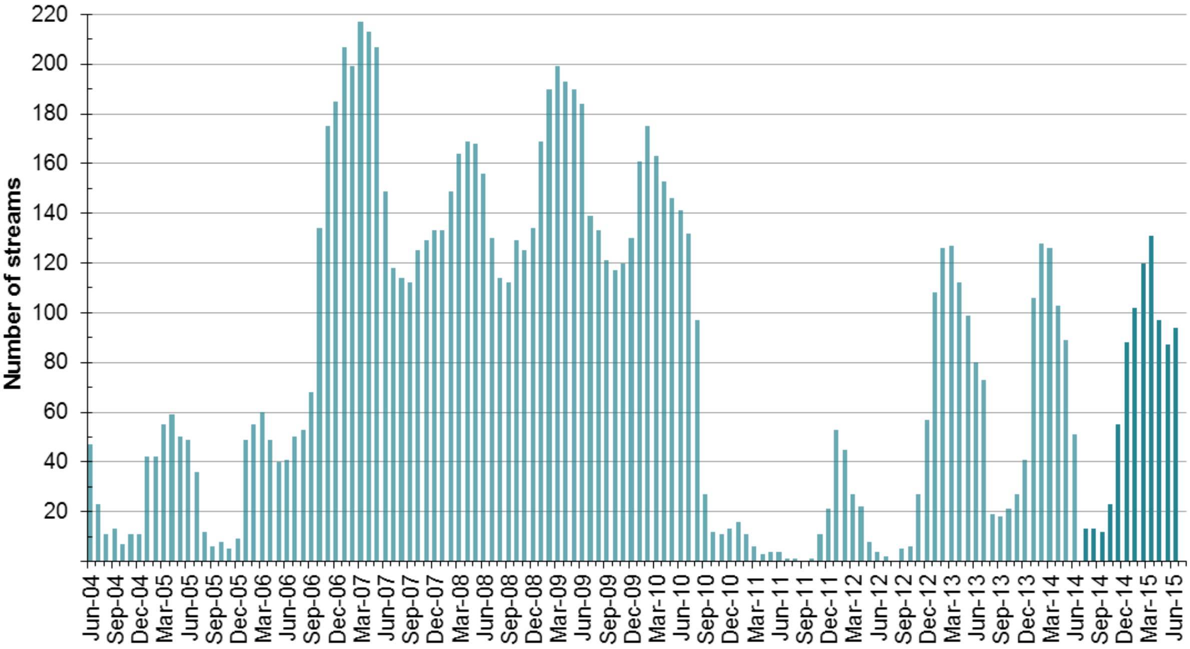
2.2.3 Restrictions on diversions from unregulated streams

Streamflow management plans (SFMPs) 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 2014–15 followed this general trend, peaking at 131 restrictions in March, compared to 133 restrictions in the previous year. However, the autumn of 2015 was drier than the previous year, and so while the number of restrictions had dropped to 51 by the end of June 2014, there were still 94 streams on restrictions at the end of the 2014–15 year.

Figure 2-3 Number of Victorian unregulated streams on restrictions, June 04-June 15



2.2.4 Seasonal allocations of groundwater in Groundwater Management Units

Seasonal allocations are announced in accordance with the groundwater management plans developed for WSPAs and 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 2014–15, three Groundwater Management Units were subject to restrictions on groundwater use. As in the previous year, Katunga WSPA received a seasonal allocation of 70% in all zones for the 2014–15 season, while Neuarpur sub-zone 1 (part of the West Wimmera GMA) received an 84% seasonal allocation for 2014–15, compared with 88% in 2013–14. The Newlyn Zone of the Loddon Highlands WSPA was restricted to 75% on 15 September 2014.

2.2.5 Water carting

Water carting is another option used by water corporations to augment town 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 second time in the reporting of the Victorian Water Accounts, no water carting was recorded in 2014–15.

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 2014–15 and 2013–14. 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 2014–15 and 2013–14

Entitlement type	Volume 2014–15 (ML)	Volume 2013–14 (ML)
Surface water		
Bulk entitlements(1)	5,575,502	5,585,894
Licences(2)	305,573	280,579
Small catchment dams(3)	522,949	522,949
Total surface water entitlements	**6,404,024**	**6,389,422**
Groundwater		
Licences	947,323	953,159
Bulk entitlements	10,000	10,000
Total groundwater entitlements	**957,323**	**963,159**
Total entitlements	**7,361,347**	**7,352,581**

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* (e.g. 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 2014–15 is summarised in Table 3-2.

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

The total available volume of Victoria's surface water, groundwater and recycled water in 2014–15 was approximately 17,300,000 ML. Of this, approximately 4,500,000 ML was taken for consumptive purposes in 2014–15.

The volume of surface water taken in 2014–15 was 61% of the total entitlement volume.

Table 3-2 Victoria's water availability and water taken for consumptive use in 2014–15

Water source	Available resource (ML)	Total entitlements (ML)	Total taken (ML)
Surface water[(1)]	15,908,327	6,404,024	4,001,971
Groundwater[(2)]	1,010,591	1,012,822	404,974
Recycled water	423,024	n/a	91,257

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 of each GMU.

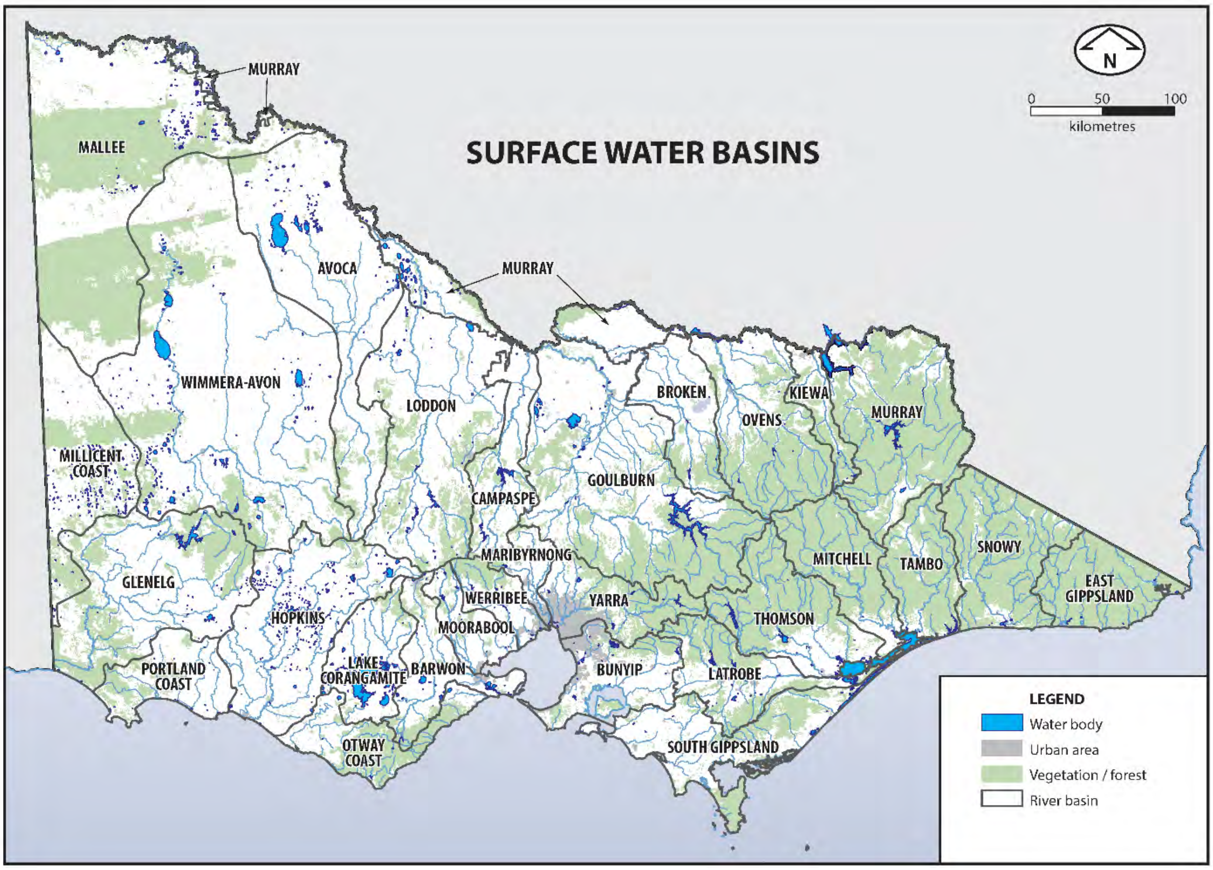
n/a: not applicable

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



The bulk entitlement volumes for some basins have changed compared with the values reported in the 2014–15 accounts.

Changes to bulk entitlement arrangement supplied by the Greater Yarra System – Thomson River Pool came into effect on 1 July 2014. The changes resulted in the disaggregation of the water corporation's entitlement to water in the Greater Yarra System – Thomson River Pool. Under the new arrangements Melbourne Water holds the right to harvest water for its headworks system from the Thomson River, Yarra River, Silver and Wallaby Creeks and Tarago and Bunyip Rivers. Water is then provided via seasonal determinations to Primary Entitlement Holders (Barwon Water, City West Water, South East Water, South Gippsland Water, Western Water, Westernport Water and Yarra Valley Water). Entitlement holders and entitlement volumes are detailed in Table 3-3.

Table 3-4 summarises the volume of water taken under bulk entitlements, licences and small catchment dams in each basin in 2014–15. More detail on diversions under surface water entitlements in each basin can be found in Part 2.

Table 3-3 Bulk entitlement volumes supplying the Melbourne system

Water Entitlements	Annual Entitlement Volume (ML)
Bulk Entitlement (Greater Yarra System) Conversion Order 2014	
Bulk Entitlement (Greater Yarra System-Thomson River Pool-City West Water Limited) Conversion Order 2014	155,227
Bulk Entitlement (Greater Yarra System-Thomson River Pool-South East Water Limited) Conversion Order 2014	209,562
Bulk Entitlement (Greater Yarra System-Thomson River Pool-Yarra Valley Water Limited) Conversion Order 2014	223,271
Bulk Entitlement (Greater Yarra System-Thomson River Pool- Barwon Water) Order 2014	16,000
Bulk Entitlement (Greater Yarra System-Thomson River Pool- South Gippsland Water) Order 2014	1,000
Bulk Entitlement (Greater Yarra System-Thomson River Pool- Western Water) Order 2014	18,250
Bulk Entitlement (Greater Yarra System-Thomson River Pool- Westernport Water) Order 2014	1,000

In addition to the Melbourne headworks system bulk disaggregation reform the following bulk and environmental entitlements were amended during 2014–15:

- On 31 July 2014, the *Bulk Entitlement (Gippsland Water – Blue Rock) Conversion Order 1997* was amended to account for Gippsland Water's purchase of the 3.87% unallocated share of Blue Rock Reservoir in accordance with Action 6.7 of the Gippsland Sustainable Water Strategy. As a result of this, Gippsland Water's entitlement increased from 15,150 ML to 20,000 ML.
- On 18 September 2014, bulk and environmental entitlements in the Wimmera-Glenelg system were amended to give effect to recommendations from the Bulk and Environmental Entitlements Operations Review (2014). The recreational entitlement held by GWM Water increased by 500 ML as result of removing the Victorian Environmental Water Holder's obligation to supply Lake Batyo Catyo
- On 16 October 2014, the *Bulk Entitlement (Bright) Conversion Order 2000* was amended and *the Bulk Entitlement (Porepunkah) Conversion Order 1999* repealed to reflect infrastructure changes in the system (the construction of an off-river storage at Freeburgh). As part of this amendment the water entitlement previously held under the Porepunkah bulk entitlement was transferred to the Bright bulk entitlement.
- On 31 March 2015 the *Bulk Entitlement (River Murray – Lower Murray Water – Irrigation) Conversion Order 1999* was amended to give effect to reductions in Lower Murray Water's loss allowance to reflect the transfer of the second instalment of water shares for Sunraysia Modernisation Project to the Commonwealth Environmental Water Holder.
- On 21 May 2015 the *Bulk Entitlement (Korumburra) Conversion Order 1997* and *Bulk Entitlement (Leongatha) Conversion Order 1997* were amended to allow South Gippsland Water Corporation to have access to up to 1,800 ML of water from the Tarwin River for Korumburra.
- On 21 May 2015 the *Bulk Entitlement (Eildon – Goulburn Weir) Conversion Order 1995 and Bulk Entitlement (River Murray – Goulburn Murray Water) Conversion Order 1999* were amended to give effect to reductions in Goulburn Murray Water's loss allowance to enable the transfer of the fifth instalment of water shares to be transferred to the Commonwealth Environmental Water Holder.

The difference in bulk entitlement volumes from 2013–14 to 2014–15 is attributed to changes outlined above and is described in detail in Chapter 6 for each basin. Environmental entitlements are not counted as they are not considered to be consumptive entitlements.

The volume of water taken under bulk entitlements in 2014–15 was 61% of the total volume of bulk entitlements, and the volume of water taken under licences was 30% of the total volume of licences.

Not all small catchment dams are required to be licensed or registered under the Act (e.g. 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 3-4 Volume allocated and taken under surface water entitlements in 2014–15

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	1,914,857	1,371,988	72%	16,961	2,318	14%	6,445
Kiewa	1,106	628	57%	15,823	2,894	18%	3,927

Ovens	50,484	12,891	26%	18,103	15,751	87%	15,888
Broken	25,279	12,615	50%	2,980	3,051	102%	15,738
Goulburn	1,892,699	1,108,987	59%	24,819	6,452	26%	47,513
Campaspe	105,648	42,079	40%	3,274	2,323	71%	28,776
Loddon	125,592	18,708	15%	22,439	8,774	39%	50,037
East Gippsland	622	163	26%	660	27	4%	1,100
Snowy	2,201	635	29%	3,962	242	6%	3,356
Tambo	342	48	14%	4,169	72	2%	3,971
Mitchell	9,208	4,036	44%	16,385	7,884	48%	4,558
Thomson	392,911	332,554	85%	17,239	4,481	26%	6,984
Latrobe	221,692	118,136	53%	18,916	5,731	30%	20,547
South Gippsland	168,815	7,526	4%	39,595	2,928	7%	24,256
Bunyip	36,595	15,609	43%	18,919	4,593	24%	15,525
Yarra	400,000	243,584	61%	42,792	9,588	22%	15,824
Maribyrnong	10,711	6,749	63%	2,088	543	26%	7,782
Werribee	38,262	18,652	49%	1,021	5	1%	9,347
Moorabool	40,600	12,402	31%	3,571	1,240	35%	22,197
Barwon	55,734	28,524	51%	5,551	1,615	29%	30,898
Corangamite	0	0	n/a	1,177	70	6%	12,366
Otway Coast	19,667	12,911	66%	6,659	691	10%	12,728
Hopkins	629	168	27%	11,410	2,751	24%	64,538
Portland Coast	0	0	n/a	1,079	2	0%	16,135
Glenelg	4,554	1,279	28%	1,048	234	22%	55,483
Millicent Coast	0	0	n/a	4	4	100%	0
Wimmera	57,016	23,660	41%	2,239	186	8%	14,337
Mallee	0	0	n/a	0	0	n/a	0
Avoca	278	33	12%	2,689	9	0%	12,693
Total	**5,575,502**	**3,394,564**	**61%**	**305,573**	**84,458**	**28%**	**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.

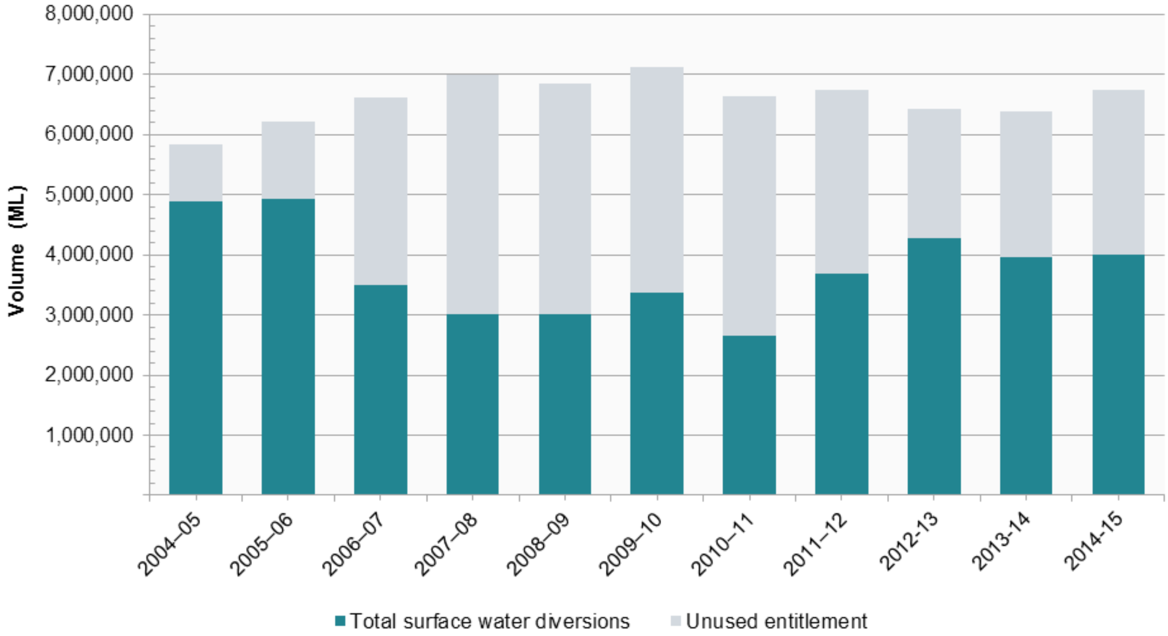
n/a: information not available

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

The low water use over the period 2006-07 to 2009-10 is a reflection of the low water availability during the last 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 61% in 2014–15, an increase from 60% in 2013–14.

The total volume of surface water entitlements generally increased over the years 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).

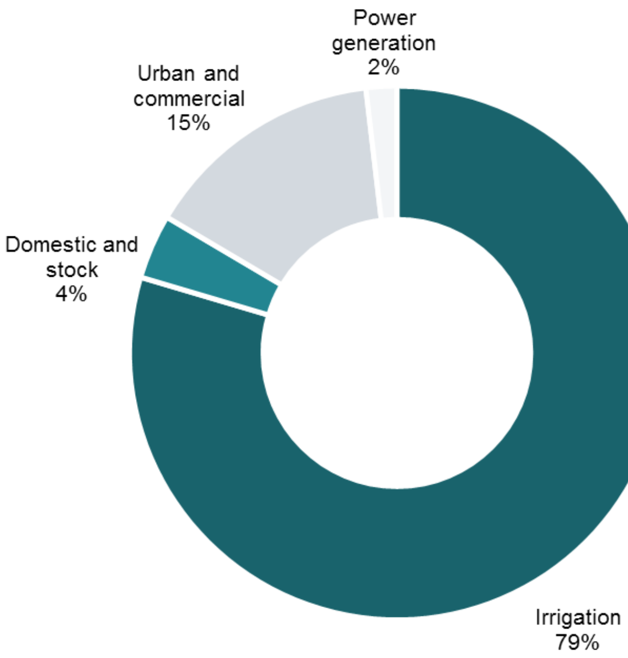
As shown in Table 3-5, the volume of water taken under consumptive entitlements in 2014–15 increased compared to 2013–14. The volume of water diverted for irrigation purposes in 2014–15 was around 72,000 ML greater than the amount diverted in 2013–14. In contrast, the volume of water diverted for urban and commercial purposes in 2014–15 was around 29,000 ML less than the previous year. The volume diverted for domestic and stock purposes was similar in 2014–15 to the volume in 2013–14, while the volume diverted for power generation was almost 4000 ML greater in 2014–15.

Irrigation continues to be the highest category of surface water use in the state, comprising 79% of all diversions as shown in Figure 3-3. This portion is the same in 2014–15 as it was in 2013–14.

Table 3-5 End use of surface water diverted under consumptive entitlements

Consumptive end use	2014–15		2013–14	
	Volume diverted (ML)	Proportion of total consumptive diversions (%)	Volume diverted (ML)	Proportion of total consumptive diversions (%)
Irrigation	3,377,415	79%	3,360,433	79%
Domestic and stock	166,396	4%	166,347	4%
Urban and commercial	621,283	15%	650,557	15%
Power generation	78,772	2%	74,881	2%
Total	**4,243,866**	**100%**	**4,252,217**	**100%**

Figure 3-3 Total surface water diversions for consumptive purposes in Victoria, 2014–15



3.2 Groundwater entitlements and use

Groundwater in Victoria is managed through Groundwater Management Units (GMUs). There are two types of GMU: Water Supply Protection Areas (WSPAs) and Groundwater Management Areas (GMAs). Areas that do not fall into these units are referred to as unincorporated areas.

- **Groundwater Management Area (GMA**): an area where groundwater has been intensively developed or has the potential to be. GMA boundaries are defined for the purposes of ongoing management.
- **Water Supply Protection Area (WSPA**): an area declared under the *Water Act 1989* to protect groundwater or surface water resources through the development of a management plan.
- **Unincorporated area (UA)**: an area where limited development or use of groundwater has occurred. This is usually because the resource is low-yielding, 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.

A number of Groundwater Management Units (GMUs) were abolished or approved during the 2014–15 year. The Nullaware and Yangery Water Supply Protection Areas (WSPAs) were revoked during the year, as were the Hawkesdale and Heywood GMAs. In their place, the South West Limestone Groundwater Management Area (GMA) was approved. The revoked GMUs were originally designed based on surface attributes rather than the groundwater system, while the new South West Limestone GMA is based on the aquifer system and will provide a more consistent approach to the groundwater resources in the area.

In the 2013–14 year, the Shepparton Irrigation WSPA was revoked, with the new plan for the Shepparton Irrigation GMA approved in June 2015.

These changes to GMUs all occurred late in the year, and hence were not in place for most of the accounting period. Therefore, the groundwater accounting in the *Victorian Water Accounts 2014–2015* includes the revoked GMUs and does not yet include the South West Limestone GMA. Full details of water entitlements and use from each GMA and WSPA in 2014–15 are presented in Appendix C.

In 2014–15, total groundwater licensed entitlement was approximately 957,323 ML across the state. The total groundwater use across the state, including domestic and stock use, was approximately 404,974 ML, which was more than the volume used in 2013–14 (329,348 ML).

There are 30,090 stock and domestic bores in Victoria. Domestic and stock use (49,696 ML) was estimated to account for approximately 15% of total groundwater use.

In Victoria's GMAs, licensed groundwater entitlements totalled 512,164 ML, with total use of 181,955 ML.Licensed groundwater entitlements in WSPAs totalled 341,171 ML, with total use of 145,407 ML of metered extractions.

The volume of groundwater entitlements outside of defined a GMU (unincorporated areas) was 103,989 ML, with 27,916 ML extracted.

The total volume of groundwater extracted for urban use in 2014–15 was 8,925 ML, which was approximately 3% of the total groundwater extracted.

Approximately 73 towns have a groundwater entitlement as either a supplementary or primary water supply. In 2014–15, only 55 of these towns recorded any extraction. The largest of these were Portland and Sale, each with extraction of between 1,700 ML and 1,800 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

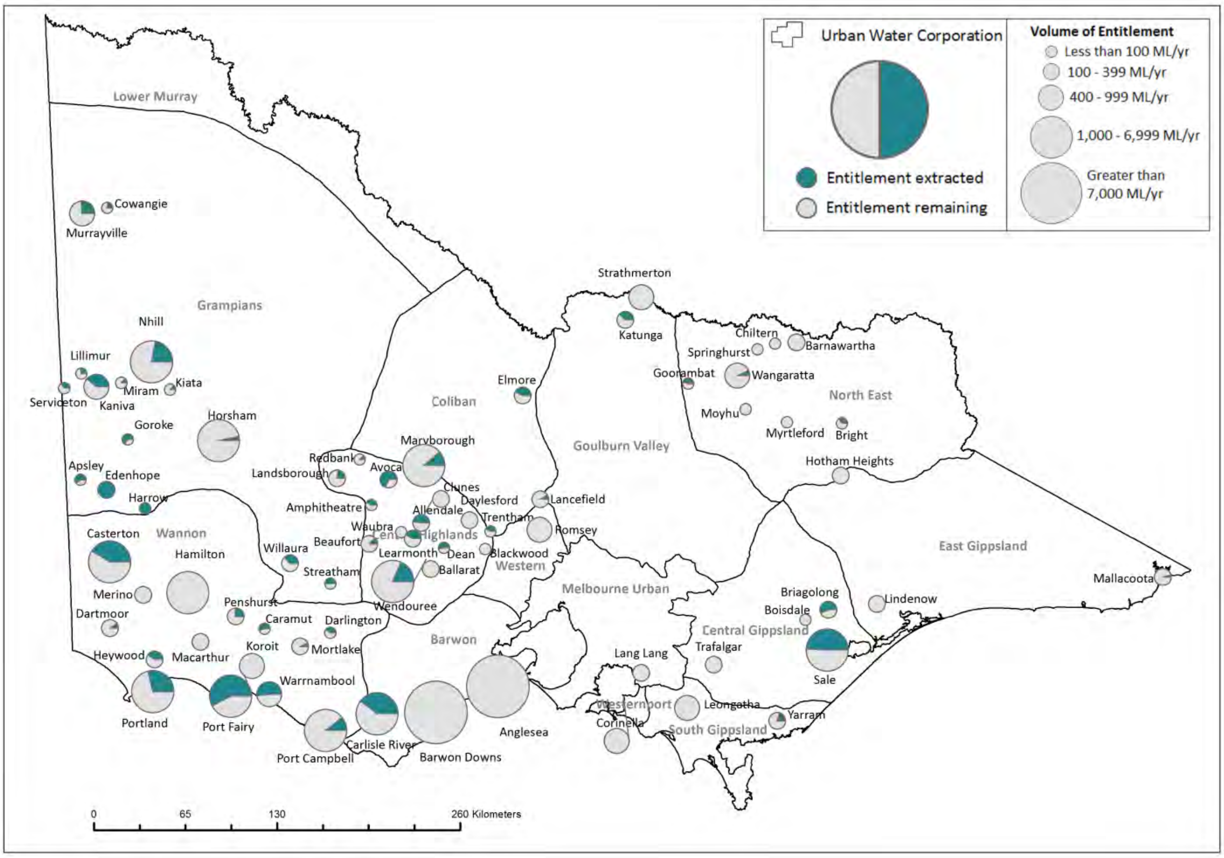
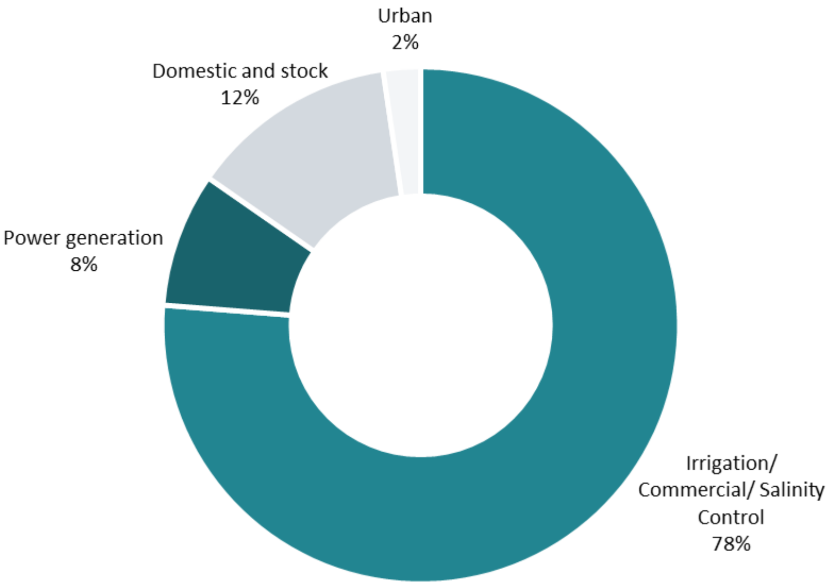


Table 3-6 and Figure 3-5 show the groundwater extraction by type of use in GMUs in 2014–15.

Table 3-6 Groundwater extraction by use in GMUs

Consumptive end use	Volume diverted (ML)	Proportion of total consumptive diversions (%)
Irrigation/commercial/salinity control	314,150	78
Domestic and stock	49,696	12
Urban	8,925	2
Power generation	32,204	8
Total consumptive diversions 2014–15	**404,974**	**100**
Total consumptive diversions 2013–14	329,349	100

Figure 3-5 Groundwater extraction by use in GMUs



3.3 Recycled water production

The total volume of 423,024 ML of wastewater produced in 2014–15 was lower than the 458,058 ML produced in 2013–14 (Table 3-7). The volume of water recycled by Victoria's water businesses for use external to treatment plants in 2014–15 was 76,897 ML, which was higher than the 72,194 ML recycled for external uses in 2013–14. An additional 14,360 ML was recycled for use within the wastewater treatment process. 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 2014–15, the volume of water recycled by the Eastern Treatment Plant was 13,713 ML, which was a decrease on the 17,886 ML recycled in 2013–14. 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 31,187 ML in 2013–14 to 32,996 ML in 2014–15. This increase is attributable largely to use of recycled water by agriculture rising from 9,401 ML in 2013–14 to 10,445 ML in 2014–15, and the volume of recycled water used by retailers increasing from 2,601 ML in 2013–14 to 4,337 ML in 2014–15.

The volume of water recycled in Melbourne, including at treatment plants operated by the Melbourne metropolitan retailers, was 42,624 ML or 14%. The percentage of recycled water was higher outside of Melbourne where weather conditions, the availability of land and access to potential purchasers (that is, agricultural producers) are more favourable. Excluding the wastewater recycled in Melbourne, the remainder of the state recycled 32%, or 34,273 ML, of the wastewater available for reuse. This was slightly higher than in 2013–14, when it was 31,420 ML.

Table 3-7 Volume of wastewater recycled in 2014–15

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	10,232	4,271	41%	0	161	4,012	0	98	3,788	2,173
Kiewa	314	129	41%	0	6	123	0	0	185	(0)
Ovens	2,437	1,022	42%	0	89	933	0	0	1,415	0
Broken	555	555	100%	0	0	555	0	0	0	0
Goulburn	8,483	7,153	84%	0	352	6,801	0	0	1,330	0

Campaspe	2,550	1,980	78%	0	257	1,722	0	1	537	33
Loddon	7,776	2,064	27%	0	1,018	1,046	0	0	5,138	574
East Gippsland	176	176	100%	0	0	176	0	0	0	0
Snowy	224	224	100%	0	0	224	0	0	0	0
Tambo	504	504	100%	0	0	504	0	0	0	0
Mitchell	1,775	1,775	100%	0	0	17	1,758	0	0	0
Thomson	943	914	97%	0	5	909	0	0	29	0
Latrobe	12,579	708	6%	0	42	70	596	0	3,675	8,196
South Gippsland	5,018	413	8%	0	16	393	0	4	4,563	42
Bunyip	138,183	17,181	6%	5,531	2,189	623	0	8,838	8,239	112,763
Yarra	11,495	3,749	12%	0	515	874	0	2,360	0	7,746
Maribyrnong	3,049	1,546	38%	0	405	748	0	393	1,483	20
Werribee	170,023	36,995	21%	4,337	573	13,355	18,129	601	5,095	127,933
Moorabool	1,410	1,410	100%	0	1,410	0	0	0	0	0
Barwon	30,572	4,001	8%	0	930	1,279	95	1,697	8,698	17,873
Corangamite	2,051	509	22%	0	10	447	0	52	1,705	-163
Otway Coast	1,245	347	24%	0	0	293	0	54	88	810
Hopkins	6,380	1,037	12%	0	223	552	0	262	0	5,343
Portland Coast	2,461	129	5%	0	0	129	0	0	184	2,148
Glenelg	906	782	86%	0	128	654	0	0	131	-7
Millicent Coast	51	51	100%	0	51	0	0	0	0	0
Wimmera	1,475	1,475	100%	0	481	994	0	0	0	0
Mallee	0	0	0%	0	0	0	0	0	0	0
Avoca	157	157	100%	0	38	119	0	0	0	0
Total 2014–15	**423,023**	**91,256**	**18%**	**9,868**	**8,899**	**37,551**	**20,578**	**14,360**	**46,283**	**285,486**
Total 2013–14	**458,058**	**90,612**	**16%**	**8,237**	**7,491**	**34,169**	**22,297**	**18,418**	**68,774**	**298,672**

Notes:

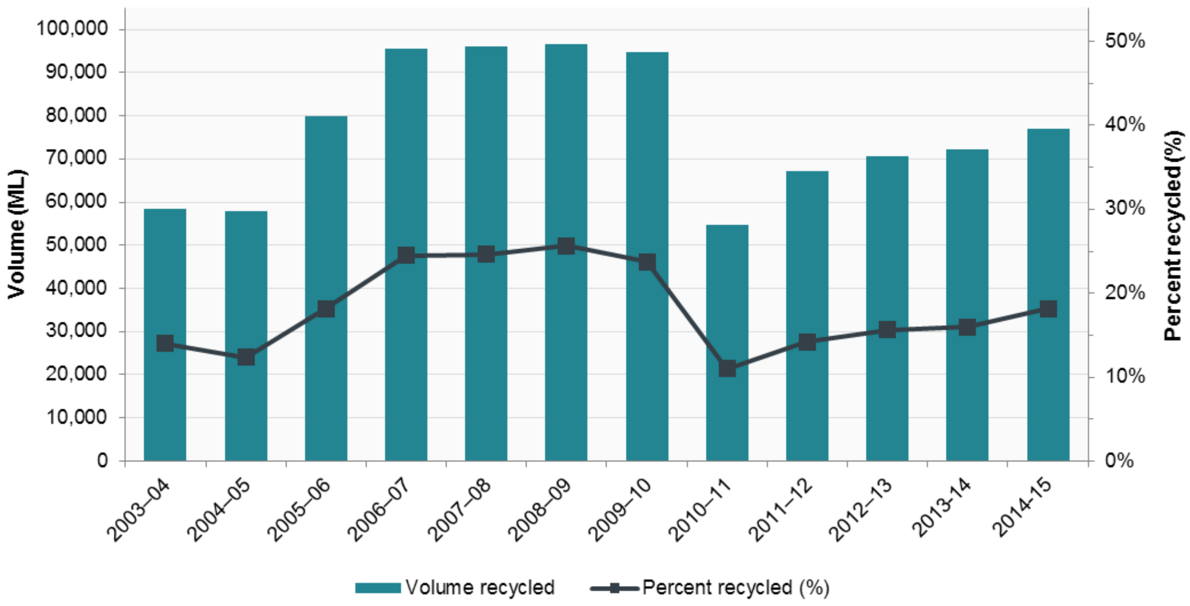
(1) Volume used to deliver specific environmental flow benefits.

(2) Water reused in wastewater treatment processes (e.g. backflushing 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 is not otherwise accounted for.

Figure 3-6 shows the trend in recycled water over the eleven years to 2014–15. In 2004–05, the volume of water recycled was slightly less than 60,000 ML. Over 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 2010-11 and 2011-12 were less than during the preceding 5 years, due to reduced demand for recycled water as a result of higher rainfall. Over the last four years to 2014–15, the volume and percentage of wastewater recycled has been slowly increasing.

Figure 3-6 Recycled water volume and percentage, 2004–05 to 2014–15[1]



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

3.4 Urban and commercial consumptive use

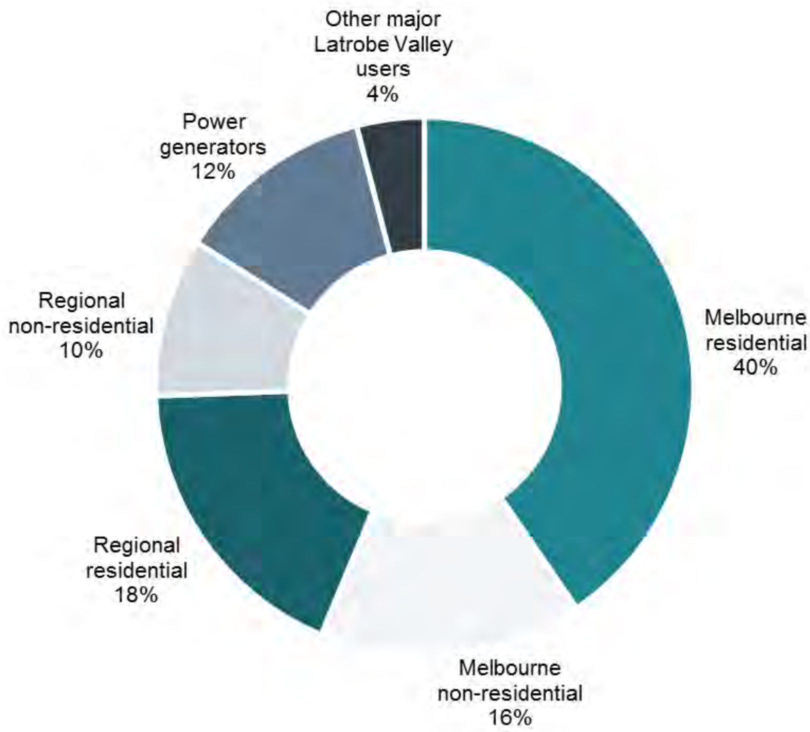
Consumption in urban areas is often measured by the metered volume of water delivered to customers. This figure differs from the bulk water diversion figures presented in Table 3-5 because water is lost in the distribution network through evaporation and leakage between the points of diversion and delivery. Therefore the metered consumption volumes discussed below are less than the urban diversion volumes in Table 3-5 and Figure 3-3. Detailed information about urban distribution systems can be found in Chapter 8.

Metered urban water consumption in Victoria increased in 2014–15 compared to 2013–14. Total urban water consumption by residential users both in and outside Melbourne increased by 2% compared to 2013–14. The increase in use by non-residential customers was also 2% in regional Victoria, and 1% in Melbourne. The largest increase in consumption was by power generators, which had a 5% increase in water consumption compared to 2013–14. The 2014–15 data in Table 3-8 is represented as a pie chart in Figure 3-7.

Table 3-8 Urban metered water consumption in Victoria

Urban consumption category	2014–15 (ML)	2013–14 (ML)	Change (%)
Melbourne – residential	257,043	252,943	2%
Melbourne – non-residential	100,424	98,995	1%
Regional – residential	115,867	113,492	2%
Regional – non-residential	60,867	59,695	2%
Power generators	78,772	74,881	5%
Other major Latrobe Valley industrial users	25,579	25,381	1%
Total urban consumption	**638,552**	**625,387**	**2%**

Figure 3-7 Consumptive uses of urban and commercial metered water in Victoria, 2014–15



4 Water for the environment

Water for the environment is set aside in Victoria's water allocation framework to preserve the environmental values and health of water ecosystems. Water for the environment is provided in three ways:

- **Water entitlements**: volumes of water held in perpetuity by the environmental water holders. Most of the environment's entitlements provide a share of the water available in storages that can be released to meet specific environmental needs. This is called 'managed environmental water' because its delivery can be actively managed.
- **Obligations on consumptive entitlements**: volumes of water which water corporations or licensed diverters are obliged to provide out of storages or past diversion points before water can be taken for consumptive use.
- **'Above cap' water**: the water available above the total volume allocated for consumptive use.

4.1 Environmental water holders

The Victorian Environmental Water Holder (VEWH) is the independent statutory body responsible for the use of environmental water across the state. They hold a number of environmental water entitlements in their own right and manage some entitlements on behalf of Snowy Recovery and the Living Murray Program. Further information on the VEWH's planning processes for use of the environmental water holdings and the outcomes of environmental watering undertaken in 2014–15 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 Office (CEWO), holds and manages water entitlements in line with the Basin Plan. The CEWO's entitlements have been recovered for the environment through water purchase and infrastructure investment in the Murray-Darling Basin. Delivery of the Commonwealth's environmental water in Victoria is managed by the VEWH in partnership with the CEWO and catchment management authorities.

4.2 Annual overview

A summary of Victoria's managed environmental watering in 2014–15 is summarised in Table 4-1.

In total **645,767 ML** of environmental water was delivered to priority environmental flow reaches and wetlands during the year. This volume included **570,709 ML** of Murray River water delivered to the South Australian border for transfer to the Murray Mouth and Lower Lakes. Fewer sites were delivered to, compared to 2013–14, because environmental watering was adapted to meet needs associated with the generally dry conditions. This meant that a number of wetlands had entered a drying regime and did not require watering in 2014–15.

Table 4-1 Summary of managed environmental watering in 2014–15

	2014–15	2013–14
Managed environmental watering sites		
# of river reaches delivered to	73	66
# wetlands delivered to	56	79
# priority watering actions achieved[1]	196	181
% of priority watering actions achieved	84%	82%
# achieved using managed environmental water	135	147
Managed environmental water availability		
Total available during the year[2]	1,726,646 ML	n/a
Managed environmental water deliveries		
Total volume delivered	645,767 ML	809,678 ML
Volume delivered to off-stream wetlands	131,546 ML	144,841 ML
Volume delivered in-stream	514,221 ML	664,837 ML
Managed environmental water – other actions		
Volume of in-stream deliveries re-credited for further use within Victoria	314,141 ML	437,293 ML
Volume traded to South Australia for delivery to the lower Murray River	570,709 ML	358,990 ML
Volume traded to the Snowy River	83,508 ML	83,509 ML
Net volume sold to non-environmental users	1,996 ML	(263 ML)

Notes:

(1) Includes actions that were partially achieved, i.e. where the flow pattern was not materially different from the planned parameters for the watering actions.

(2) Total available includes the volume carried over from the previous year plus allocations or share of inflows, plus any return flows environmental holders. 2013–14 data was not available for publishing.

In 2014–15, there was no change to the formal water management plans in effect in Victoria. Eight stream flow management plans (SFMPs) were in place in the Yarra basin, and one integrated water management plan in the Ovens basin. In 2012-13, five-yearly reviews were undertaken on six of the SFMPs, and as an outcome Melbourne Water proposed that amendments be made to the Olinda Creek SFMP, and that the Diamond Creek SFMP be revoked and the area managed under a local management plan. The Diamond Creek SFMP has now been revoked, and the process to amend the Olinda Creek SFMP is underway. Consultation has begun on the potential abolition of the Wandin Yallock, Bungaree and Barwon Basin WSPAs, so that Southern Rural Water can manage these areas without the need to prepare a statutory management plan.

The below-average rainfall and lower river flows experienced across much of the state in 2014–15 meant that the total volume of water leaving Victoria's river basins was lower than the previous year (12,678 GL, compared to 14,984 GL in 2013–14). However, as a percentage of total inflow volume, the water reaching the basin outlets was higher, with 80% reaching the basin outlets in 2014–15 compared to 76% in 2013–14 (see section 4.5).

4.3 Water entitlements

Water entitlements are held for the environment in 16 Victorian surface water basins. A total of 1,726,370 ML was made available under these entitlements during the year (before trade), of which 645,005 ML was used for environmental benefit within Victoria. Table 4-2 presents the volumes made available and used in each surface water basin during 2014–15 and the total entitlement volume at 30 June 2015.

Table 4-2 Environmental water availability and use in 2014–15 (ML)

	Basin(1)	Reliability	Entitlement volume	Net carry-over	Allocation / Share of inflows	Return flows	Total available (pre trade)	Net trade in(2)	Use	Closing balance
North	Murray(3)	High	415,905	277,970	507,298	314,011	1,099,279	-456,913	166,741	475,625
		Low	132,284							
		Provisional	75,000							
		Unregulated	74,300							
	Ovens	High	70	0	70	0	70	0	70	0
	Broken	High	253	0	121	0	121	769	887	3
		Low	4							
	Goulburn	High	379,496	60,177	363,755	0	423,932	-19,325	342,319	62,289
		Low	208,507							
	Campaspe	High	27,295	12,170	27,736	0	39,906	-8,736	31,170	0
		Low	8,266							
	Loddon	High	7,406	2,760	6,580	0	9,340	645	7,885	2,100
		Low	2,551							
		Provisional	7,490							
		Total Northern systems		**353,077**	**905,560**	**314,011**	**1,572,648**	**-483,560**	**549,072**	**540,016**
West	Wimmera & Glenelg	High	40,560	25,838	19,509	0	45,347	0	33,720	11,627
		Wetlands	1,000							
		Total Western systems		**25,838**	**19,509**	**0**	**45,347**	**0**	**33,720**	**11,627**
Central	Tarago	Inflows share	10.3%	3,753	2,595	0	6,348	0	1,842	4,506
	Yarra	High	17,000	34,076	17,000	0	51,076	-3,760	29,251	18,065
	Werribee(4)	Inflows share	10%	865	104	130	1,099	330	714	716
	Maribyrnong(5)	n/a	n/a	0	0	0	0	629	610	19
	Moorabool	Inflows share	11.9%	2,208	457	0	2,665	0	1,685	980
	Barwon(6)	Unregulated	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a
		Total Central systems		**40,902**	**20,156**	**130**	**61,188**	**-2,801**	**34,102**	**24,286**
Gippsland	Latrobe(6)(7)	Unregulated	n/a	18,834	3,872	0	22,715	0	3,984	18,731
		Inflows share	9%							
	Thomson	High	22,461	2,041	23,707	0	25,748	3,760	24,888	4,620
		Low	6,230							
		Total Gippsland Systems		**20,875**	**27,578**	**0**	**48,462**	**3,760**	**28,872**	**23,350**

Total	**440,692**	**972,804**	**314,141**	**1,727,646**	**-481,565**	**645,765**	**599,279**

Notes:

(1) This table includes entitlements held in Victorian surface water basins for environmental purposes by the VEWH, CEWO and the MDBA (for The Living Murray Program).
(2) 'Net trade in' includes trades used to move water between environmental water accounts. In 2014–15 this included 570,709 ML of water that was traded to South Australia for delivery to the lower Murray River and 83,508 ML that was traded to the upper Snowy River in NSW for environmental flows. The environment only traded water with non-environmental parties in the Murray (6,844 ML in), Goulburn (8840 ML out), Werribee (330 ML in) and Maribyrnong (629 ML in) basins.
(3) The Barmah Millewa Environmental Water Allocation is not included within the carryover and allocation volumes for the Murray basin because these represent accounting transactions and the water could not be used during the year.
(4) The allocation / share of inflows reported for Werribee includes 18.7 ML of adjustments made during the year for release corrections and evaporation.
(5) There are no environmental entitlements in the Maribyrnong River basin, however in partnership with Melbourne Water, the VEWH purchased 629 ML from entitlement holders in the system.
(6) There are unregulated environmental entitlements in these basins where availability is dependent on river heights so are not quantified in volumes.
(7) The allocation / share of inflows reported for Latrobe includes 364.6 ML of adjustments made under the Blue Rock Environmental Entitlement (inflows share) for inflows, internal spills, evaporation losses and release corrections.

4.3.1 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 River and the Murray River.

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 4-3 was sourced from the New South Wales Office of Water.

Table 4-3 Snowy River entitlements 2014–15 (ML)

Entitlement source	Entitlement at 1 March 2015 (ML)	Volume available for release in 2014–15 (ML)
Victoria(1)	115,939	83,509
New South Wales(2)	192,219	134,665
Total	**308,158**	**218,175**
Volume apportioned to Snowy River increased flows		*148,175*
Volume apportioned to River Murray increased flows		*70,000*

Notes:
(1) Includes 83,508 ML high-reliability entitlements and 32,431 ML of low-reliability entitlements
(2) Includes 52,635 ML high security entitlements, 115,084 ML general security entitlements and 24,500 ML conveyance entitlements

4.4 Obligations on consumptive water entitlements

4.4.1 Passing flows

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 2014–15, however six minor failures to meet passing flow requirements occurred:

- Barwon Water recorded two days of non-compliance in Painkalac Creek when the passing flow release was not adjusted to reflect a minor increase to reservoir inflows following a rainfall event.
- 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 the Campaspe River downstream of the Waranga Western Channel, for two days, where the required flow was below the required flow by up to two megalitres per day. Passing flows not provided were credited to the passing flow account for later use.

- Western Water was unable to meet the minimum passing flow requirements in Willimigongon Creek due to manual operation requirements. A shortfall totalling 19 megalitres was not released as instantaneous passing flows. This was compensated by ensuring average passing flows over the year exceeded the shortfall. To improve the manual operation process, an extra meter was added to the monitoring network.
- Southern Rural Water recorded one day of non compliance with passing flows on Jacksons Creek, when the instantaneous flow dropped below the required level. The daily flow volume did not drop below the required volume. Southern Rural Water does not believe any adverse environmental consequences resulted, and measures have been implemented to ensure that a repeat event does not occur.
- Westernport Water did not comply with all conditions for environmental flows in Tennent Creek, though the volume required was released. An amendment to the conditions of the relevant bulk entitlement is being considered by the Minister.

4.4.2 Management plans in unregulated river 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 include **stream flow management plans** (for unregulated surface water systems) and **integrated water management plans** (for highly-connected groundwater and unregulated surface water systems), and;
- **local management plans** – which are developed by water corporations to capture and formalise existing rules in unregulated systems where there are no statutory management plans.

SFMPs determine how water in a waterway will be shared between consumptive users and the environment in unregulated systems.

In 2014–15, seven SFMPs were in effect in Victoria (all within the Yarra basin), and one integrated water management plan (WMP) (in the Upper Ovens River). Table 4-4 lists each basin where SFMPs, are in place and gives the status of each plan during the 2014–15 water year.

21 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 (LMPs) will be used instead. An LMP explains 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 twenty-one priority streams initially identified in 2004, as reported in Table 4-4.

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

Basin	Stream(s)	Work undertaken in 2014–15
Kiewa	Kiewa River	Local management plan in place as recommended under the Northern Region Sustainable Water Strategy
Ovens	Upper Ovens River above Myrtleford	Integrated water management plan 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 stream flow management plans approved and operational. Diamond Creek SFMP has been revoked and a LMP developed.
Maribyrnong	Upper Maribyrnong River (Deep Creek)	Need for stream flow management plan to be reviewed.
Barwon	Barwon River main stem and tributaries to the south including Leigh River	Need for stream flow 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 is recommended. A statutory SFMP will not be developed.
Wimmera	Upper Wimmera River	Reviewed under the Western Region Sustainable Water Strategy: a local management plan is recommended. A statutory SFMP will not be developed.

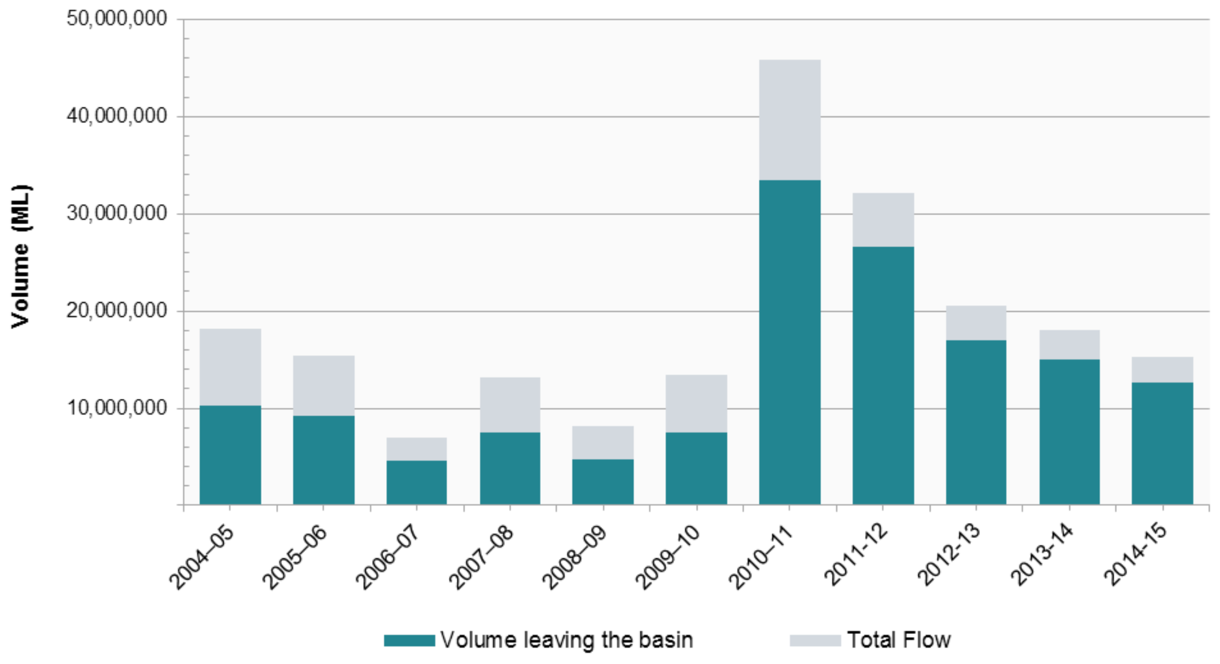
Compliance with each approved SFMP is reported annually by the relevant water corporation to the Minister for Water and the relevant Catchment Management Authority. Melbourne Water is responsible for the management and implementation of the seven SFMPs that are in effect, and information regarding compliance is available in their 2014–15 annual report, and on the Melbourne Water website.

Goulburn–Murray Water is responsible for the management and implementation of the integrated Upper Ovens River Water Management Plan, and information regarding compliance is reported in the Upper Ovens River WMP annual report available on the Goulburn–Murray Water website.

4.5 'Above cap' water

Figure 4-1 compares the total flows throughout the state with the total volume leaving the state's basins since 2003-04. Table 4-5 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.

Figure 4-1 Volume leaving Victorian surface water basins, as proportion of total flow, 2004-05 to 2014–15



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 Environmental Water Reserve (EWR). It also includes water not used under consumptive entitlements and, in some cases, water traded out of a system.

In 2014–15, the proportion of total flow leaving the basin decreased in around half of the basins, and increased in the other half when compared to the previous year (Table 4-5). The basins that experienced the lowest proportions of water leaving the basin as a percentage of total flow in 2014–15 were the Avoca (0%), Moorabool (10%), Werribee (20%), Loddon (25%), and Wimmera (27%) basins. The proportion of annual flow leaving the basin was above 90% in 10 basins, predominantly in the south of the state, similar to 2013–14. The Snowy and East Gippsland basins recorded the highest proportion of total flow leaving the basin in 2014–15; consumptive use in these basins is generally very low compared to water availability, and there was high rainfall in 2014–15, so a volume equal to or greater than inflows was passed to Bass Strait.

Across Victoria as a whole, the total volume of water leaving the river basins in 2014–15 was 12,678 GL compared to 14,984 GL in 2013–14 (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 higher than the previous year, with 80% in 2014–15 compared to 75% in 2013–14 (Table 4-5).

Table 4-5 Volume leaving Victorian surface water basins 2014–15

Basin	Outflow to	2014–15			2013–14		
		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	3,436,013	1,891,600	55%	4,562,480	2,437,400	53%
Kiewa(2)	Murray River	482,118	438,423	91%	605,828	569,621	94%
Ovens	Murray River	948,433	887,438	94%	1,450,612	1,395,536	96%
Broken	Murray River	141,401	106,062	75%	210,402	156,008	74%
Goulburn	Murray River	1,686,933	954,910	57%	2,399,347	939,676	39%
Campaspe	Murray River	90,292	70,371	78%	161,438	64,280	40%
Loddon	Murray River	120,217	30,067	25%	157,132	35,129	22%
East Gippsland	Bass Strait	1,359,269	1,357,912	100%	666,465	665,059	100%
Snowy (Vic. only)(5)	Bass Strait	1,544,877	2,049,928	133%	1,110,316	1,485,553	134%
Tambo	Gippsland Lakes	337,832	331,755	98%	144,683	138,321	96%
Mitchell	Gippsland Lakes	660,176	642,629	97%	782,716	762,965	97%
Thomson	Gippsland Lakes	740,389	425,875	59%	718,366	490,207	68%
Latrobe	Gippsland Lakes	703,080	586,940	83%	789,922	687,467	87%
South Gippsland	Bass Strait, Western Port	726,782	692,117	95%	1,361,864	1,326,435	97%
Bunyip	Bass Strait, Western Port, Port Phillip Bay	497,668	469,843	95%	854,730	826,921	97%
Yarra(6)	Port Phillip Bay	597,405	370,448	62%	699,325	410,630	59%
Maribyrnong	Port Phillip Bay	22,282	9,553	43%	43,563	29,131	67%
Werribee	Port Phillip Bay	23,922	4,872	20%	41,588	7,359	18%
Moorabool	Port Phillip Bay	50,588	5,272	10%	51,988	10,814	21%
Barwon	Port Phillip Bay, Bass Strait	106,398	60,106	56%	198,475	141,873	71%
Corangamite(3)	Corangamite lakes	147,447	130,182	88%	307,353	290,180	94%
Otway Coast	Bass Strait	574,875	545,599	95%	962,890	934,417	97%
Hopkins	Bass Strait	222,928	125,075	57%	280,650	183,891	66%
Portland Coast	Bass Strait	273,021	252,584	93%	571,317	550,934	96%
Glenelg	Bass Strait	349,327	225,540	68%	599,750	427,820	71%
Millicent Coast(4)	South Australia	4	n/a	n/a	4	n/a	n/a
Wimmera(3)	Lakes Hindmarsh and Albacutya	42,143	13,280	27%	92,907	17,212	19%
Mallee(4)	Murray River	n/a	n/a	n/a	n/a	n/a	n/a
Avoca(3)	Lake Bael Bael and the Marshes	22,507	0	0%	24,253	22	0%
Total		**15,908,327**	**12,678,382**	**80%**	**19,850,362**	**14,984,862**	**75%**

Notes:

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

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

(3) 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 NSW 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.

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 2014–15 water year, taking into consideration the volume of water traded and the geographical movements of water in those trades.

Further information about water trading in Victoria is provided in the *Victorian Water Trading 2014–15 Annual Report*, available at http://waterregister.vic.gov.au.

5.1 Victoria's water trade framework

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.

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, trade may involve 'entitlement volume trade' between licences or the 'change of ownership' of a licence due to land ownership change.

5.1.1 Allocation trade

Water allocation is water available each season under water entitlements, for example water shares. Water is allocated based on the available resource in any given year. (Discussion about seasonal allocations in 2014–15 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. Allocation trade can either occur within a trading zone or between trading zones in line with the trading rules for declared water systems.

Allocation trade includes trade of allocation made available under water shares and bulk entitlements. Most allocation trade 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. In other parts of the state trade of allocation available under bulk entitlements may also occur.

Environmental Water Holders also use allocation trade to move water between accounts.

5.1.2 Trade of water shares

A water share is a legally recognised, secure entitlement to a share of the water available for use in a declared water system. Trade of water shares can mean a transfer of ownership from one person to another, a change of the location where the water share is used, or both. This chapter provides summary information on transfer of ownership of water shares.

More detailed reporting on the movement of water shares into or out of different water delivery systems in Victoria is provided in the *Victorian Water Trading Annual Report*. 'Movement' can either be considered to occur with:

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

5.1.3 Trade of take and use licences

Outside declared water systems, take and use licences allow water to be taken from either unregulated surface water systems or from groundwater and be used on the land defined in the licence. Trading of take and use licences is subject to the constraints of the *Water Act 1989*, the ministerial policies for managing take and use licences and any approved local management rules or plans..

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 due to land ownership change without affecting the volume and location of the licence.

In this chapter, unregulated surface water trades and groundwater trades are reported separately.

5.2 Overview of trade in 2014–15

5.2.1 Allocation trade

A total of 2,694 GL of allocation was traded in Victoria during 2014–15, an increase on 2013–14 when 2,097 GL was traded. Most of this occurred in northern Victoria (2,673 GL) with small amounts in southern Victoria (13 GL) and western Victoria (8 GL).

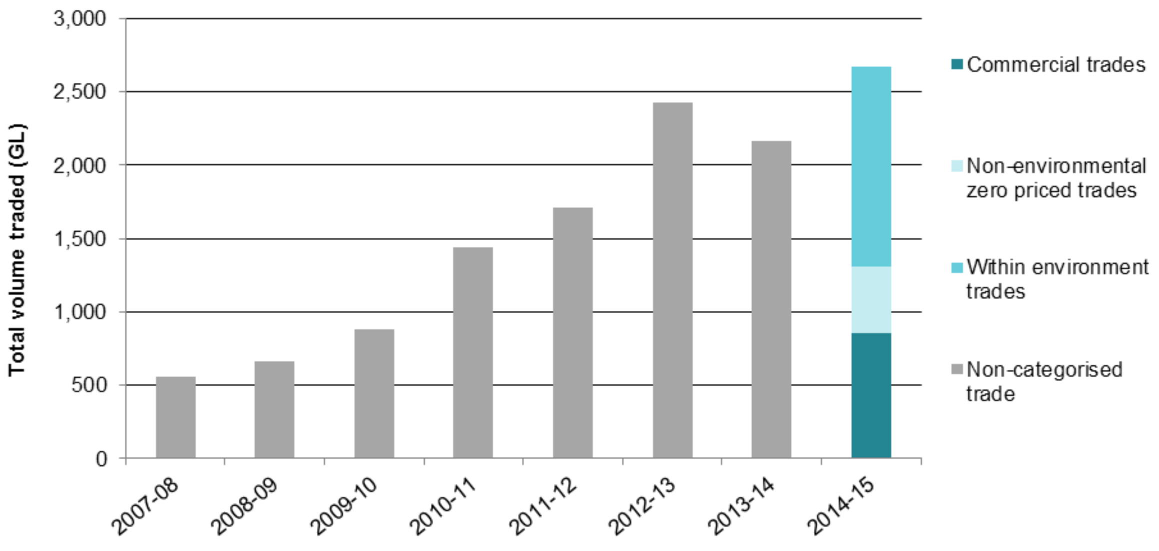
The continued high level of trade resulted from a combination of high volumes of allocation available and hot and dry conditions, as well as the volume of allocation traded by environmental water holders moving water between their accounts. As in previous years, environmental trades made up a significant portion of the volume traded in 2014–15; there was 1,362.9 GL of within environment allocation trade (Table 5-1) which equates to 51% of the total volume traded. For a discussion regarding the assumptions made to distinguish between environmental and non-environmental trading, see the 2014–15 *Victorian Water Trading Annual Report*.

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

Trade type	Number of trades	Volume (ML)
Commercial trades	9,498	857,013
Zero priced allocation trades	4,861	473,806
Within environment trade	103	1,362,947
Total	14,462	2,693,766

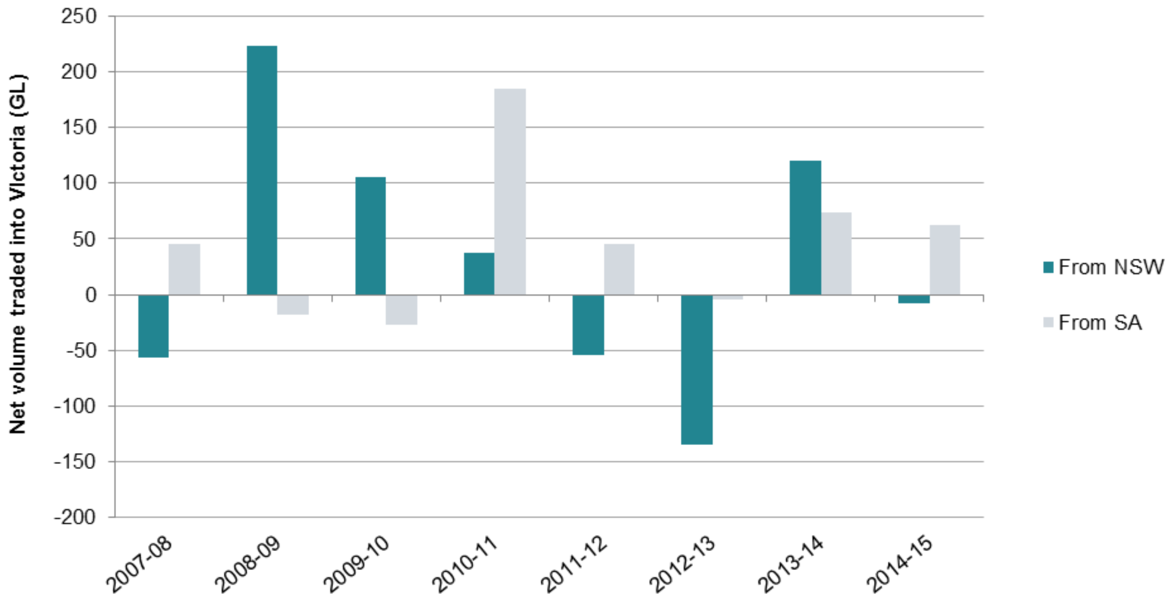
Across the state, trades of environmental water represented a large proportion of the volume traded. The VEWH uses trade to move water between areas across Victoria, depending on its environmental watering plan. Commercial trades, where allocation is sold for a specified price, represented 857 GL of the total volume of allocation traded. Zero priced trades (where water is traded from one account to another without payment) represented approximately 18% of the total volume traded (Figure 5-1). These trades may include trades between accounts owned by the same person, or between related parties. The proportion of trade applications received without price information has reduced in recent years enabling more confidence in this type of more detailed market analysis.

Figure 5-1 Volume of allocation trade in Victoria



Water trade between Victoria, New South Wales and South Australia is permitted, subject to trading rules. Excluding allocation traded within environmental accounts, there was a total of 146 GL traded into Victoria (125 GL commercially) during 2014–15 and 86 GL traded out of Victoria (72 GL commercially) resulting in an overall net trade into Victoria of 60 GL (Figure 5-2).

Figure 5-2 Net volume of allocation trade into Victoria from New South Wales and South Australia



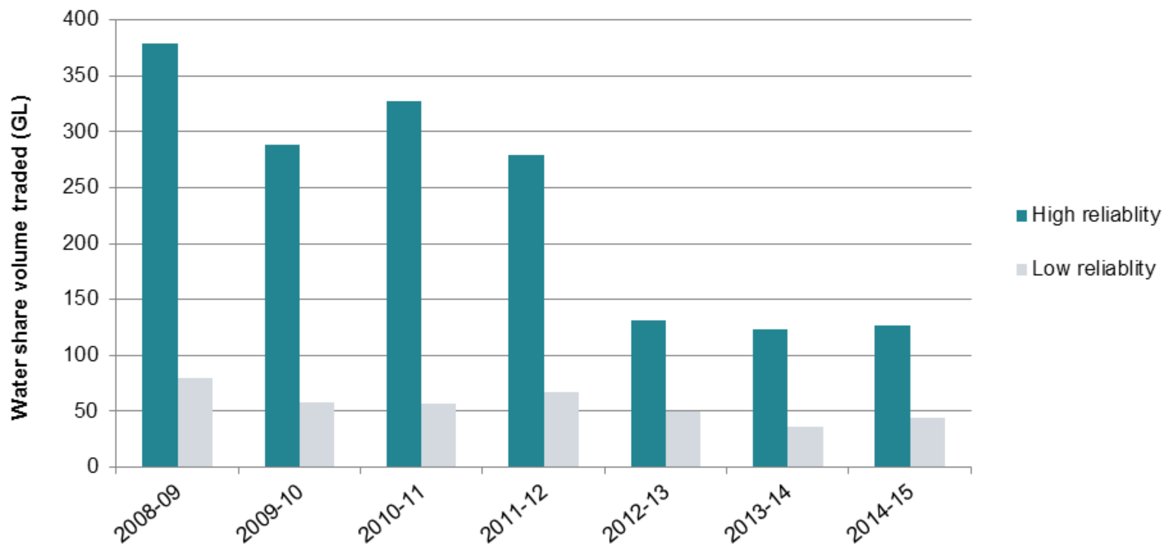
5.2.2 Water share transfers

Water share trade across Victoria during 2014–15 included 133 GL of high and 44 GL of low-reliability water shares transferring ownership (Table 5-2 and Figure 5-3). As with allocation trade, most of this occurred in northern Victoria, with a small amount in southern Victoria.

Table 5-2 Water share transfers in Victoria

Water share type	Number of trades	Volume (ML)
High reliability	2,359	133,262
Low reliability	763	44,307

Figure 5-3 Transfer of ownership of water shares in Victoria



5.2.3 Unregulated surface water

Surface water take and use licence trading in 2014–15 was similar to the previous year, with 4.5 GL of permanent trade and 2.2 GL of temporary trade. Unlike allocation and water share trading, most of the surface water take and use licence trade occurred in southern Victoria, with 2.9 GL of permanent trade and 1.3 GL of temporary trade. Slightly lower volumes were traded in northern Victoria, and almost no take and use licence volume was traded in western Victoria.

As shown in Table 5-3, trade in surface water take and use licences are much lower than the trade in groundwater take and use licences (Table 5-4). 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 5-3 Trade of surface water take and use licences in Victoria

Region	Permanent trade		Temporary trade		Trade as part of land transfer	
	Number	Volume (ML)	Number	Volume (ML)	Number	Volume (ML)
North	68	1,572	94	905	198	2,685
South	101	2,900	32	1,275	210	6,135
West	0	0	2	37	19	361
Total	**169**	**4,472**	**128**	**2,217**	**427**	**9,181**

5.2.4 Groundwater

The volume of groundwater take and use license trading was higher in 2014–15 than in the previous year, with 17 GL of temporary trade (compared to 15 GL in 2013–14) and 9 GL of permanent trade (compared to 4 GL in 2013–14).

Table 5-4 shows that in 2014–15, trades of groundwater take and use licences were mostly part of land transfers (take and use licence 'change of ownership') with 318 trades amounting to about 51 GL. Temporary and permanent entitlement volume trades had 58 transfers (about 8.5 GL) and 166 transfers (about 17 GL), respectively.

Table 5-4 Trade of groundwater take and use licences in Victorian Groundwater Management Units

Region	Permanent trade		Temporary trade		Trade as part of land transfer	
	Number	Volume (ML)	Number	Volume (ML)	Number	Volume (ML)
North	78	8,765	29	5,346	164	35,585
South	69	4,087	25	2,538	144	11,644
West	19	4,585	4	675	10	4,030
Total	**166**	**17,437**	**58**	**8,559**	**318**	**51,259**

Part 2: Water Accounts 2014–15

Part 2 of the 2014–15 Victorian Water Accounts presents an account of surface water, groundwater and distribution systems in Victoria for 2014–15.

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 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 in the basin accounts.

The basin water accounts are compiled from information obtained from:

- responses to requests for data to water corporations, CMAs, VEWH, DELWP, major users of water and the 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 corporation's annual reports and related documents.
- The basin water accounts report information on surface water and recycled water in 2014–15 for the 29 river basins within Victoria. The basin definitions are based on the river basin boundaries designated by the former 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 is 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 2015 to 30 June 2015. Responsibilities for water management are reported in the accounts as they were during 2014–15. Any changes to responsibilities since the end of June 2015 will be reported in future water accounts.

6.1.4 Surface water resources section

Information on surface water in 2014–15 is presented in this section for each of the 29 river basins. There are three sub-sections: water balance, storages and flows and entitlement volumes and diversions.

6.1.5 Surface water balance sub-section

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 match 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. Refer to 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: Licensed 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: Transfers to other basins represent 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 documents 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. This item 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 2014–15

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 sub-section

This section provides an overview of inflows and volumes in storage within each basin. A chart is presented in each river basin 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 eight 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 sub-section

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 (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations 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, 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 2014–15 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 2013–13 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 are 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.

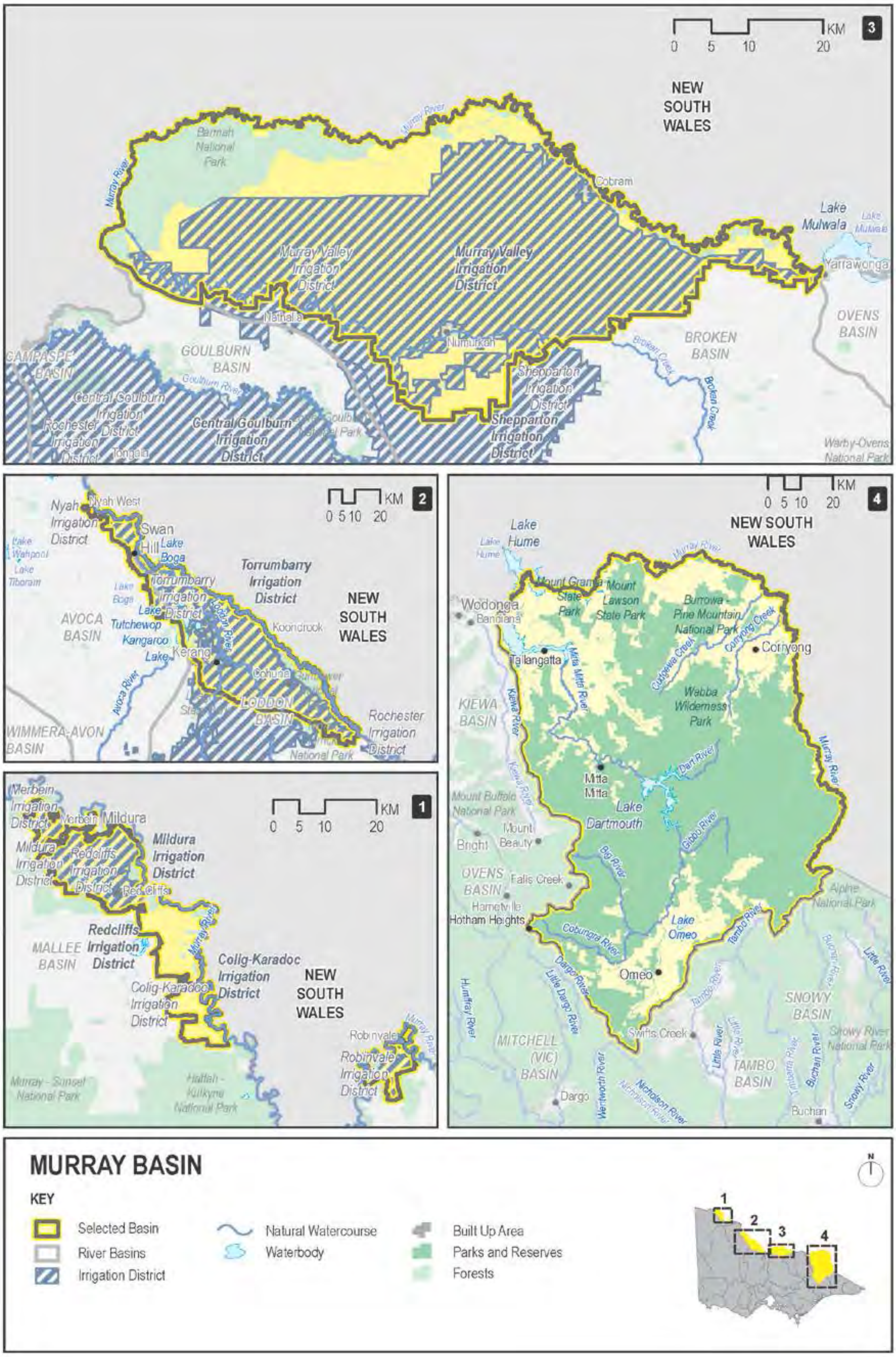
A table in each basin chapter provides the following information:

- 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

In the eastern part of the Murray basin in 2014–15, rainfall was between 60% and 100% of the long term average. Further west, rainfall was only 40% to 80% of the long term average.

Catchment inflows to the Murray basin in 2014–15 were 45% of the long-term average, lower compared to 2013–14when inflows were 60% of the long-term average.

The volume held in Victoria's share of the major Murray system storages started at 66% of capacity at the beginning of July and was at 55% of capacity at the end of June 2015.

Allocations in the regulated Murray system began the year at 57%. The allocation for high-reliability water shares reached 100% by September 2014. There was no allocation for low-reliability water shares in 2014–15.

No urban water use restrictions applied in the Murray basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

The MDBA is responsible under the *Water Act 2007* (Commonwealth) 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.

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 and Mulcra Islands Living Murray Icon sites also depend on the EWR in the Murray basin. These sites rely on the freshwater inputs from the Murray River to function ecologically.

In 2014–15 the Murray basin (Victoria) EWR comprised the following components:

- the Bulk Entitlement (River Murray – Flora and Fauna) Conversion Order 1999, comprising 29,782 ML of high-reliability, 3,892 ML of low-reliability and 40,000 ML unregulated entitlements held by the Victorian Environmental Water Holder (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 21,965 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 14,671 ML of high-reliability and 6,423 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 166,741 ML of environmental water was used in the Murray basin in 2014–15, including 69,824 ML of Commonwealth environmental water.

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	2014–15 (ML)[5]	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	3,170,910	3,782,415
Volume in storage at end of year	2,634,426	3,170,910
Change in storage	**(536,484)**	**(611,505)**
Inflows		
Catchment inflow[1]	3,436,013	4,562,480
Rainfall on major storages	80,987	104,178
Transfer from NSW[2]	240,030	0
Return flow from irrigation	269,026	272,162
Treated wastewater discharged back to river	3,788	3,586
Total inflows	**4,029,844**	**4,942,406**
Outflows		
Diversions		
Urban diversions	37,720	36,319
Irrigation district diversions	1,171,556	1,135,176
Licensed diversions from regulated streams	431,397	355,913
Licensed diversions from unregulated streams	2,318	2,159
Environmental water diversions	128,101	142,405
Transfer to NSW[3]	115,830	481,200
Small catchment dams	6,445	6,445
Total diversions	**1,893,366**	**2,159,617**
Losses		
Evaporation losses from major storages	194,668	205,064
Evaporation from small catchment dams	1,164	1,164
In-stream infiltration to groundwater, flows to floodplain and evaporation[4]	585,530	750,666
Total losses	**781,362**	**956,894**
Water passed at outlet of basin		
Murray River flow to South Australia from Victoria's allocation	1,891,600	2,437,400
Total water passed at outlet of basin	**1,891,600**	**2,437,400**
Total outflows	**4,566,328**	**5,553,911**

Notes:
(1) Inflows calculated based on estimates of inflows to major storages, plus inflows from tributaries.
(2) Transfers from NSW includes internal spills and volumes ceded from NSW share of storage. In 2014–15, no volume was ceded from NSW share of storage, and 240,030 ML was spilled.
(3) Transfers to NSW include internal spills and volumes ceded from Victoria to NSW. In 2013–14, these volumes were reported as water passed at outlet of basin.
(4) 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.
(5) 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 2014–15 at 3,170,910 ML (66% of capacity) and ended the year at 2,634,426 (55% 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)

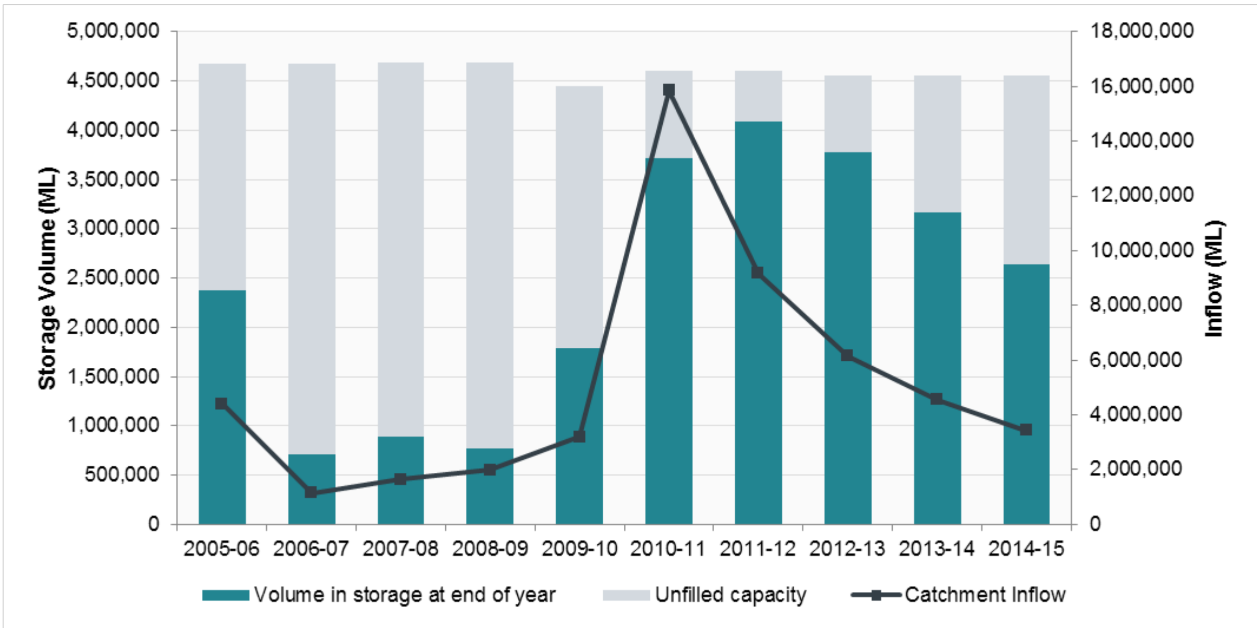
Table 6-4 Storage volumes in the Murray basin (Victoria)

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	4,410	487	4,368	3,796	4,326
Lake Dartmouth (VIC share)	1,928,116	1,928,000	12,700	19,700	(29,700)	1,891,300
Lake Hume (VIC share)	1,502,579	1,004,100	60,600	107,600	(472,200)	484,900
Lake Victoria (VIC share)	338,500	234,400	7,200	63,000	75,300	253,900
Menindee Lakes (VIC share)	1,025,000	0	0	0	0	0
Total	**4,799,465**	**3,170,910**	**80,987**	**194,668**	**(422,804)**	**2,634,426**

Victoria's share of catchment inflows were 45% of the long-term average of 7,618,000ML, lower than 2013–14, when catchment inflows were 60% of the long-term average (Figure 6-2).

The Victorian component of water flowing from the Murray basin to South Australia was 1,891,600 ML in 2014–15. This represented 55% of the catchment inflows into the basin, compared to 53% in 2013–14.

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 corporations 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	896,602
Low reliability water shares	298,672
High reliability supply by agreements	1,437
Low reliability supply by agreements	597
Loss provisions(1)	257,493
Mid Murray Storages - Loss provision	47,371
Sub-total: Bulk Entitlement (River Murray - Goulburn–Murray Water) Conversion Order 1999	**1,502,839**
Bulk Entitlement (River Murray - Lower Murray Urban and Rural Water - Irrigation) Conversion Order 1999	
High reliability water shares	326,393
Low reliability water shares	7,429
High reliability supply by agreements	98
Waterworks districts	714
Provision for unrecognised domestic and stock / house and garden supplies	535
Loss provisions(1)	17,034
Sub-total: Bulk Entitlement (River Murray - Lower Murray Urban and Rural Water - Irrigation) Conversion Order 1999	**352,204**
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
Sub-total: 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	**16,961**
Total volume of water entitlements in the Murray basin	**2,181,027**

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

Murray basin (Victoria)

Allocation available under bulk entitlements and licences for 2014–15 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; 46,276 ML was written-off due to actual spill events in 2014–15. This is considerably less than the 603,118 ML written-off due to spill events in 2013–14. Water corporations' diversions under bulk entitlements for 2014–15 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 128,101 ML to off-stream wetlands from water available under Victorian environmental entitlements and water traded in from the CEWO. Further information on water held by environmental water holders 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	298,695	877,997	(205,802)	631,149	29,406	16,583	293,752
Supply by agreements	679	1,417	46	1,405	81	45	632
Losses in district	-	-	-	145,796	-	-	-
Other operating losses[(1)]	-	-	-	46,937	-	-	-
Net diversion: River Murray – Goulburn–Murray Water[(2)]				**825,286**			
River Murray – Lower Murray Urban and Rural Water – Irrigation							
Water shares	84,062	340,089	168,356	491,556	15,249	7,889	77,813
Supply by agreements	448	1,312	(815)	746	99	80	19
Loss provisions	-	-	-	12,766	-	-	-
Diversion: River Murray – Lower Murray Water[(3)]				**505,067**			
River Murray - Lower Murray Water (Urban)	756	30,971	(7,436)	20,023	167	205	3,896
River Murray - Wimmera Mallee Water	597	3,486	100	3,914	132	7	130
River Murray - North East Water[(4)]	884	15,122	(5,291)	8,512	195	22	1,986
River Murray - Goulburn Valley Water	158	5,593	0	4,536	35	29	1,151
River Murray - Coliban Water	224	6,285	(1,200)	4,293	49	140	827
River Murray - Melbourne Retailers[(5)]	12,016	14,269	(13,425)	0	0	643	12,218
Corryong	-	680	0	260	-	420	-
Cudgewa	-	29	0	0	-	29	-
Dartmouth	-	60	0	24	-	36	-
Omeo	-	77	0	55	-	22	-
Walwa	-	61	0	18	-	43	-
River Murray – Flora and Fauna							
High reliability entitlement[(6)]	4,570	286,013	(170,224)	85,032	862	1,440	33,025
Low reliability entitlement[(6)]	2,841	67,369	(31,090)	35,173	0	195	3,752
Unregulated entitlement	-	36,061	0	36,061	-	0	-
Subtotal: River Murray – Flora and Fauna[(7)]				**156,266**			
River Murray - NVIRP Stage 1[(8)]	16,246	15,152	(829)	10,475	0	1,005	19,089
River Murray - Snowy Environmental Reserve	0	29,794	(29,794)	0	0	0	0
Take and use licences - unregulated surface water	-	16,961	0	2,318	-	14,643	-

Notes:
(1) Other operating losses include primarily 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 entitlements.
(4) Allocation includes return flows of 1,886 ML credited to North East Water from Wodonga recycled water treatment
(5) Melbourne retailer's transactions are held in one account as they each own equal shares of the available allocation.
(6) Allocation includes return flows of 314,011 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 156,266 ML reported, 119,303 ML represents diversions from the waterway.
(8) Water use here represents both in-stream use and actual diversions from the waterway; of the 10,475 ML reported, 8,797 ML represents diversions 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 41% 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 lower than the proportion recycled and water consumption rates in 2013–14, which was 46%.

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)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Bellbridge	38	38	100%	0	38	0	0	0	0
Bundalong	0	0	0%	0	0	0	0	0	0
Cobram	311	311	100%	0	311	0	0	0	0
Cohuna	0	0	0%	0	0	0	0	0	0
Corryong	101	101	100%	0	101	0	0	0	0
Dartmouth	4	0	0%	0	0	0	0	4	0
Gunbower / Leitchville	15	15	100%	0	15	0	0	0	0
Koondrook	80	0	0%	0	0	0	0	0	80
Koorlong	2,184	2,095	96%	0	2,095	0	0	0	89
Lake Boga	46	0	0%	0	0	0	0	0	46
Merbein	142	0	0%	0	0	0	0	0	142
Mildura	1,076	559	52%	0	559	0	0	0	517
Murrabit	7	0	0%	0	0	0	0	0	7
Nathalia	117	117	100%	0	117	0	0	0	0
Numurkah	107	107	100%	0	107	0	0	0	0
Nyah/Nyah West	91	0	0%	0	0	0	0	0	91
Omeo	23	23	98%	0	23	0	0	0	0
Robinvale	208	145	70%	0	145	0	0	0	63

Murray basin (Victoria)

Strathmerton	0	0	0%	0	0	0	0	0	0
Swan Hill	1,129	0	0%	0	0	0	0	0	1,129
Tallangatta	91	91	100%	0	91	0	0	0	0
Walwa	6	6	100%	6	0	0	0	0	0
Wodonga	4,046	253	4%	155	0	0	98	3,784	9
Yarrawonga	412	412	100%	0	412	0	0	0	0
Total 2014–15	**10,232**	**4,271**	**41%**	**161**	**4,012**	**0**	**98**	**3,788**	**2,173**
Total 2013–14	10,337	4,777	46%	315	4,462	0	0	3,586	1,974

Notes:

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

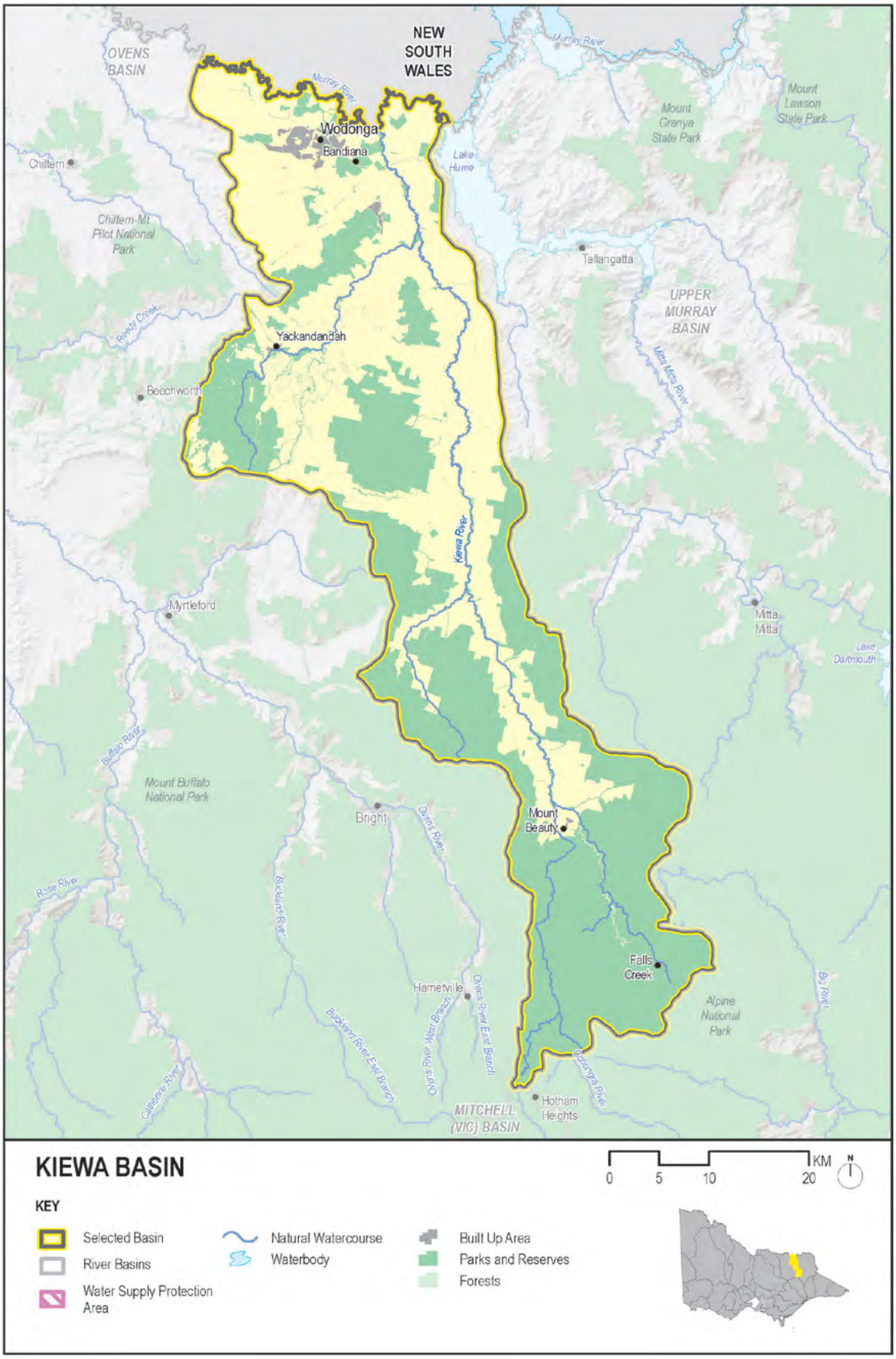
(2) ‘Within process’ refers to water reused in wastewater treatment processes, for example to maintain biological processes. This value is not included in the total percent recycled, consistent with its treatment in the ESC’s performance report.

(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 2014–15, rainfall in the Kiewa basin was generally between 80% and 100% of the long-term average, though a small area in the southern reach of the basin only received between 60% and 80% of the long-term average.

Catchment inflows were 70% of the long-term average, compared to 88% in 2013–14. The volume of water flowing out of the Kiewa River into the Murray basin represented 90% of the Kiewa basin's total inflows.

The major water storages in the Kiewa basin finished the year at 53% of capacity, compared with 41% of capacity at the start of the year.

No urban water use restrictions applied in the Kiewa basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 2014–15, 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

In 2014–15 the total volumes of water available and supplied from water resources in the Kiewa basin 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 lower in 2014–15 (Table 6-10) than those reported in the 2013–14 Victorian Water Accounts. Only a small proportion of the surface water resources in the Kiewa basin (1.5%) was extracted for consumptive use, though this is still higher than in 2013–14, when only 0.4% was extracted for consumptive use.

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

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	11,828	21,045
Volume in storage at end of year	15,548	11,828
Change in storage	**3,720**	**(9,217)**
Inflows		
Catchment inflow(1)	482,118	605,828
Rainfall on major storages	3,561	3,690

Treated wastewater discharged back to river	304	311
Total inflows	**485,983**	**609,829**
Outflows		
Diversions		
Urban diversions	628	585
Licensed diversions from unregulated streams	2,894	2,034
Small catchment dams	3,927	3,927
Total diversions	***7,449***	***6,546***
Losses		
Evaporation losses from major storages	2,737	2,920
Evaporation from small catchment dams	1,099	1,099
In-stream infiltration to groundwater, flows to floodplain and evaporation	32,554	38,859
Total losses	***36,390***	***42,878***
Water passed at outlet of basin		
Kiewa basin outflow to Murray River – Victoria share	219,212	284,811
Kiewa basin outflow to Murray River – NSW share	219,212	284,811
Total water passed at outlet of basin	***438,423***	***569,622***
Total outflows	**482,263**	**619,046**

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 16,113 ML (53% of capacity) by the end of June 2015 compared to 12,347 ML (41% of capacity) at the start of July 2014 (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.

Table 6-11 Storage volumes in the Kiewa basin

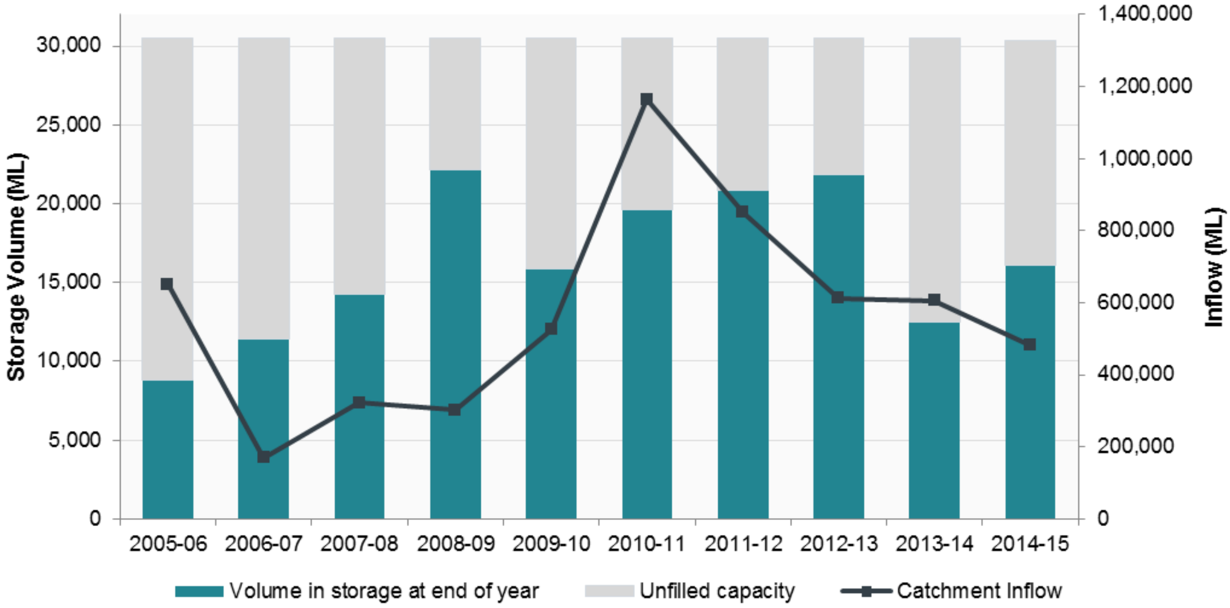
Storage	Total Capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Lake Guy	1,416	954	192	148	(553)	445
Rocky Valley	28,294	10,874	3,369	2,590	3,450	15,103
Total on-stream storages	***29,710***	***11,828***	***3,561***	***2,737***	***2,897***	***15,548***
Off-stream storages						
Clover Pondage	255	164	n/a	n/a	46	210
Pretty Valley Basin	355	355	n/a	n/a	0	355
Total off-stream storages	***610***	***519***	***n/a***	***n/a***	***46***	***565***
Total	**30,320**	**12,347**	**3,561**	**2,737**	**2,943**	**16,113**

n/a: Information not available.

The catchment inflow volume for 2014–15 was 482,118 ML, representing 70% of the long-term average of 689,000 ML. The volume of water flowing from the Kiewa basin into the Murray River decreased to 438,423 ML in 2014–15 (including the New South Wales share of Kiewa River flows under the Murray–Darling Basin Agreement). This volume was approximately 131,199 ML less than the 2013–14 outflow volume of 569,622 ML. The volume of water flowing from the Kiewa basin into the Murray River in 2014–15 represented 90% 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 2014–15 compared to the previous nine years.

Figure 6-4 All major storages and catchment inflows



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 (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations 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	15,822
Total volume of water entitlements in the Kiewa basin	**16,928**

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 2014–15 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*

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

Water Entitlement	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	408	310
Yackandandah(2)	209	0	220	(11)
Take and use licences - unregulated surface water	15,822	0	2,894	12,928

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.

(2) Overuse was due to storage being overfilled and spilled. North East Water has implemented controls to prevent recurrence and has capped allocation to recover the overuse.

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 purpose is provided in Table 6-15. In addition to the recycled water reported in the table below, 119 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 2014–15.

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)	53	53	101%	0	53	0	0	0	(0)
Mount Beauty	192	6	3%	6	0	0	0	185	0
Yackandandah	69	69	100%	0	69	0	0	0	0
Total 2014–15	**314**	**129**	**41%**	**6**	**123**	**0**	**0**	**185**	**(0)**
Total 2013–14	298	128	43%	3	125	0	0	196	(26)

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.

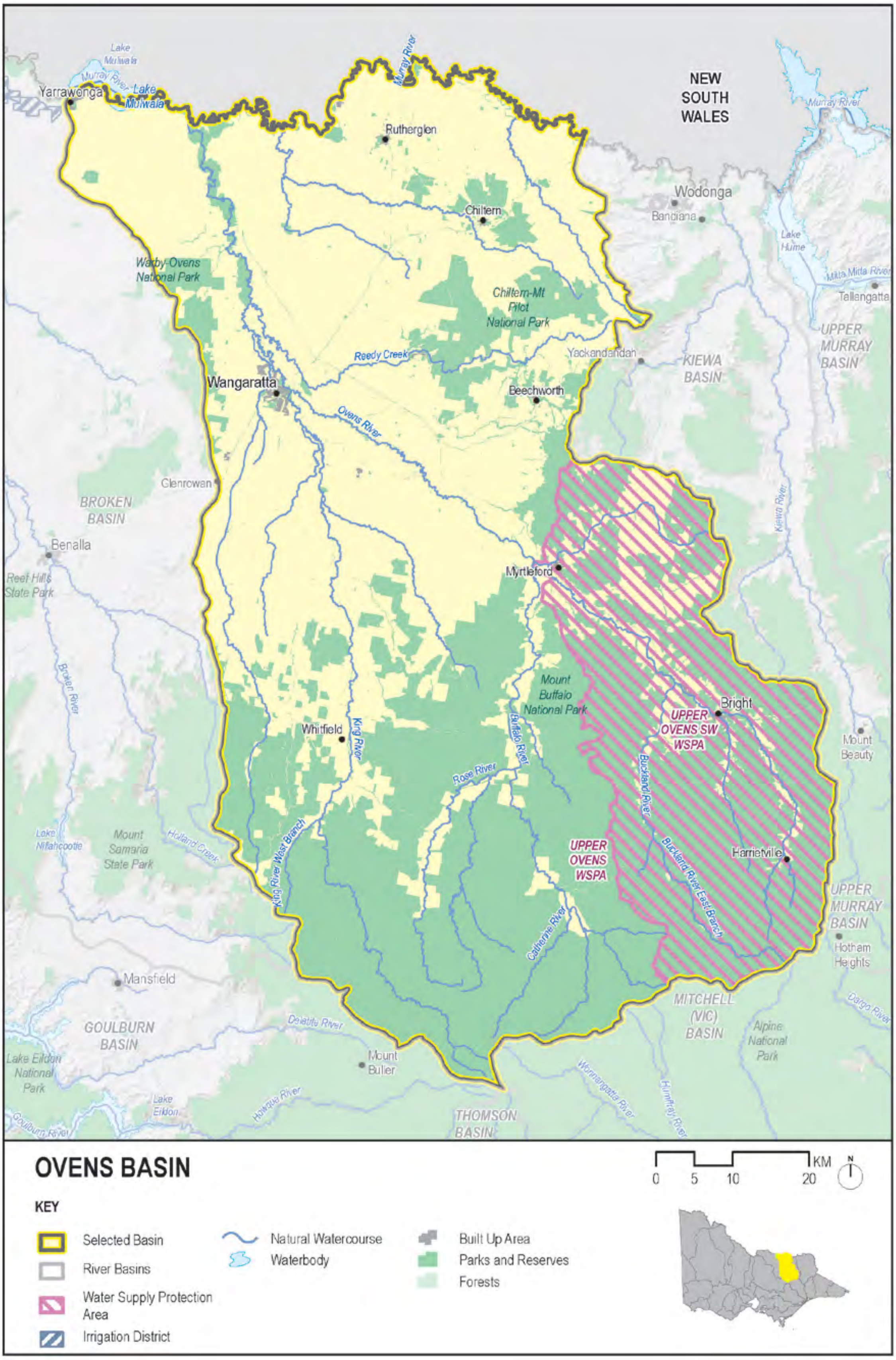
(3) 'Other' refers to a change in on-site effluent storage or items affecting the annual water balance for recycled water that are not otherwise accounted for.

(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 2014–15, rainfall across the southern Ovens basin was 60% to 80% of the long-term average, while rainfall in the north east of the basin reached 80% to 100%.

Catchment inflows in 2014–15 were 54% of the long-term average annual volume representing a decrease from the previous year. The volume of water flowing out of the Ovens basin into the Murray River represented 93% of the Ovens basin's total inflows.

The total volume of water held in major storages in the Ovens basin finished the year at 75% capacity, lower than the 81% at the start of the year. No urban water use restrictions applied in the Ovens basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 2014–15 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 Water Management Plan
- 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 volume of surface water resources in 2014–15 decreased to 952,712 ML, compared to 1,456,965 ML in 2013–14. Total water use was greater than the previous year, with total use of 44,530 ML in 2014–15 compared with 34,545 ML in 2013–14.

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

Ovens basin

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

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	30,522	26,342
Volume in storage at end of year	28,035	30,522
Change in storage	**(2,487)**	**4,180**
Inflows		
Catchment inflow(1)	948,433	1,450,612
Rainfall on major storages	2,864	4,492
Treated effluent discharged back to river	1,415	1,861
Total inflows	**952,712**	**1,456,965**
Outflows		
Diversions		
Urban diversions	5,429	5,349
Licensed diversions from regulated streams	7,462	6,138
Licensed diversions from unregulated streams	15,751	7,170
Small catchment dams	15,888	15,888
Total diversions	***44,530***	***34,545***
Losses		
Evaporation losses from major storages	3,781	3,254
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	***23,231***	***22,704***
Water passed at outlet of basin		
Ovens basin outflow to Murray River	887,438	1,395,536
Total water passed at outlet of basin	***887,438***	***1,395,536***
Total outflows	**955,199**	**1,452,785**

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 30,522 ML at 1 July 2014 and 28,035 ML or 76% of capacity by end June 2015 (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.

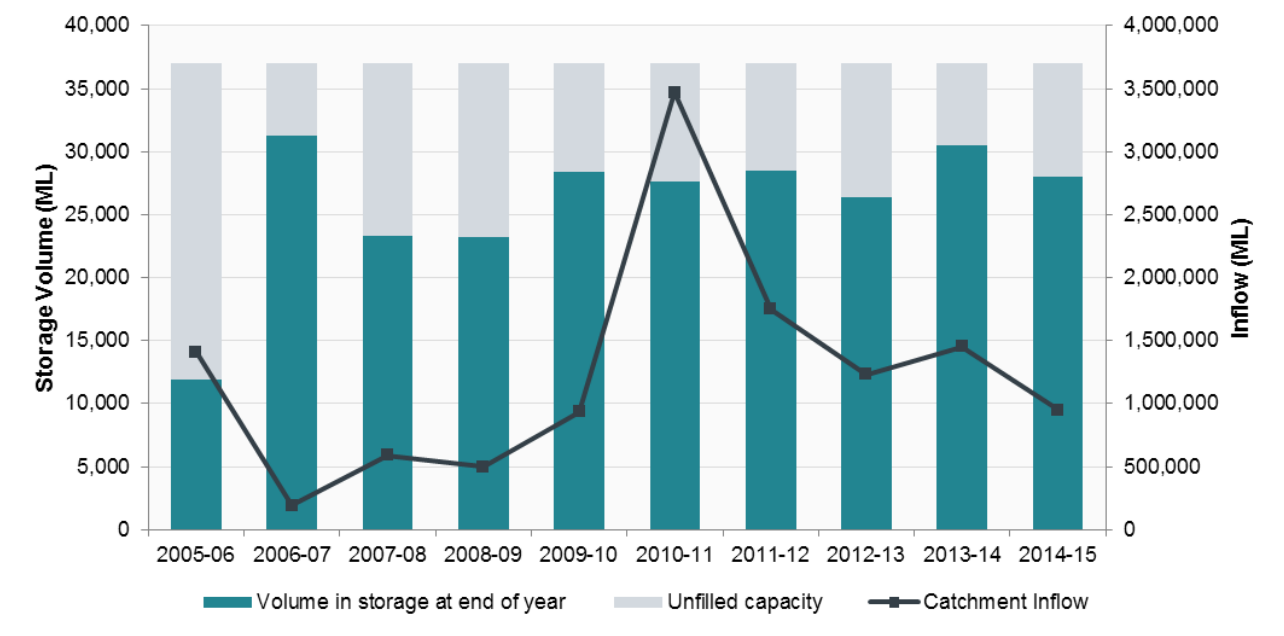
Table 6-18 Storage volumes in the Ovens basin

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	23,340	16,302	2,069	3,072	(689)	14,610
Lake William Hovell	13,690	14,220	795	709	(882)	13,425
Grand Total	**37,030**	**30,522**	**2,864**	**3,781**	**(1,571)**	**28,035**

Catchment inflows in 2014–15 were 54% of the long-term annual average (1,758,000 ML), compared to 83% in 2013–14. The volume of water flowing from the Ovens basin into the Murray River was 887,438 ML in 2014–15. This represented 93% of the total inflows into the basin, compared to 96% in 2013–14.

Figure 6-6 shows the storage levels and inflow volumes in the Ovens basin from 2005-06 to 2014–15.

. 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 (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations 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	26,251
Spill reliability water shares	12,530
Bulk Entitlement (Ovens System - Moyhu, Oxley and Wangaratta - North East Water) Conversion Order 2004	7,832
Sub-total: Bulk Entitlement (Ovens System - Goulburn Murray Water) Conversion Order 2004	**46,613**
Bulk Entitlement (Beechworth) Conversion Order 2001	**1,100**
Bulk Entitlement (Bright) Conversion Order 2000(2)	**870**
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(3)	**1,470**
Bulk Entitlement (Springhurst) Conversion Order 1999	**36**
Bulk Entitlement (Whitfield) Conversion Order 1999	**34**
Take and use licences - unregulated surface water	**18,103**
Total volume of water entitlements in the Broken basin	**68,587**

Notes:

(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) On 16 October 2014, the Bulk Entitlement (Bright Conversion Order 2000 was amended and the Bulk Entitlement (Porepunkah) Conversion Order 1999 repealed to reflect infrastructure changes in the system (the construction of an off-river storage at Freeburgh). As part of this amendment the water entitlement previously held under the Porepunkah bulk entitlement was transferred to the Bright bulk entitlement.

(3) 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 2-year period is 2,424 ML (1,212 ML annual average).

Ovens basin

Allocation available under bulk entitlements and licences for 2014–15 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)]	27,003	0	7,532	19,471
Ovens System - Moyhu, Oxley and Wangaratta	7,832	0	3,404	4,428
Diversion: Ovens system – Goulburn–Murray Water[(2)]			**10,867**	
Beechworth	1,100	0	535	565
Bright[(3)]	870	0	854	16
Chiltern[(4)]	180	0	0	180
Glenrowan	90	0	7	83
Harrietville	91	0	62	29
Myrtleford	1,470	0	566	904
Springhurst	36	0	0	36
Whitfield	34	0	0	34
Take and use licences - unregulated surface water[(5)]	18,103	246	15,751	2,599

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) On 16 October 2014, the Bulk Entitlement (Bright Conversion Order 2000 was amended and the Bulk Entitlement (Porepunkah) Conversion Order 1999 was repealed to reflect infrastructure changes in the system (the construction of an off-river storage at Freeburgh). As part of this amendment the 166 ML water entitlement held under the Porepunkah bulk entitlement was transferred to the Bright bulk entitlement.

(4) North East Water has not diverted any water under this bulk entitlement since February 2008 when Chiltern was connected to the Wodonga 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 42% of the wastewater passing through treatment plants in the basin in 2014–15 was recycled, less than the estimated 25% in 2013–14.

Table 6-22 shows the volumes of water recycled in the Ovens basin in 2014–15.

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): Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)	Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
Barnawartha	0	0	0%	0	0	0	0	0	0
Beechworth	290	79	27%	0	79	0	0	211	0
Bright / Porepunkah	288	25	9%	25	0	0	0	263	0
Chiltern	86	86	100%	0	86	0	0	0	0
Myrtleford	163	0	0%	0	0	0	0	163	0
Rutherglen / Wahgunyah	113	113	100%	58	56	0	0	0	0
Wangaratta	1,496	719	48%	6	713	0	0	778	0
Total 2014–15	**2,437**	**1,022**	**42%**	**89**	**933**	**0**	**0**	**1,415**	**0**
Total 2013–14	2,494	634	25%	89	545	0	0	1,860	0

Notes:

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

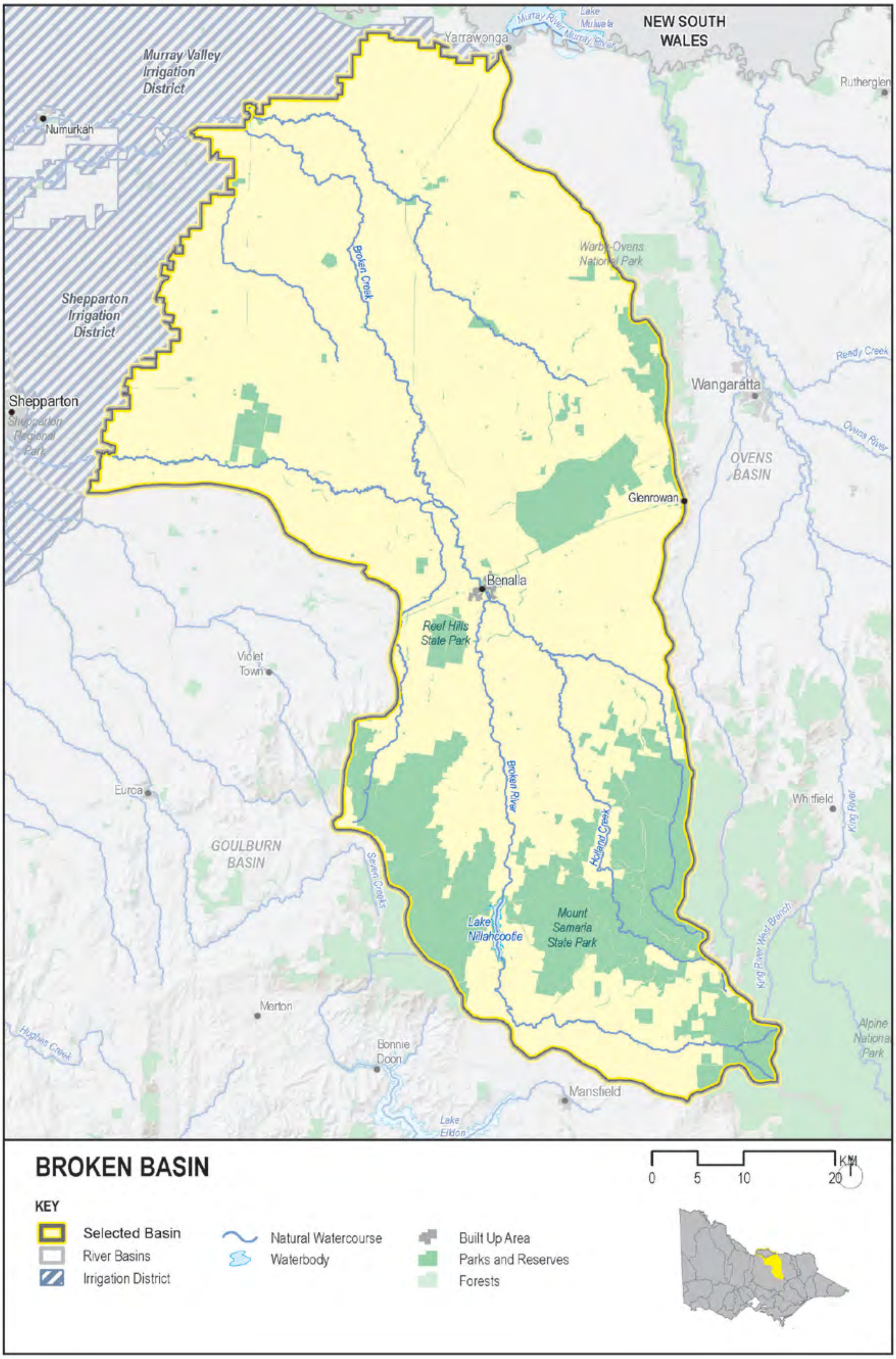
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(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 2014–15, rainfall across the Broken basin was 60% to 80% of the long-term average in the majority of the basin, with a small area receiving 80% to 100% of average rainfall. Total catchment inflows were 46% of the long-term average, lower than the previous year which had inflows of 67% of the long term average.

Major storages in the Broken basin were at 55% of capacity at the end of the year, after being at 83% of capacity at the start.

The year began with a 15% July allocation for high-reliability water shares for Broken system irrigators. High-reliability water share allocation reached 100% in September, and a 37% allocation to low-reliability water shares was made. This increased to 100% by December.

There were no restrictions on urban water use in the Broken basin during 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 Environmental Water Reserve (EWR). Similarly dependent are sites in Broken Creek and Lower Broken Creek, which 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 2014–15, 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.

In 2014–15, 887 ML of environmental water was used in the Broken basin, including 250 ML of Commonwealth environmental water.

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.

Broken basin

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

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	35,040	26,220
Volume in storage at end of year	23,060	35,040
Change in storage	**(11,980)**	**8,819**
Inflows		
Catchment inflow(1)	141,401	210,402
Rainfall on major storages	2,926	4,705
Total inflows	**144,327**	**215,107**
Outflows		
Diversions		
Urban diversions	1,390	1,336
Licensed diversions from regulated streams	10,338	8,748
Licensed diversions from unregulated streams	2,960	1,613
Environmental water diversion	887	122
Small catchment dams	15,738	15,738
Total diversions	***31,314***	***27,557***
Losses		
Evaporation losses from major storages	4,366	4,468
Evaporation from small catchment dams	7,227	7,227
In-stream infiltration to groundwater, flows to floodplain and evaporation	7,338	11,028
Total losses	***18,931***	***22,723***
Water passed at outlet of basin		
Broken River at Gowangardie to Goulburn basin	102,464	149,976
Boosey Creek at Tungamah to Murray basin	2,228	4,783
Broken Creek at Katamatite to Murray basin	1,370	1,248
Total water passed at outlet of basin	***106,062***	***156,008***
Total outflows	**156,307**	**206,288**

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 23,060 ML at the end of June 2015, representing a net decrease 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.

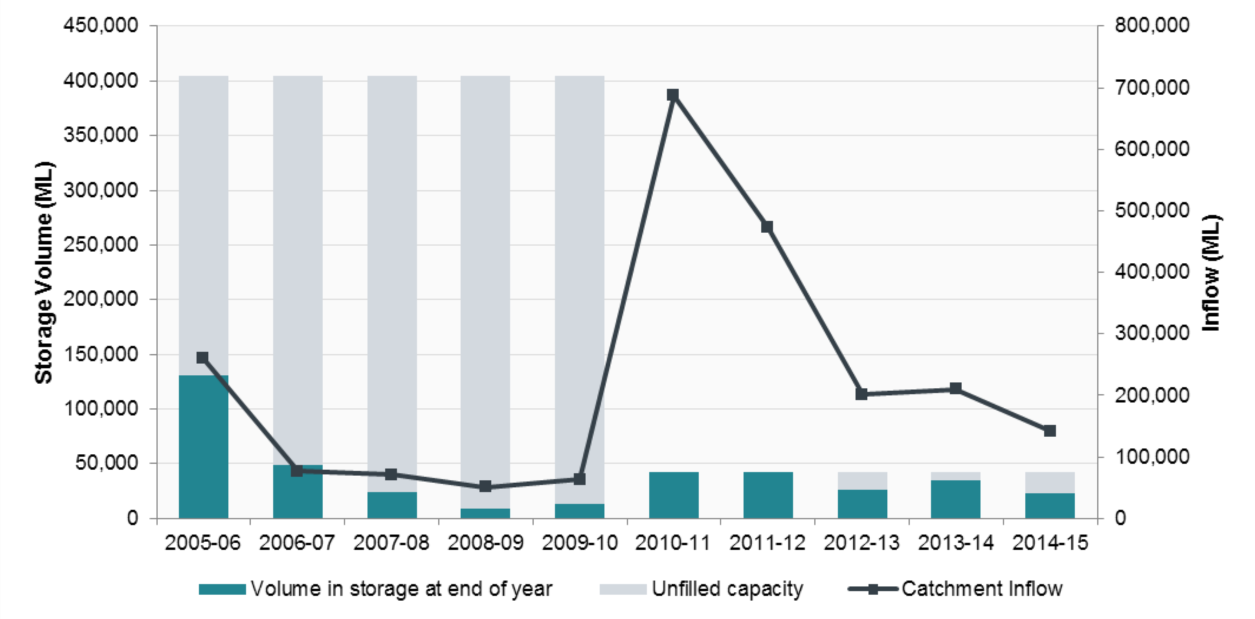
Table 6-25 Storage volumes in the Broken basin

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	33,293	2,680	3,596	10,943	21,434
Loombah-McCall Say	1,747	1,747	246	770	(403)	1,626
Grand Total	**42,147**	**35,040**	**2,926**	**4,366**	**10,539**	**23,060**

Catchment inflows were 46% of the long-term average of 308,000 ML, lower than the 67% recorded in 2013–14 (Figure 6-8).

The amount of water flowing from the Broken basin into the Murray River decreased to 106,062 ML in 2014–15. This represented 68% of the Broken basin's total inflows, compared to 74% in 2013–14.

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 (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations 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
Sub-total: 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	**2,960**
Total volume of water entitlements in the Broken basin	**28,239**

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 2014–15 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 fifty percent 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.*

Broken basin

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]	7,407	13,563	(5,517)	6,892	3,794	4,767
Tungamah, Devenish and St. James[2]	64	71	0	0	71	64
Loss provision	-	-	-	4,455	-	-
Diversion: Broken system - Goulburn Murray Water[3]				**11,347**		
Loombah-McCall Say (Benalla)	-	2,324	0	1,390	934	-
Take and use licences - unregulated surface water	-	2,960	0	770	2,190	-

Notes:
(1) Water use reported includes 887 ML of environmental use.
(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 2014–15 these towns continued to be supplied with 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 increased from 232 ML in 2013–14 to 555 ML in 2014–15. As in the previous two years, 100% of the wastewater produced in 2014–15 was recycled. Table 6-29 below details the recycling undertaken at Benalla in 2014–15.

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

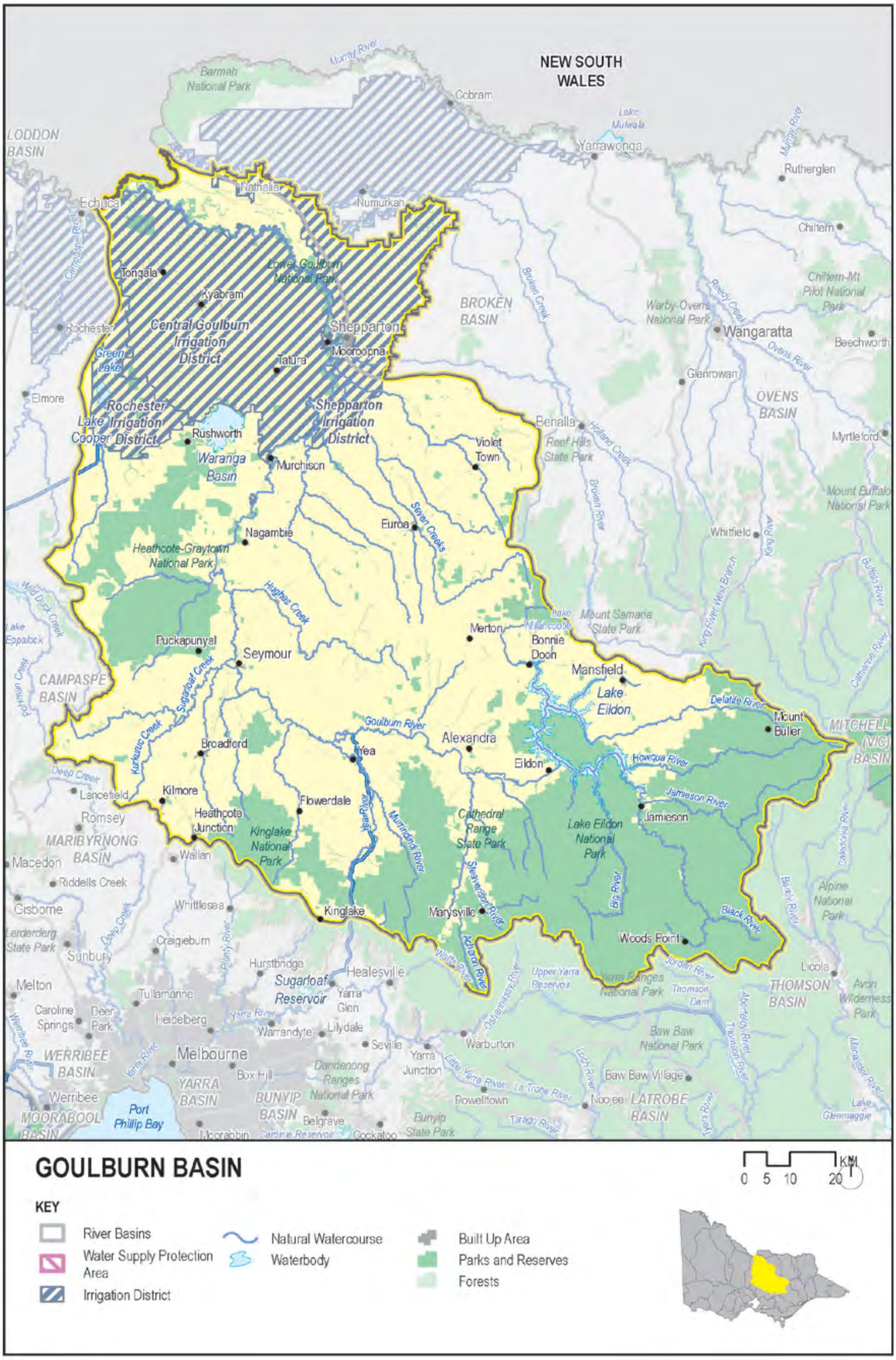
Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Benalla	555	555	100%	0	555	0	0	0	0
Total 2014–15	**555**	**555**	**100%**	**0**	**555**	**0**	**0**	**0**	**0**
Total 2013–14	232	232	100%	0	232	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 2014–15, rainfall across the Goulburn basin was between 60% and 80% of the long-term average. The amount of water flowing from the Goulburn basin into the Murray River represented 52% of the total inflows into the basin.

The volume of water in major storages in the Goulburn basin started the year at 71% of capacity and ended the year at 54% of capacity.

The seasonal allocation for high-reliability water shares started at 74% and reached 100% in August 2014. There was no allocation for low-reliability water shares in 2014–15.

No urban water use restrictions applied in the Goulburn basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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
Grampians Wimmera Mallee Water			Supplies the town of Quambatook	
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 wetlands of national significance, significant areas of intact riparian and floodplains vegetation, and endangered flora and fauna species (including Trout Cod and Murray Cod), depend on the EWR in the Goulburn basin. Water from the Goulburn basin also feeds into the Murray basin, helping to maintain internationally significant environmental assets such as Gunbower Forest and the Kerang Wetlands within that basin. Sites 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 2014–15, the Goulburn basin EWR comprised:

- the *Environmental Entitlement (Goulburn System – Living Murray 2007)*, comprising of 39,625 ML of high-reliability entitlement and 156,980 ML of low-reliability entitlement held by the Victorian Environmental Water Holder (VEWH)
- the *Goulburn River Environmental Entitlement 2010* of 8,851 ML high-reliability and 3,140 ML low-reliability entitlement held by the VEWH
- the *Environmental Entitlement (Goulburn System – NVIRP Stage 1) 2012* held by the VEWH, which includes mitigation water allocated for the purposes of watering specific environmental sites that have been identified through GMW Connections Project environmental approvals processes and an allocation as a result of water savings generated by the GMW Connections Project.

- the *Bulk Entitlement (Goulburn System – Snowy Environment Reserve) Order 2004* comprising 30,252 ML of high-reliability and 8,156 ML of low-reliability entitlement
- water shares – Snowy River Environmental Reserve comprising 8,321 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.

In 2014–15, a total of 335,676 ML of environmental water was used in the Goulburn basin, including 252,257 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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	2,440,563	2,366,591
Volume in storage at end of year	1,879,721	2,440,563
Change in storage	**(560,842)**	**73,972**
Inflows		
Catchment inflow(1)	1,584,463	2,249,371
Rainfall on major storages	94,707	111,537
Inflow from Broken River at Gowangardie	102,464	149,976
Inflow from Loddon via the Goulburn supplement	0	6,628
Return flow from irrigation	0	0
Transfer from Campaspe via Waranga Western Channel	0	0
Treated wastewater discharged back to river	1,471	514
Total inflows	**1,783,105**	**2,518,026**
Outflows		
Diversions		
Urban diversions	26,048	25,121
Irrigation district diversions	1,058,951	1,108,654
Licensed diversions from regulated streams	22,684	59,634
Licensed diversions from unregulated streams	6,452	6,354
Transfer from Silver and Wallaby creeks to Yarra basin	1,454	1,880
Transfers to Melbourne via North-South pipeline(2)	0	0
Environmental water diversions	0	50
Small catchment dams	47,513	47,513
Total diversions	**1,163,102**	**1,249,205**
Losses		
Evaporation losses from major storages	75,390	110,080
Losses from small catchment dams	10,065	10,065
In-stream infiltration to groundwater, flows to floodplain and evaporation	140,480	135,028
Total losses	**225,935**	**255,173**
Water passed at outlet of basin		

Goulburn River to Campaspe River via Waranga Western Channel	1,778	0
Goulburn River outflow to Murray River	929,458	920,450
Goulburn River outflow to Murray River via Broken Creek	23,674	19,226
Total water passed at outlet of basin	**954,910**	**939,676**
Total outflows	**2,343,947**	**2,444,055**

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 2014–15 water year. A volume of 6 ML was used to charge the pipeline for fire-fighting purposes.

6.6.2.2 Storages and flows

Levels for all major storages in the basin were 2,053,916 ML at the end June 2015, or 54% of the total storage capacity, compared to 2,718,240 ML at the start of July 2014 (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.

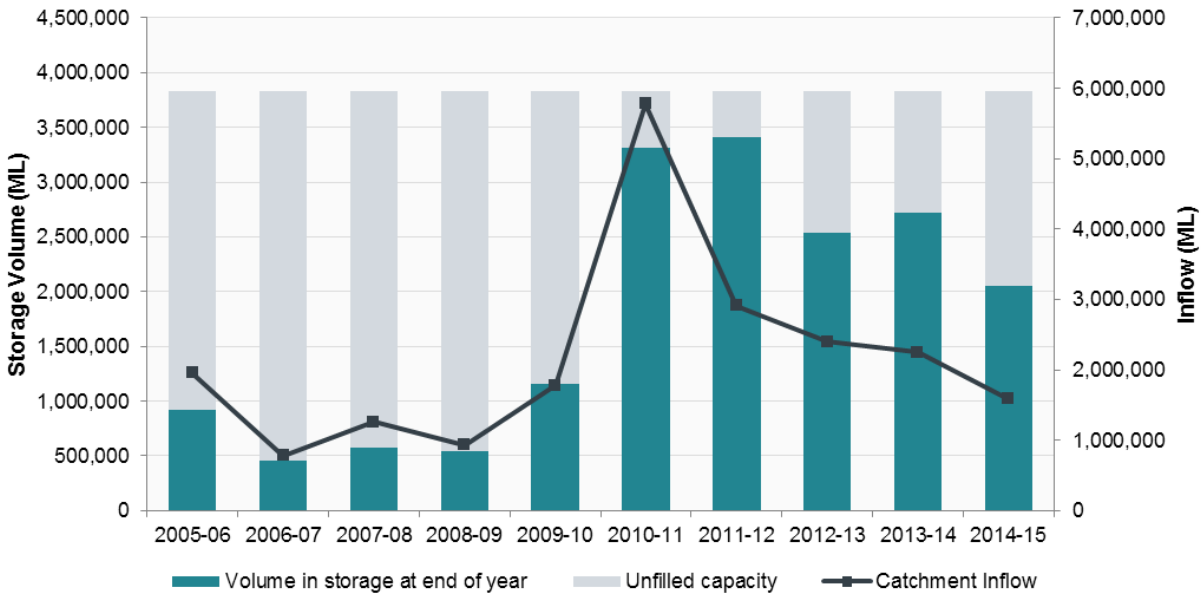
Only volumes for major on-stream storages have been included in the water balance; major off-stream storages such as Waranga basin and Greens Lake have not been included.

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	24,351	3,671	11,361	8,607	25,268
Lake Eildon	3,334,158	2,414,693	90,954	63,905	(588,347)	1,853,395
Sunday Creek Reservoir	1,650	1,519	82	124	(419)	1,058
Total on-stream storages	**3,361,308**	**2,440,563**	**94,707**	**75,390**	**(580,159)**	**1,879,721**
Off-stream storages						
Greens' Lake	32,500	20,370	1,466	4,848	5,381	22,370
Waranga Basin	432,360	257,307	15,254	50,315	(70,421)	151,825
Total off-stream storages	**464,860**	**277,677**	**16,720**	**55,163**	**(65,040)**	**174,195**
Total	**3,826,168**	**2,718,240**	**111,427**	**130,552**	**(645,198)**	**2,053,916**

Catchment inflows to the Goulburn basin in 2014–15 were 47% of the long-term average (Figure 6-10). The amount of water flowing from the Goulburn basin into the Murray River increased to 953,132 ML in 2014–15. This represented 53% of the total inflows into the Goulburn basin, an increase from 37% in 2013–14.

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



6.6.2.3 Entitlement volumes and diversions

GMW, Coliban Water, Goulburn Valley Water, Grampians Wimmera Mallee Water, the Melbourne metropolitan retailers (City West Water, South East Water and Yarra Valley Water), Melbourne 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. Melbourne Water holds a bulk entitlement to divert surface water from the Silver and Wallaby Creeks. This water is used to supply Primary Entitlement Holders in the Melbourne headworks system (City West Water, South East Water, Yarra Valley Water, Barwon Water, South Gippsland Water, Western Water and Westernport Water) which were issued entitlements to the Greater Yarra System – Thomson River Pool in 2014.

Entitlements in the Goulburn basin include rights granted to individuals (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations 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	1,025,597
Low reliability water shares	449,004
High reliability supply by agreements	4,484
Low reliability supply by agreements	1,851
Waterworks districts(2)	2,335
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	
Bulk Entitlement (Goulburn System - City West Water) Order 2012(3)	n/a
Bulk Entitlement (Goulburn System - South East Water) Order 2012(3)	n/a
Bulk Entitlement (Goulburn System - Yarra Valley Water) Order 2012(3)	n/a
Sub-total: Goulburn System - Melbourne Metropolitan Retailers	**n/a**
Environmental Entitlement (Goulburn System - Living Murray) 2007	196,605
Environmental Entitlement (Goulburn System - NVIRP Stage 1) 2012(4)	n/a
Bulk Entitlement (Goulburn System - Snowy Environmental Reserve) Order 2004	38,408

Goulburn River Environmental Entitlement 2010	11,991
Loss provision(5)	343,620
Sub-total: Bulk Entitlement (Eildon - Goulburn Weir) Conversion Order 1995	**2,109,905**
Bulk Entitlement (Broadford, Kilmore and Wallan) Conversion and Augmentation Order 2003(6)	**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(5)	**1,300**
Bulk Entitlement (Marysville) Conversion Order 1995	**462**
Bulk Entitlement (Pyalong) Conversion Order 1997	**75**
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 Hyrdro Ltd) Conversion Order 1997(7)	**0**
Bulk Entitlement (Silver and Wallaby Creeks - Melbourne Water) Order 2014(8)	**22,000**
Silver and Wallaby Creeks Environmental Entitlement 2006	**n/a**
Take and use licences - unregulated surface water	**24,819**
Total volume of water entitlements in the Goulburn basin	**2,164,522**

Notes:

(1) Under GMW'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) This entitlement includes losses and excludes the volume to supply GWMWater's Quambatook bulk entitlement (100 ML) and Coliban Water (65 ML), as described in GMW's Eildon-Goulburn Weir bulk entitlement.

(3) The Melbourne Retailer 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 GMW Connections Project Stage 1 as verified by an audit.

(4) 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.

(5) The volume specified is the loss entitlement volume recorded in the Victorian Water Register. The volume has decreased since 2013–14 as a result of water shares issued to the Commonwealth Government for the GMW Connections Project Stage 2.

(6) 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).

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

(8) Melbourne Water holds a 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. This water is used to supply primary entitlement holders (City West Water, South East Water, Yarra Valley Water, Barwon Water, Western Water, South Gippsland Water and Westernport Water) with entitlement to the Greater Yarra System-Thomson River Pool which sources water from the Yarra River, Thomson River, Tarago River, Silver Creek and Wallaby Creek.

Allocation available under bulk entitlements and licences for 2014–15 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 2014–15 affecting customers' accounts.

The VEWH holds *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 River and the Murray River. Information on this entitlement is available in Table 4-3 in Chapter 4.

Diversions under bulk entitlements for 2014–15 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 Murray Darling Basin Authority'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	385,021	1,027,422	(286,252)	871,998	0	16,755	237,438
Supply by agreements	2,397	4,484	(864)	3,807	0	291	1,919
Waterworks districts(1)	-	2,335	0	1,448	-	887	-
Goulburn Channel System - CW	856	2,420	(901)	1,574	0	46	756
Goulburn River and Eildon - GVW(2)	33	26,325	(9,574)	15,535	0	57	1,192
Goulburn Channel System - GVW	17	7,191	(1,200)	5,598	0	11	399
Quambatook - GWMWater	37	100	0	121	0	1	15
Goulburn System - Melbourne Retailers	24,464	21,100	(22,129)	6	0	1,171	22,258
Environmental Entitlement Goulburn System - Living Murray(3)	20,598	39,625	8,343	54,349	0	711	13,507
Goulburn System - NVIRP Stage 1(3)	22,410	21,922	3,509	29,139	0	935	17,767
Goulburn System - Snowy Environmental Reserve	0	30,252	(30,252)	0	0	0	0
Goulburn River Environmental Entitlement(3)	0	8,851	246,478	252,189	0	157	2,983
Operating provisions (whole of system)(3)	-	-	-	(27,523)	-	-	-
Loss provisions(4)	-	-	-	180,530	-	-	-
Diversion: Eildon - Goulburn Weir(3)				**1,053,092**			
Broadford, Kilmore and Wallan	-	2,875	0	1,585	-	1,290	-
Buxton	-	110	0	0	-	110	-
Euroa System	-	1,990	0	730	-	1,260	-
Longwood	-	120	0	51	-	69	-
Mansfield	-	1,300	0	463	-	837	-
Marysville	-	462	0	169	-	293	-
Pyalong	-	75	0	35	-	40	-
Silver and Wallaby Creeks - Melbourne Water	-	23	0	17	-	6	-
Strathbogie	-	120	0	0	-	120	-
Thornton	-	235	0	73	-	162	-
Upper Delatite	-	20	0	0	-	20	-
Violet Town	-	30	0	4	-	26	-
Woods Point	-	438	0	214	-	224	-
Yea	-	-	-	-	-	-	-
Rubicon - Hydro Ltd	-	22,000	0	1,454	-	20,546	-
Silver and Wallaby Creeks Environmental Entitlement	-	-	-	-	-	-	-
Take and use licences - unregulated surface water	-	24,757	63	6,452	-	18,367	-

Notes:

(1) Reported volumes relate to stock and domestic customers and delivery losses. Water available under Coliban Water and Grampians Wimmera Mallee Water's bulk entitlements in the waterworks districts are excluded from this line item (and reported against those bulk entitlements).

(2) Volume of allocation issued includes return flows of 26.2 ML, credited to Goulburn Valley Water for return flows from GMW customers.

(3) 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.

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

(5) 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.

Goulburn basin

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 84% of the volume of wastewater passing through treatment plants in the basin was recycled, a decrease of 10% compared to 2013–14. In addition to the recycled water reported below, 140 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 2014–15.

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

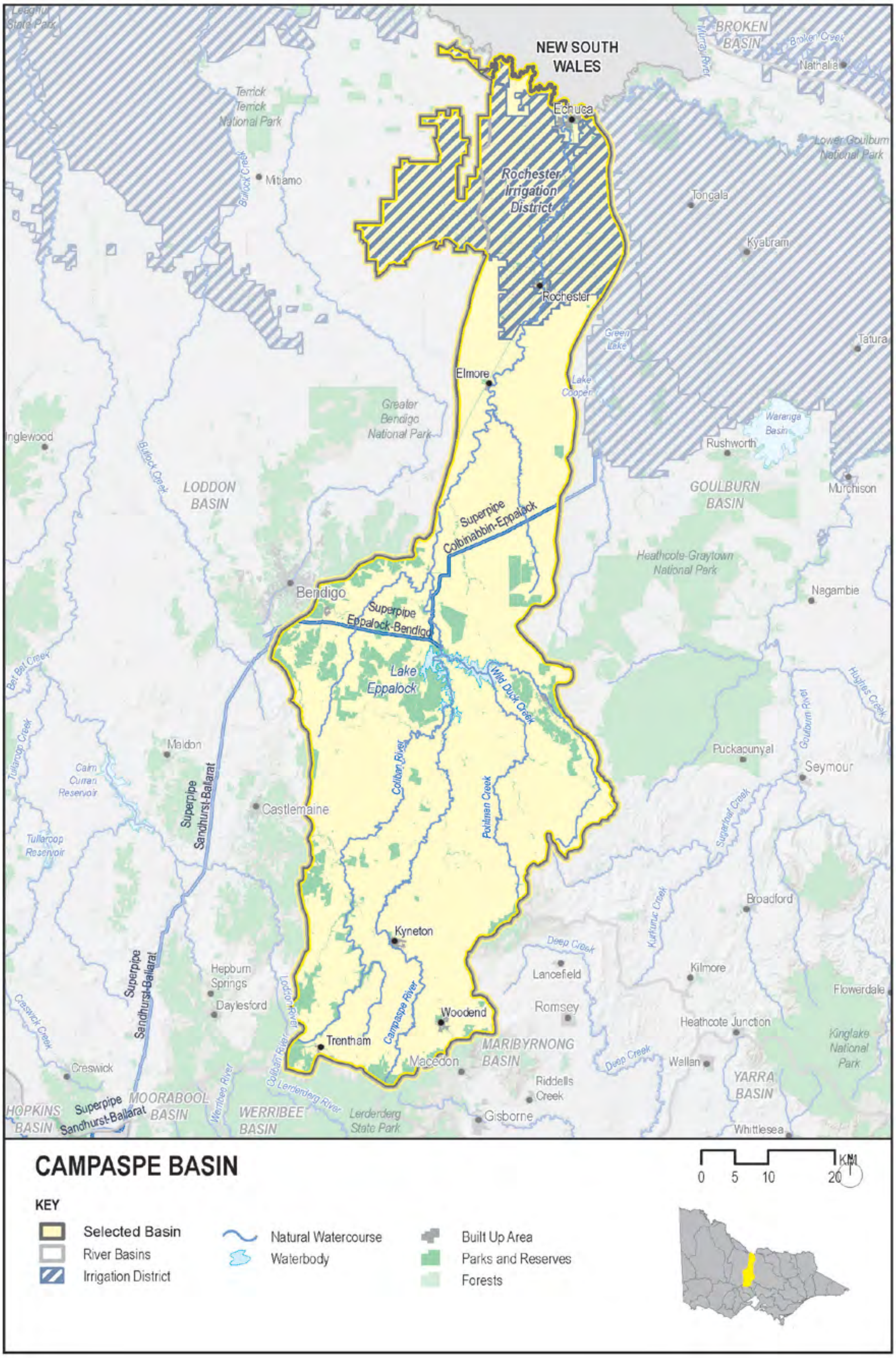
Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled[2]	End- use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other[3] (ML)
				Urban and industrial	Agriculture	Beneficial allocation[1]	Within process[2]		
Alexandra	152	59	39%	41	18	0	0	93	0
Avenel	7	7	100%	0	7	0	0	0	0
Bonnie Doon	19	19	100%	0	19	0	0	0	0
Broadford	130	130	100%	0	130	0	0	0	0
Eildon	108	19	18%	19	0	0	0	89	0
Euroa	240	240	100%	58	182	0	0	0	0
Girgarre	0	0	0%	0	0	0	0	0	0
Kilmore	287	227	79%	0	227	0	0	60	0
Kyabram/Merrigum	408	408	100%	0	408	0	0	0	0
Mansfield	240	200	83%	77	123	0	0	40	0
Marysville	55	55	100%	55	0	0	0	0	0
Mooroopna	932	932	100%	0	932	0	0	0	0
Murchison	0	0	0%	0	0	0	0	0	0
Nagambie	97	97	100%	0	97	0	0	0	0
Seymour	470	470	100%	46	424	0	0	0	0
Shepparton	3,537	2,939	83%	0	2,939	0	0	598	0
Stanhope / Rushworth	35	35	100%	0	35	0	0	0	0
Tatura	1,240	898	72%	0	898	0	0	342	0
Tongala	376	266	71%	0	266	0	0	110	0
Upper Delatite	34	34	100%	0	34	0	0	0	0
Violet Town	30	30	100%	0	30	0	0	0	0
Yea	88	88	100%	56	32	0	0	0	0
Total 2014–15	**8,483**	**7,153**	**84%**	**352**	**6,801**	**0**	**0**	**1,330**	**0**
Total 2013–14	6,419	6,012	94%	263	5,749	0	0	362	45

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 2014–15 was between 60% and 80% of the long-term average. Catchment inflows to the Campaspe basin were 26% of the long-term average, compared to 46% in 2013–14.

Campaspe system irrigators received a 100% high-reliability water share allocation in July 2014. No allocation to low-reliability water shares was made during the year.

The volume of water in major storages in the Campaspe basin finished the year lower than it began. Campaspe storages held 73% of capacity at the start of the year and 48% at the end of June 2015. No urban water use restrictions applied in the Campaspe basin in 2014–15, with all towns remaining on permanent water savings 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 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 2014–15, the Campaspe basin EWR comprised:

- the *Campaspe River Environmental Entitlement 2013* comprising 20,652 ML high-reliability 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.

In 2014–15, a total of 31,170 ML of environmental water was used in the Campaspe basin, including 5,971 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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	272,348	278,410
Volume in storage at end of year	179,801	272,348
Change in storage	**(92,547)**	**(6,062)**
Inflows		
Catchment inflow(1)	90,292	161,438
Rainfall on major storages	12,544	21,616
Transfer from Waranga Western Channel to Lake Eppalock	1,778	207
Transfer to Campaspe basin from Waranga Western Channel	118	0
Treated wastewater discharged back to river	537	752
Total inflows	**105,269**	**184,013**
Outflows		
Diversions		
Urban diversions	18,322	15,028
Diversion for Coliban Water rural entitlements	13,712	10,153
Licensed diversions from regulated streams	10,045	10,097
Licensed diversions from unregulated streams	2,323	1,201
Small catchment dams	28,776	28,776
Transfer from Campaspe basin to Western Waranga Channel	0	0
Transfer from Campaspe Basin to White Swan Reservoir	563	207
Total diversions	**73,741**	**65,462**
Losses		
Evaporation losses from major storages	33,610	40,095
Losses from small catchment dams	14,794	14,794
In-stream infiltration to groundwater, flows to floodplain and evaporation	5,300	5,444
Total losses	**53,704**	**60,334**
Water passed at outlet of basin		
Campaspe River outflow to Murray River	70,371	64,280
Total water passed at outlet of basin	**70,371**	**64,280**
Total outflows	**197,816**	**190,076**

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 182,150 ML (48% of capacity) by the end of June 2015 compared to 274,972 ML (73% of capacity) in July 2014 (Table 6-39). In the Campaspe basin, major on-stream storages include Lake Eppalock, 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.

Campaspe basin

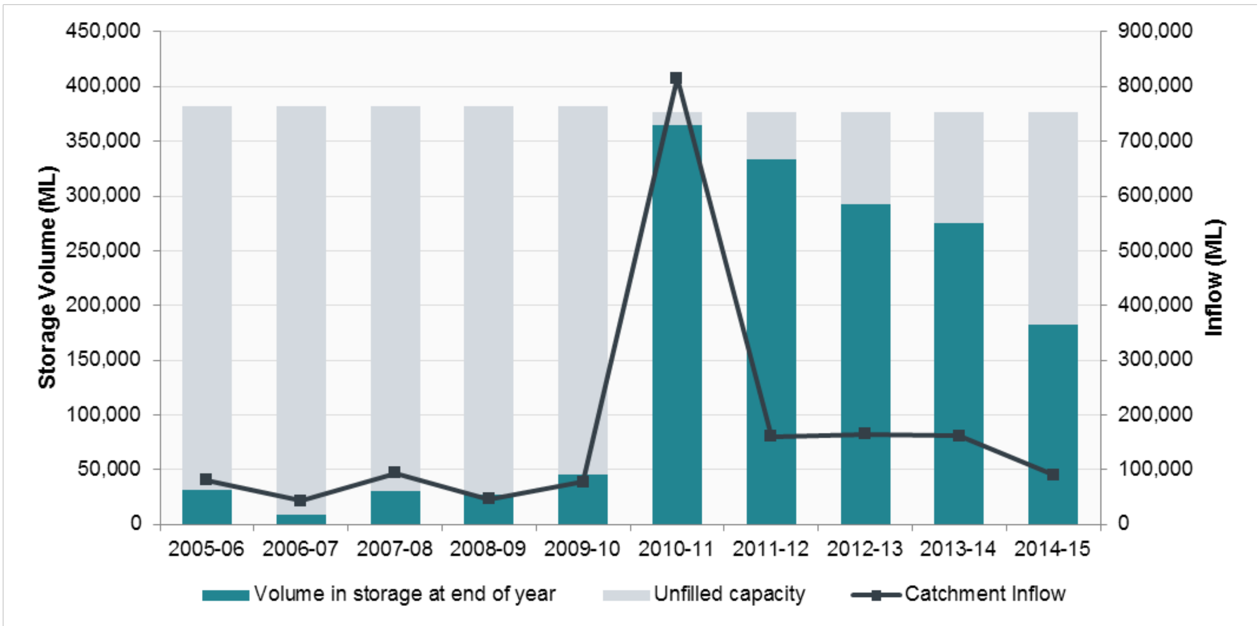
Table 6-39 Storage volumes in the Campaspe basin

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	304,650	224,620	8,811	26,056	(69,886)	137,490
Lauriston Reservoir	19,790	15,780	880	1,941	2,671	17,390
Malmsbury Reservoir	12,034	6,138	790	1,843	(605)	4,480
Upper Coliban Reservoir	37,770	25,810	2,063	3,770	(3,662)	20,441
Total on-stream storages	**374,244**	**272,348**	**12,544**	**33,610**	**(71,482)**	**179,801**
Off-stream storages						
Campaspe Weir	2,624	2,624	n/a	n/a	(275)	2,349
Total off-stream storages	**2,624**	**2,624**	**n/a**	**n/a**	**(275)**	**2,349**
Grand Total	**376,868**	**274,972**	**12,544**	**33,610**	**(71,757)**	**182,150**

n/a: information not available

Catchment inflows to the Campaspe basin amounted to 90,292 ML in 2014–15, which is 26% 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 2014–15 was 70,371 ML, representing 67% 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 (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations or the VEWH. Rights to water in the Campaspe basin are outlined in Table 6-40.

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 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
Sub-total: 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
Sub-total: 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	**3,274**
Total volume of water entitlements in the Campaspe basin	**137,714**

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 ten 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 annum 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 2014–15 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 2014–15 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 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)
Campaspe System - Goulburn Murray Water							
Water shares	13,554	23,465	(13,083)	10,045	0	899	12,992
Axedale, Goornong and Rochester	332	349	(294)	57	0	16	313
Campaspe River - Living Murray Initiative[(1)]	2,448	126	0	2,574	0	0	0
Campaspe River Environmental Entitlement 2013[(1)]	9,549	20,652	(2,046)	28,155	0	0	0
Plus provision for system operation	-	-	-	0	-	-	-
Diversion: Campaspe System - Goulburn Murray Water				**10,102**			
Campaspe System - Coliban Water							

Campaspe basin

Rural entitlements	-	15,742	0	4,753	-	10,989	-
Urban commitments	-	34,518	0	16,243	-	18,275	-
Plus provision for system operation	-	-	-	10,573	-	-	-
Diversion: Campaspe System - Coliban Water				**31,569**			
Trentham[(2)]	-	120	0	121	-	(1)	-
Woodend	-	470	0	287	-	183	-
Take and use licences - unregulated surface water (GMW)	-	3,274	0	2,323	-	951	-

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) Under the Trentham bulk entitlement Coliban Water can use an average of 120 ML/year over a three year period which has not been exceeded despite the water use in 2014–15 exceeding allocation by 1 ML.

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 78% 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	12	12	100%	12	0	0	0	0	0
Echuca	1,464	1,464	100%	0	1,464	0	0	0	0
Elmore	0	0	0%	0	0	0	0	0	0
Heathcote	115	115	100%	115	0	0	0	0	0
Kyneton	621	330	53%	94	236	0	0	291	0
Lockington	0	0	0%	0	0	0	0	0	0
Rochester	0	0	0%	0	0	0	0	0	0
Woodend	339	60	17%	37	22	0	1	246	33
Total 2014–15	**2,550**	**1,980**	**78%**	**257**	**1,722**	**0**	**1**	**537**	**33**
Total 2013–14	1,909	1,244	65%	243	1,001	0	0	752	(87)

Notes:

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

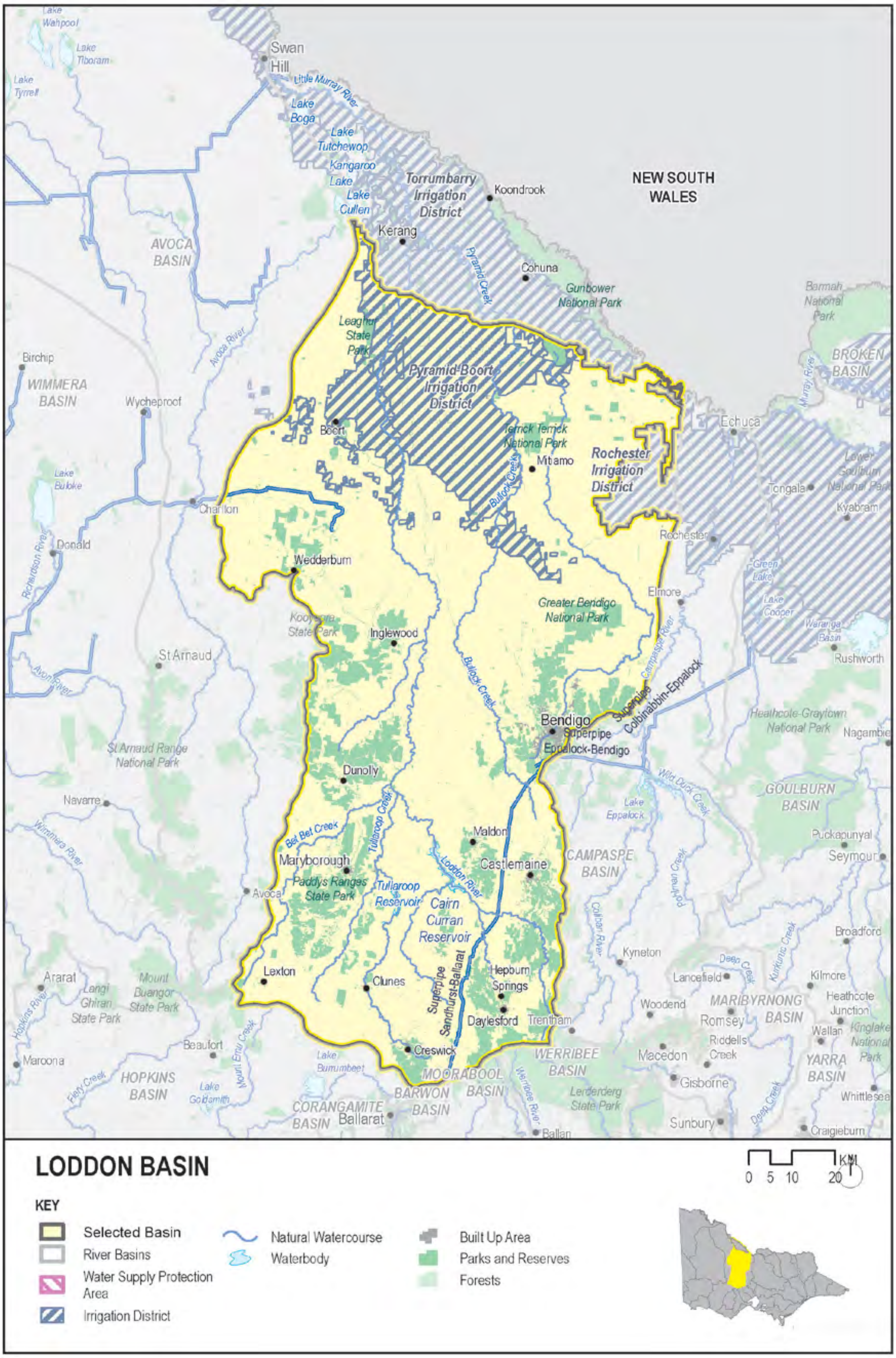
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(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 2014–15, rainfall in most of the Loddon basin was between 60% and 80% of the long-term average. Areas in the north and west of the basin experienced less rainfall, between 40% and 60% of the long term average. The catchment inflow volume was 32% of the long-term average.

The volume of water in major storages in the Loddon basin were at 55% of capacity at the start of the year and by the end of June 2015 were at 37%.

The year began with a 74% July allocation for high-reliability water shares in the Loddon system. This increased to 100% during August. No allocations were made to low-reliability water shares during the year. The Bullarook system did not receive an allocation on 1 July 2014, but high-reliability water shares received a 100% allocation in August. In September, a 100% allocation was also made to low-reliability water shares.

No urban water use restrictions applied in the Loddon basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 Murray Cod and Painted Snipe) and communities of threatened riparian vegetation, depend on the Environmental Water Reserve (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. Specifically, Gunbower Forest 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 2014–15, the Loddon basin EWR comprised:

- the *Bulk Entitlement (Loddon River – Environmental Water Reserve) Order 2005*, of 3,480 ML high-reliability, 2,024 ML low-reliability and 7,490 ML of provisional reliability water entitlements held by the Victorian Environmental Water Holder (VEWH)
- The *Environmental Entitlement (Birch Creek – Bullarook System) 2009*, which includes passing flows and 100 ML of water in Newlyn Reservoir when high-reliability water shares are greater than 20% in the Bullarook system at the start of December
- water set aside for the environment 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.

In 2014–15, a total of 14,528 ML of environmental water was used in the Loddon basin, including 2,870 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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	128,747	148,483
Volume in storage at end of year	84,106	128,747
Change in storage	**(44,641)**	**(19,736)**
Inflows		
Catchment inflow(1)	120,217	157,132
Rainfall on major storages	6,542	11,673
Treated wastewater discharged back to river	5,138	5,204
Total inflows	**131,897**	**174,009**
Outflows		
Diversions		
Urban diversions	4,621	4,278
Licensed diversions and irrigation diversions from regulated streams	14,227	12,202
Transfer to Goulburn basin (through Loddon supplement)	0	6,628
Licensed diversions from unregulated streams	8,774	7,263
Environmental water diversion	2,000	2,000
Small catchment dams	50,037	50,037
Total diversions	***79,659***	***82,408***
Losses		
Evaporation losses from major storages	22,234	29,008
Losses from small catchment dams	29,579	29,579
In-stream infiltration to groundwater, flows to floodplain and evaporation	15,000	17,621
Total losses	***66,813***	***76,208***
Water passed at outlet of basin		
Loddon River outflow to Murray River (Appin South)	27,803	27,984
Wandella Creek at Fairley	0	0
Mount Hope Creek at Mitiamo	2,000	6,906
Bullock Creek, Calivil Creek and Nine Mile Creek	265	239
Total water passed at outlet of basin	***30,067***	***35,129***
Total outflows	**176,538**	**193,745**

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 88,146 ML (37% of capacity) at the end of June 2015 compared with 132,003 ML (55% of capacity) at the beginning 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 51,556 ML in storage (35% of capacity).

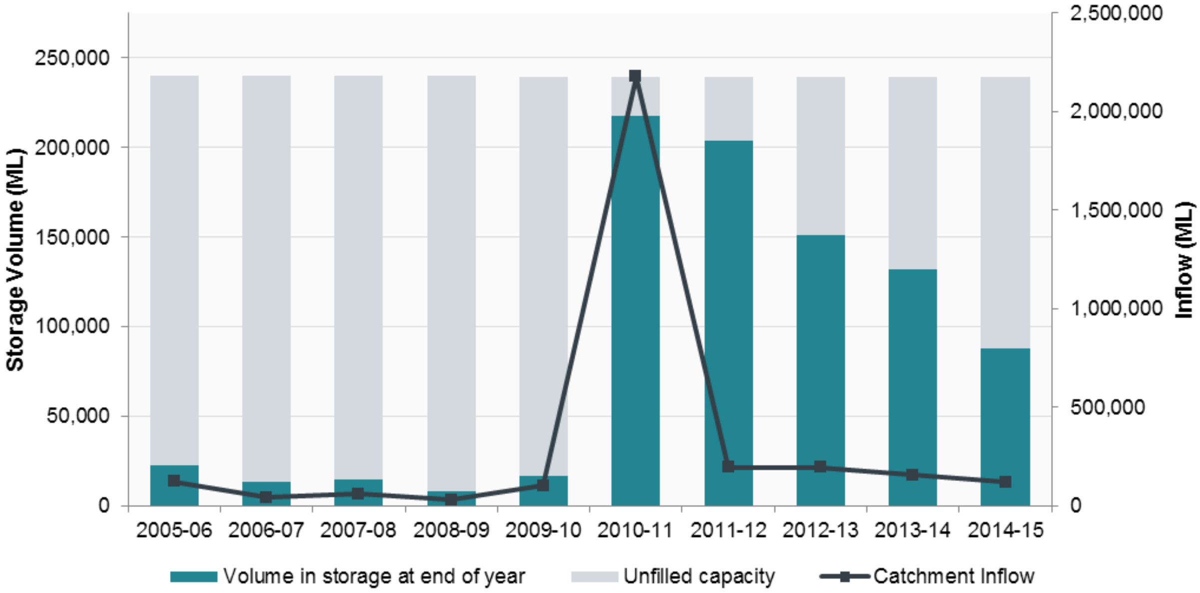
Loddon basin

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	83,990	3,326	12,860	(22,900)	51,556
Hepburn Lagoon	2,457	1,448	689	1,135	171	1,173
Laanecoorie Reservoir	8,000	2,622	451	2,086	1,561	2,548
Newlyn Reservoir	3,012	1,640	415	685	(14)	1,356
Tullaroop Reservoir	72,950	39,048	1,661	5,468	(7,767)	27,473
Total on-stream storages	***233,549***	***128,747***	***6,542***	***22,234***	**(28,949)**	***84,106***
Off-stream storages						
Evansford Reservoir	1,400	1,049	80	248	245	1,126
Sandhurst Reservoir	2,590	1,505	102	288	753	2,072
Spring Gully Reservoir	1,680	702	102	284	322	842
Total off-stream storages	***5,670***	***3,256***	***284***	***820***	**1,320**	***4,040***
Total	**239,219**	**132,003**	**6,826**	**23,054**	**(27,629)**	**88,146**

Catchment inflows were 32% of the long-term average of 373,000 ML, a decrease compared to the volume of inflows in 2013–14 (Figure 6-14). The amount of water flowing from the Loddon basin was 30,067 ML in 2014–15. This represents 23% 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 who all 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 (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations or the VEWH). Rights to water in the Loddon basin are outlined in Table 6-47.

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	21,389
Low reliability water shares – Loddon	8,083
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
Sub-total: Bulk Entitlement (Loddon System - Goulburn Murray Water) Conversion Order 2005	**132,486**
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
Sub-total: 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	**22,439**
Total volume of water entitlements in the Loddon basin	**161,125**

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 2014–15 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 fifty percent 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.*

Loddon basin

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	4,986	17,502	(8,288)	10,111	960	3,130
Loddon River – Environmental Reserve(1)	2,660	10,310	3,985	14,108	846	2,000
Loddon System – Part Maryborough – Central Highlands Water	874	1,200	290	1,445	19	900
Loddon System – Coliban Water	390	431	(99)	382	17	322
Loddon supplement(2)	-	-	-	0	-	-
Operating provisions (whole of system)(3)	-	-	-	3,318	-	-
Diversion: Loddon system – Goulburn–Murray Water(4)				**17,256**		
Bullarook System – Goulburn–Murray Water						
Water shares – Bullarook	194	943	20	706	184	269
Bullarook System – Central Highlands Water	238	263	(20)	217	26	238
Environmental Entitlement Birch Creek – Bullarook System	100	0	0	100	0	0
Diversion: Bullarook system – Goulburn–Murray Water(5)				**1,023**		
Creswick	-	500	0	470	30	-
Daylesford – Hepburn Springs	-	916	0	644	272	-
Lexton	-	45	0	19	26	-
Evansford – Talbot System – Part Maryborough – Central Highlands Water	-	3,000	0	1,435	1,565	-
Take and use licences – unregulated surface water	-	22,439	0	8,774	13,665	-

Notes:

(1) 12,108 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 2014–15 slightly decreased, compared to 2013–14. The proportion of wastewater recycled in 2014–15 was 27%, similar to 2013–14. This is presented in Table 6-50.

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	5,170	1,089	21%	792	297	0	0	4,081	0
Boort	18	18	100%	0	18	0	0	0	0
Bridgewater / Inglewood	0	0	0%	0	0	0	0	0	0
Castlemaine	1,175	118	10%	118	0	0	0	1,057	0
Clunes	0	0	0%	0	0	0	0	0	0
Daylesford	422	422	100%	30	392	0	0	0	0
Dunolly	0	0	0%	0	0	0	0	0	0
Kerang	574	0	0%	0	0	0	0	0	574
Maryborough	379	379	100%	79	300	0	0	0	0
Pyramid Hill	14	14	100%	0	14	0	0	0	0
Wedderburn	24	24	100%	0	24	0	0	0	0
Total 2014–15	**7,776**	**2,064**	**27%**	**1,018**	**1,046**	**0**	**0**	**5,138**	**574**
Total 2013–14	7,889	2,159	27%	830	1,329	0	0	5,204	526

Notes:

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

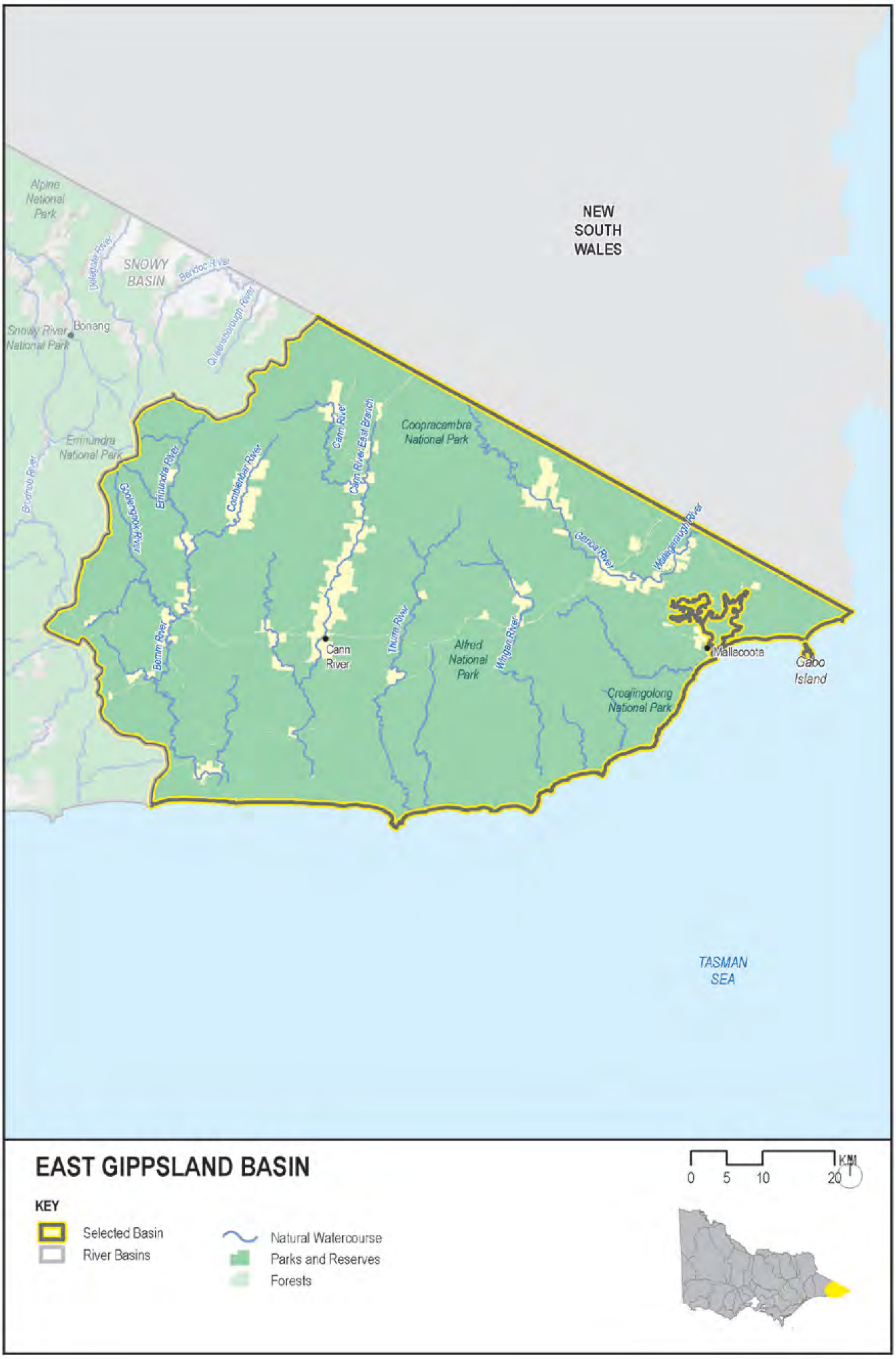
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(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 2014–15, rainfall in the East Gippsland basin was between 100% and 125% of the long-term average.

Catchment inflows were 190% of the long-term annual average, an increase from the 93% recorded in 2013–14. Consumptive use in the basin is generally very low compared to water availability, and almost 100% of total inflows passed to Bass Strait in 2014–15.

No urban water use restrictions applied in the East Gippsland basin in 2014–15, with all towns remaining on permanent water savings rules throughout the 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 2014–15, 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	2014–15 (ML)	2013–14 (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)	1,359,269	666,465
Rainfall on major storages	-	-
Treated wastewater discharged back to river	0	0
Total inflows	**1,359,269**	**666,465**
Outflows		
Diversions		
Urban diversions	163	149
Licensed diversions from unregulated streams	27	90
Small catchment dams	1,100	1,100

Total diversions	***1,290***	***1,338***
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	1,357,912	665,059
Total water passed at outlet of basin	***1,357,912***	***665,059***
Total outflows	**1,359,269**	**666,465**

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.

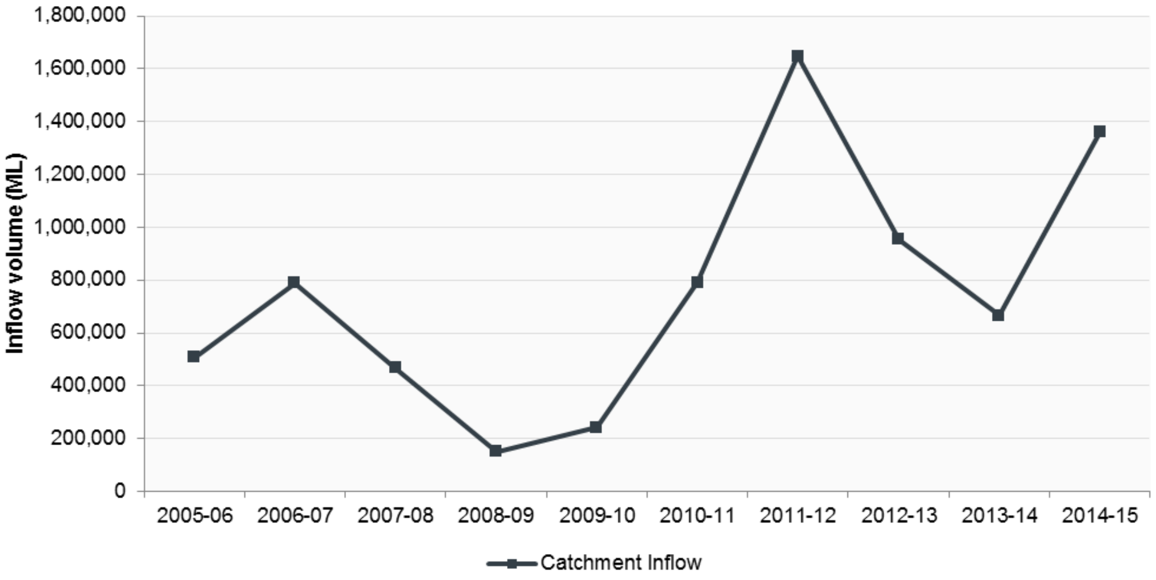
6.9.2.2 Storages and flows

Catchment inflows in 2014–15 were 190% of the long-term annual average of 714,000 ML, higher than the volume for 2013–14, which was 93% of the long-term average (Figure 6-16).

The amount of water flowing from the East Gippsland basin into Bass Strait was 1,357,912 ML in 2014–15, compared to 665,059 ML in 2013–14. 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 (for example, bulk entitlements granted to water corporations 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 systems)	660
Total volume of water entitlements in the East Gippsland basin	**1,282**

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-54. The total volume of water diverted by bulk entitlement holders was similar to volume reported in the 2013–14 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	17	83
Cann River	192	0	34	158
Mallacoota	330	0	112	218
Take and use licences - unregulated surface water	660	0	27	633

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 2014–15 increased, compared to 2013–14, and 100% 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 2014–15.

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	7	7	105%	0	7	0	0	0	0
Cann River	33	33	100%	0	33	0	0	0	0
Mallacoota	136	136	100%	0	136	0	0	0	0
Total 2014–15	**176**	**176**	**100%**	**0**	**176**	**0**	**0**	**0**	**0**
Total 2013–14	148	101	68%	0	101	0	0	0	47

Notes:

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

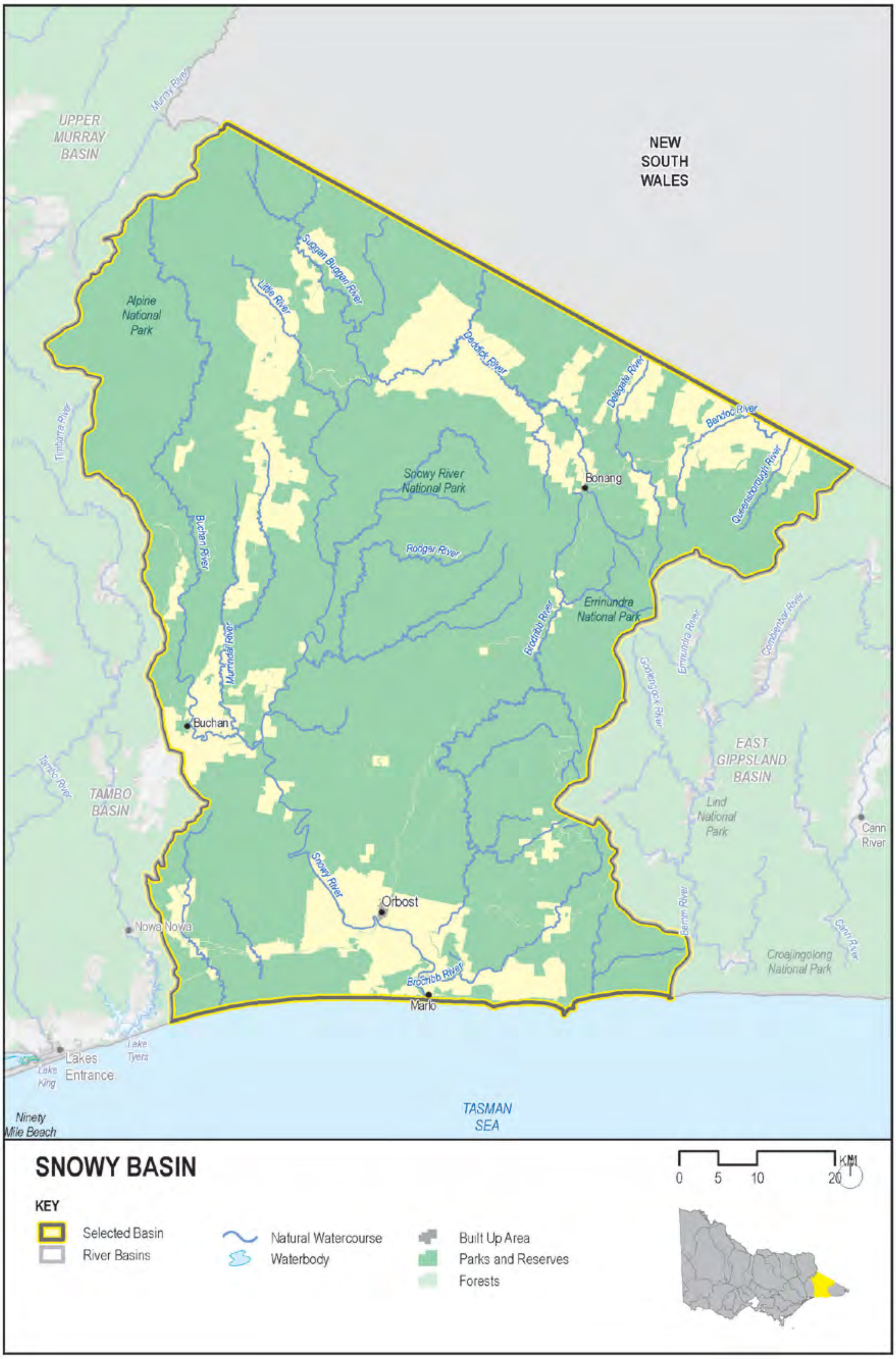
(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

(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 2014–15, rainfall across the Snowy basin was 100% to 125% of the long-term average in the majority of the basin, with a small area receiving slightly less rainfall of 80% to 100%. Catchment inflows were above average. Total inflows from New South Wales and Victoria were 2,054,861 ML compared to 1,490,860 ML in the previous year. Consumptive water use in the Snowy basin is generally low compared to the total water resource, and more than 99% of the basin's total inflows for 2014–15 flowed into Bass Strait.

No urban water use restrictions applied in the Snowy basin in 2014–15, with all towns remaining on permanent water savings rules 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 2014–15 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.

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 75% of the total inflows to the Snowy basin. The volume of water diverted within the Victorian portion of the basin represents less than one per cent of the total inflows.

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

Water account component	2014–15 (ML)	2013–14 (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)]	1,544,877	1,110,316
Catchment inflow from NSW[(2)]	509,984	380,544
Rainfall on major storages	-	-
Treated effluent discharged back to river	0	0
Total inflows	**2,054,861**	**1,490,860**
Outflows		
Diversions		
Urban diversions	635	687
Licensed diversions from unregulated streams	242	564
Small catchment dams	3,356	3,356
Total diversions	***4,233***	***4,607***
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	2,049,928	1,485,553
Total water passed at outlet of basin	***2,049,928***	***1,485,553***
Total outflows	**2,054,861**	**1,490,860**

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.

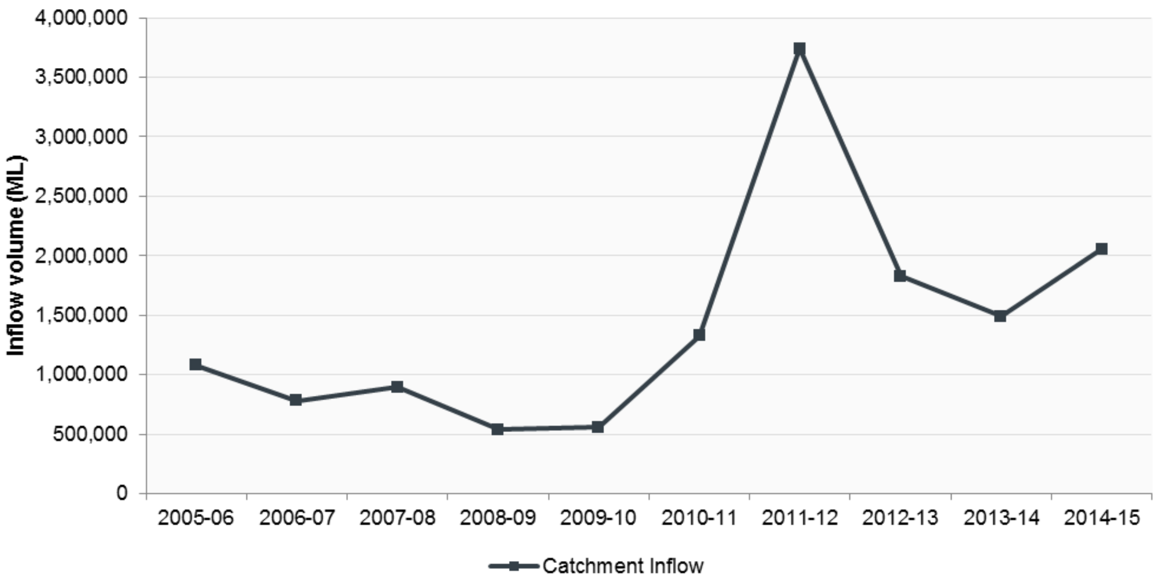
6.10.2.2 Storages and flows

Total inflows to the Victorian portion of the basin in 2014–15 were 1,544,877 ML, or 151% of the long-term average (of 1,022,000 ML), compared to 1,110,316 ML, or 109% of the long-term average in 2013–14 (Figure 6-18). Inflows from New South Wales are regulated by the Snowy Mountains Hydro-Electric Scheme. This inflow was 509,984 ML in 2014–15, up from 380,544 ML in 2013–14.

The amount of water flowing from the Snowy basin into Bass Strait was 2,049,928 ML in 2014–15. This represents over 99% of total inflows to the basin.

There are no major storages located within the Victorian portion of the 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 (for example, 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	3,962
Total volume of water entitlements in the Snowy basin	**6,163**

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-60. The total volume of water diverted by bulk entitlement holders was similar to amount reported in the 2013–14 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 remains significantly lower than the total licence volume. The volume of water diverted from unregulated streams by licence holders in the Snowy basin was 242 ML which was lower than the 2013–14 volume of 564 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	147
Orbost System	2,031	0	612	1,419
Take and use licences - unregulated surface water	3,962	0	242	3,720

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 2014–15, 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	224	224	100%	0	224	0	0	0	0
Total 2014–15	**224**	**224**	**100%**	**0**	**224**	**0**	**0**	**0**	**0**
Total 2013–14	295	257	87%	0	257	0	0	0	38

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 2014–15, rainfall in most of the Tambo basin was between 100% and 125% of the long-term average, with slightly less rainfall in the north of the basin which received 80% to 100% of the long-term average.

There are no large authorised diversions in the Tambo basin. Its larger towns, such as Lakes Entrance, are supplied by the Bairnsdale water system. As such, approximately 98% of basin inflow flowed to the Gippsland Lakes in 2014–15.

No urban water use restrictions applied in the Tambo basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 2014–15, 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	2014–15 (ML)	2013–14 (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)	337,832	144,683
Rainfall on major storages	-	-
Treated effluent discharged back to river	0	0
Total inflows	**337,832**	**144,683**
Outflows		
Diversions		
Urban diversions	48	48
Licensed diversions from unregulated streams	72	358

Small catchment dams	3,971	3,971
Total diversions	***4,091***	***4,376***
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	331,755	138,321
Total water passed at outlet of basin	***331,755***	***138,321***
Total outflows	**337,832**	**144,683**

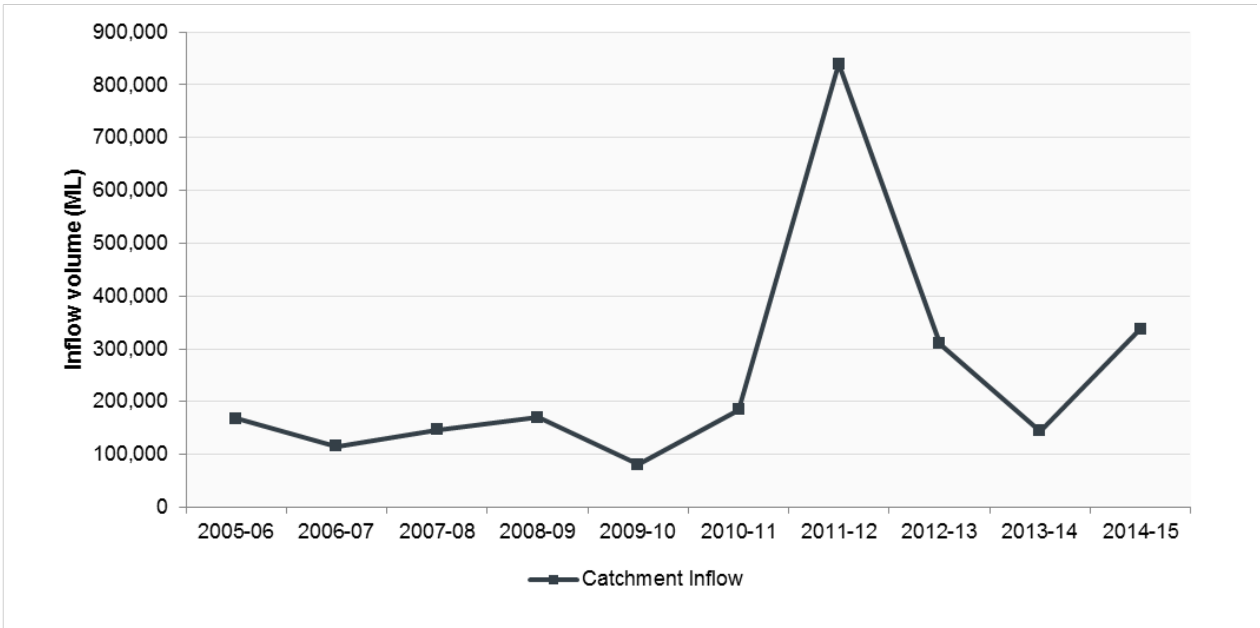
Notes:
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows
(2) No suitable model is available to make an estimate of in-stream losses.

6.11.2.2 Storages and flows

Catchment inflows to the basin were 337,832 ML, or 113% of the long-term average (of 297,800 ML) in 2014–15, compared to 144,683 ML or 49% of the long-term average in 2013–14 (Figure 6-20). The amount of water flowing from the Tambo basin into the Gippsland Lakes was 331,755 ML in 2014–15, which was approximately 98% 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	4,169
Total volume of water entitlements in Tambo basin	**4,511**

Tambo basin

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-66.

The volume of water diverted from unregulated streams by licence holders in the Tambo basin (72 ML) was less in 2014–15 than the volume reported for 2013–14 (358 ML).

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	4,169	0	72	4,097

Notes:

(1) No water was taken under the Nowa Nowa bulk entitlement in 2014–15. East Gippsland Water supplied this town under the Bairnsdale bulk entitlement, reported in Table 6.71 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 2014–15.

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	357	357	100%	0	357	0	0	0	0
Metung	147	147	100%	0	147	0	0	0	0
Total 2014–15	**504**	**504**	**100%**	**0**	**504**	**0**	**0**	**0**	**0**
Total 2013–14[4]	783	798	102%	0	798	0	0	0	(15)

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) In 2013–14, the volume of water recycled exceeded the total volume of wastewater produced, as 15 ML of wastewater was carried over in storage 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 2014–15, rainfall in the Mitchell basin ranged between 80% and 125% of the long-term average. The south of the basin was wetter than the north. Inflows in the Mitchell basin were 75% of the long-term average, compared to 88% in 2013–14. Consumptive use in the basin is generally low when compared to the total water resource. About 97% of the total inflows were not diverted, and hence entered the Gippsland Lakes.

No urban water use restrictions applied in the Mitchell basin in 2014–15, with all towns remaining on permanent water savings 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 which are 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), water birds (Great Egret) and botanical values (Yellowwood).

In 2014–15, 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 2.5% of the 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	2014–15 (ML)	2013–14 (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)	660,176	782,716
Rainfall on major storages	-	-
Treated effluent discharged back to river	119	68
Total inflows	**660,295**	**782,784**
Outflows		
Diversions		

Urban diversions	4,036	4,655
Licensed diversions from unregulated streams	7,884	8,718
Small catchment dams	4,558	4,558
Total diversions	***16,478***	***17,930***
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	182	882
Total losses	***1,188***	***1,888***
Water passed at outlet of basin		
River outflows to the ocean	642,629	762,965
Total water passed at outlet of basin	***642,629***	***762,965***
Total outflows	**660,295**	**782,784**

Note:

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

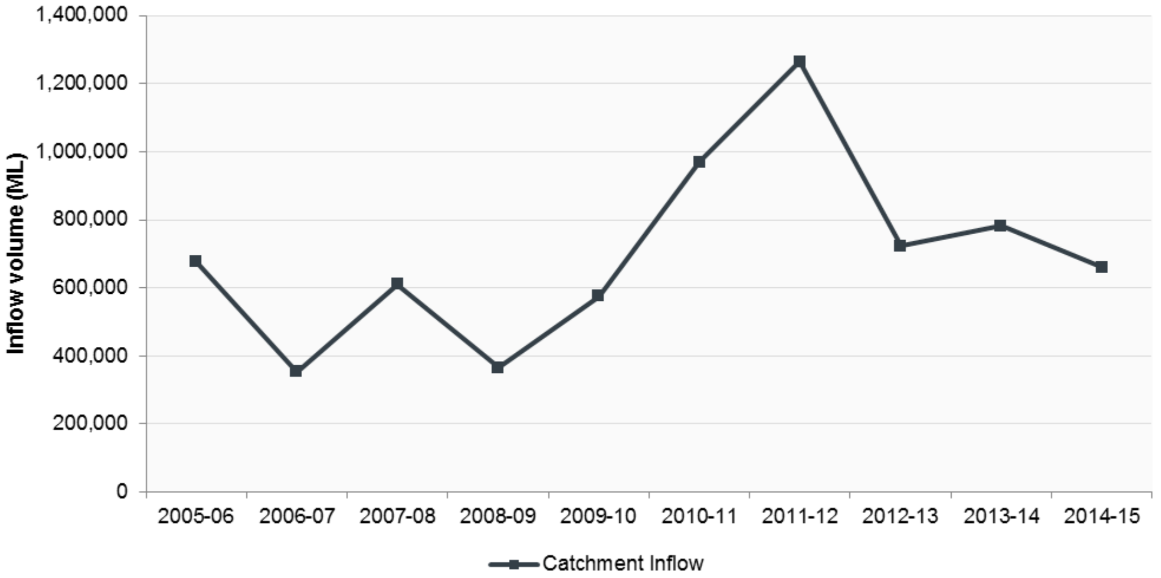
6.12.2.2 Storages and flows

Catchment inflows to the basin were 75% of the long-term average (of 884,500 ML), compared to 88% in 2013–14 (Figure 6-22).

The amount of water flowing from the Mitchell basin into the Gippsland Lakes was 642,629 ML in 2014–15, a decrease from 762,965 ML recorded in 2013–14. The 2014–15 outflows were 97% 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 (for example, bulk entitlements granted to water authorities or the VEWH). Rights to water in the Mitchell basin are outlined in Table 6-71.

Mitchell basin

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 2014–15 is presented in Table 6-72.

The volume of water diverted from unregulated streams by licence holders in the Mitchell basin (7,884 ML) was less in 2014–15 compared to the volume 8,718 ML reported in the 2013–14 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	4,036	1,866
Take and use licences - unregulated surface water	16,385	0	7,884	8,501

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.

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	1,492	1,492	100%	0	17	1,475	0	0	0
Lindenow	8	8	100%	0	0	8	0	0	0
Paynesville	275	275	100%	0	0	275	0	0	0
Total 2014–15	**1,775**	**1,775**	**100%**	**0**	**17**	**1,758**	**0**	**0**	**0**
Total 2013–14	1,724	1,653	96%	0	231	1,422	0	0	71

Notes:

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

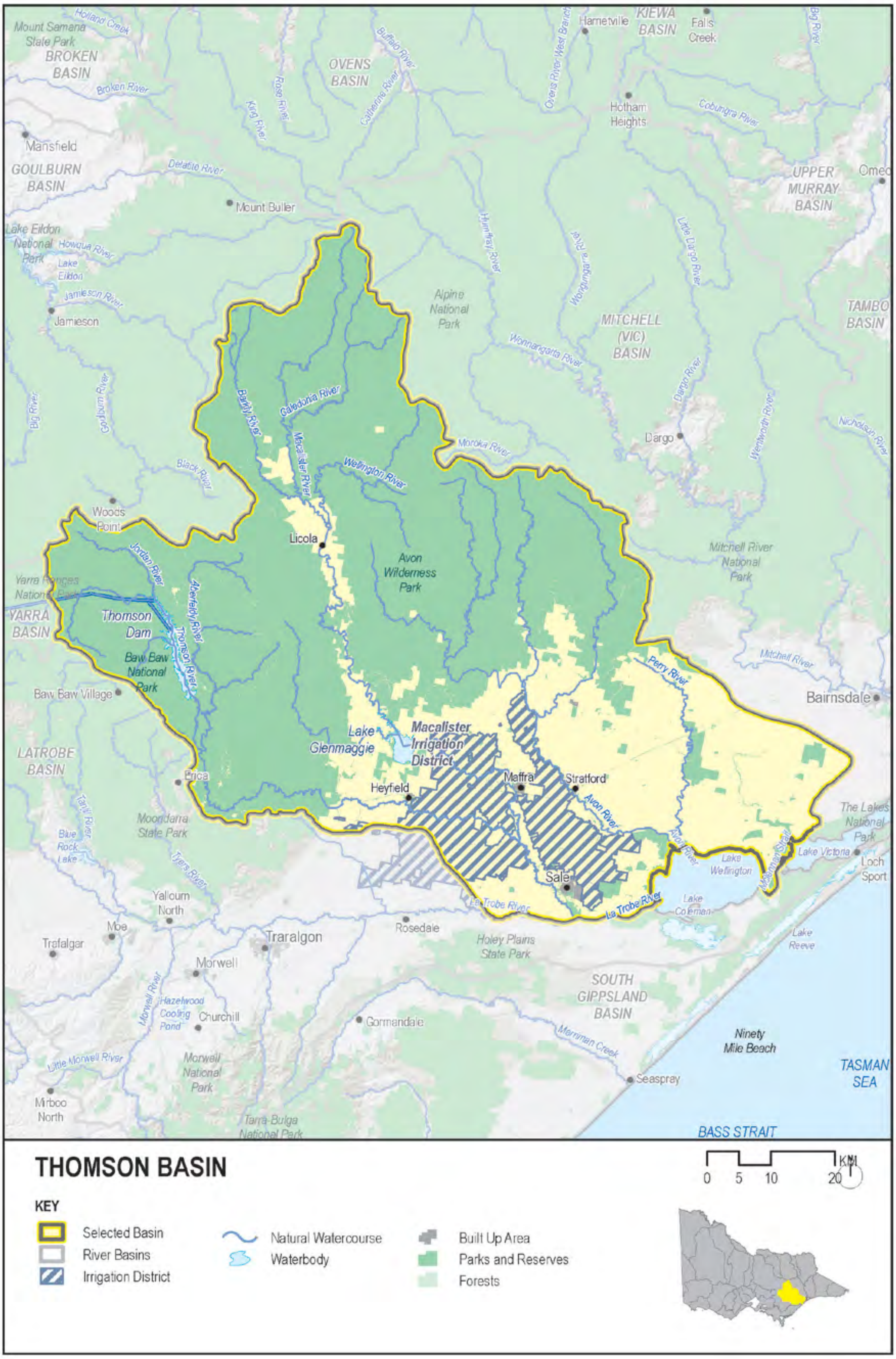
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(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 2014–15, rainfall in the Thomson basin ranged between 60 to 125% of the long-term average. The north west of the basin was driest, with 60% to 80% of average rainfall, while the south east was wettest, receiving greater than 100% of average rainfall. Catchment inflows were 67% of the long-term average, compared to 65% in 2013–14. The amount of water flowing from the Thomson basin into the Gippsland Lakes represented 55% of the total inflows in the basin in 2014–15.

Major storages in the Thomson basin started the year at 74% of capacity and were at 70% at the end of June 2015.

The year began with a 100% July allocation for high-reliability water shares in the Macalister Irrigation District. In April 2015, a 20% allocation was made to low-reliability water shares.

No urban water use restrictions applied in the Thomson basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 the 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 2014–15 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 Victorian Environmental Water Holder (VEWH) and water set aside for the environment through the operation of passing flows released from the Thomson Reservoir
- 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 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.

In 2014–15, a total of 24,888 ML of held environmental water was used in the Thomson basin.

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 comprised the majority of diversions within the basin.

A total volume of 164,271 ML was diverted to irrigation districts in 2014–15, lower than 2013–14. Melbourne Water's diversion from the Thomson Reservoir increased to 148,744 ML in 2014–15.

Table 6-76 Balance of surface water in the Thomson basin

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	919,542	891,681
Volume in storage at end of year	888,496	919,542
Change in storage	**(31,046)**	**27,861**
Inflows		
Catchment inflow(1)	740,389	718,366
Rainfall on major storages	26,225	185,227
Return flow from irrigation	19,926	25,106
Treated effluent discharged back to river	29	30
Total inflows	**786,569**	**928,730**
Outflows		
Diversions		
Urban diversions	1,349	1,439
Transfers to Yarra River basin for urban use	148,744	132,197
Irrigation district diversions	164,271	189,068
Licensed diversions from regulated streams	18,190	19,440
Licensed diversions from unregulated streams	4,481	3,965
Small catchment dams	6,984	6,984
Total diversions	***344,019***	***353,093***
Losses		
Evaporation losses from major storages	30,972	38,719
Evaporation from small catchment dams	2,552	2,552
In-stream infiltration to groundwater, flows to floodplain and evaporation	14,197	16,298
Total losses	***47,721***	***57,568***
Water passed at outlet of basin		
River outflows to the Latrobe River	281,116	396,059
River outflows to the Lake Wellington(2)	144,759	94,148
Total water passed at outlet of basin	***425,875***	***490,207***
Total outflows	**817,615**	**900,869**

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) River outflows to the Lake Wellington includes Perry River volume of 19,386.27 ML

6.13.2.2 Storages and flows

The volume of water held in major storages was 888,496 ML (71% of capacity) at the end of June 2015 compared to 919,542 ML at the start of July 2014.

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 76% of capacity and decreased to 72% by the end of June 2015. Lake Glenmaggie finished the year with a volume of 118,106 ML, which is 66% 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.

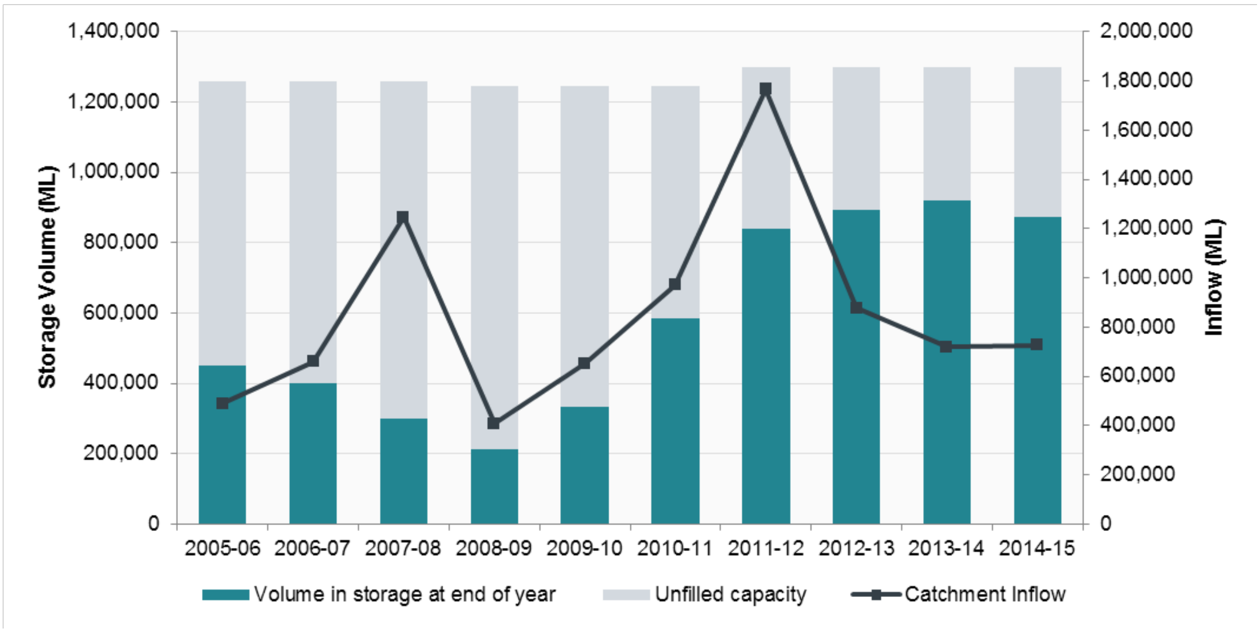
Table 6-77 Storage volumes in the Thomson basin

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	107,797	9,378	13,377	14,308	118,106
Thomson Reservoir[1]	1,068,000	811,745	16,847	17,595	(40,607)	770,390
Total	**1,245,640**	**919,542**	**26,225**	**30,972**	**(26,299)**	**888,496**

Note:
(1) Volumes in store in the Thomson do not include 55,100 ML of volume in dead storage.

Catchment inflows to the Thomson basin amounted to 740,389 ML in 2014–15, which is 67% of the long-term average (Figure 6-24). The amount of water flowing from the Thomson basin into the Gippsland Lakes in 2014–15 was 425,875 ML, compared to 490,207 ML in 2013–14. This represents 59% of catchment inflows into the basin for 2014–15.

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, Melbourne Water and the VEWH hold bulk entitlements in the Thomson basin. Melbourne Water holds a bulk entitlement to divert surface water from the Thomson River. This water is used to supply Primary Entitlement Holders in the Melbourne headworks system (City West Water, South East Water, Yarra Valley Water, Barwon Water, South Gippsland Water, Western Water and Westernport Water) which were issued entitlements to the Greater Yarra System – Thomson River Pool in 2014.

Details of the new entitlement arrangements are outlined in Chapter 3, section 3.1.Surface water is also diverted by licensed diverters, and is harvested in small catchment dams.

Entitlements include rights granted to individuals (for example water shares and take and use licences) and rights granted to authorities (for example bulk entitlements granted to water corporations 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	148,045
Low reliability water shares	70,731
Bulk Entitlement (Thomson Macalister Towns - Gippsland Water) Conversion Order 2005	2,335
Macalister River Environmental Entitlement 2010	18,690
Sub-total: Bulk Entitlement (Thomson Macalister - Southern Rural Water) Conversion Order 2001	**239,801**
Bulk Entitlement (Thomson River – Melbourne Water) Order 2014(2)	**171,800**
Bulk Entitlement (Thomson River - Environment) Conversion Order 2005	**10,000**
Take and use licences - unregulated surface water	**17,239**
Total volume of water entitlements in the Thomson basin	**438,840**

Notes:

(1) Under this bulk entitlement, Southern Rural Water operates Lake Glenmaggie and Cowwarr Weir to supply water share holders in the Macalister Irrigation District and diverters on the Thomson and Macalister rivers, Rainbow Creek and to supply water to Gippsland Water's Thomson Macalister towns bulk entitlement

(2) This water is used to supply primary entitlement holders (City West Water, South East Water, Yarra Valley Water, Barwon Water, Western Water, South Gippsland Water and Westernport Water) with entitlement to the Greater Yarra System- Thomson River Pool which sources water from the Yarra River, Thomson River, Tarago River, Silver Creek and Wallaby Creek.

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-79. The total volume of water diverted by bulk entitlement holders was higher in 2014–15 compared to the volume reported in the 2013–14 Victorian Water Accounts. The volume of water diverted from unregulated streams by licence holders in the Thomson basin was 4,481 ML, which was higher than the 2013–14 volume of 3,965 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)	206,281	0	135,489	70,792
Thomson Macalister Towns - Gippsland Water	2,335	0	1,349	986
Macalister River Environmental Entitlement 2010(2)(3)	15,625	0	11,409	4,216
Operating provisions(4)	-	-	46,972	-
Diversion: Thomson Macalister – Southern Rural Water(5)			**183,810**	
Thomson River - Melbourne Water(6)(7)	171,800	0	148,744	23,056
Thomson River - Environment (3)(8)	10,113	3,760	13,479	
Take and use licences - unregulated surface water	17,239	0	4,481	12,758

Notes:

(1) Allocation issued includes 44,090 ML of spill allocation made available to water shares holders in 2014–15.

(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 be carried over under these entitlements. Refer to Chapter 4, Table 4.2.

(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 Melbourne Water 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 2014–15 was 104,729 ML.

(7) The combined volume of water taken by Melbourne Water 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 2014–15 was 397,517 ML.

(8) 394 ML or water available under this entitlement at 30 June 2015 is not forfeited and is carried over for use in 2015-16.

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 for watering facilities such as the Maffra Recreational Reserve. The volume of wastewater produced in 2014–15 was higher than 2013–14. A total of 97% of wastewater was recycled in the basin in 2014–15 (Table 6-81).

Table 6-81 Volume of recycled water in the Thomson basin

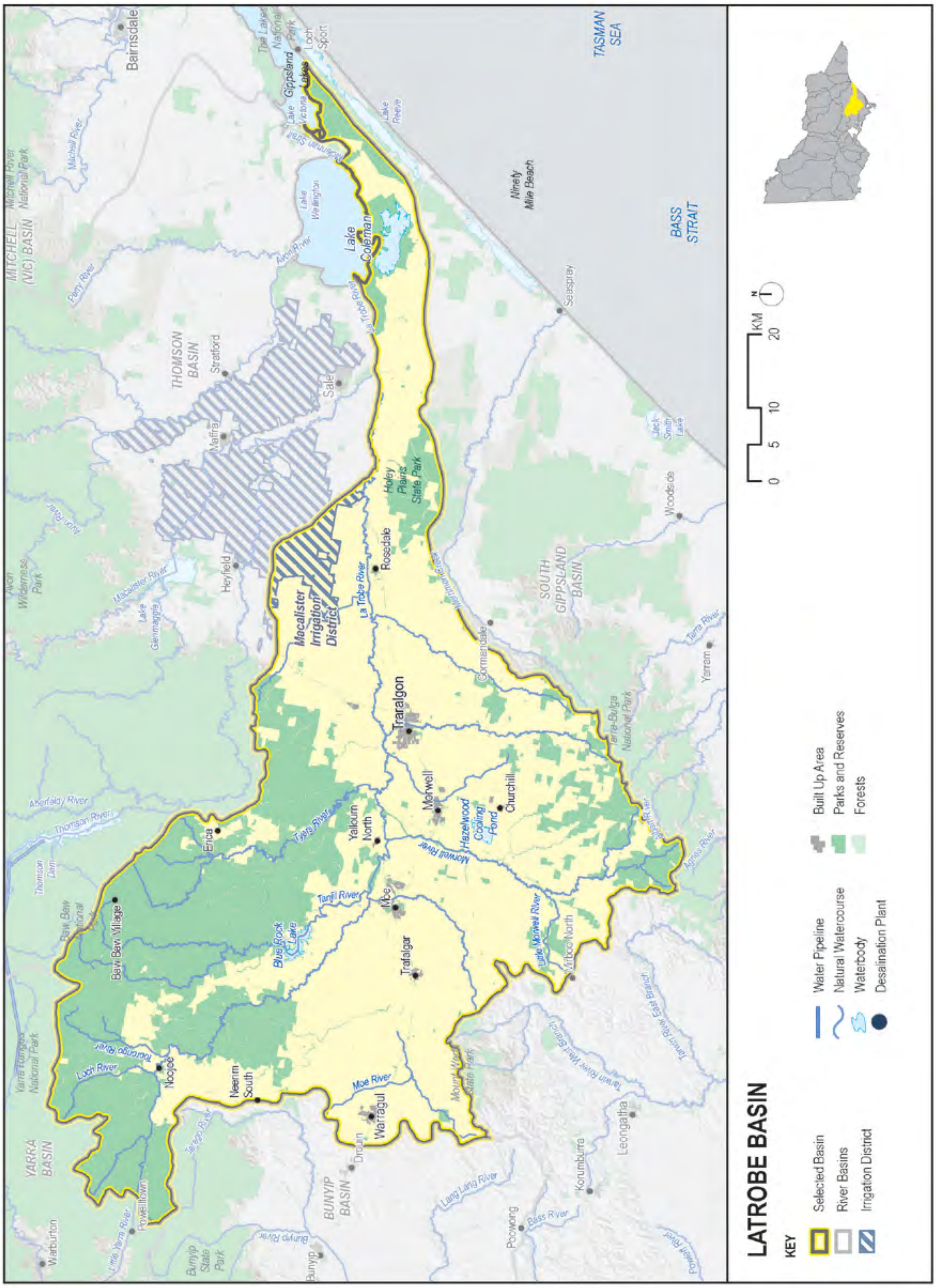
Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Heyfield	76	76	100%	0	76	0	0	0	0
Maffra	299	299	100%	5	294	0	0	0	0
Rawson	29	0	0%	0	0	0	0	29	0
Sale	400	400	100%	0	400	0	0	0	0
Stratford	139	139	100%	0	139	0	0	0	0
Total 2014–15	**943**	**914**	**97%**	**5**	**909**	**0**	**0**	**29**	**0**
Total 2013–14	377	347	92%	8	339	0	0	30	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 2014–15, the Latrobe basin received between 80% and 100% of long-term average rainfall. The amount of water flowing from the Latrobe basin into the Gippsland Lakes (excluding the Thomson River), represented 84% of the catchment inflows in the basin in 2014–15.

The volume of water in major storages remained high throughout the year, starting and ending the year at greater than 98 % of capacity. No urban water use restrictions applied in the Latrobe basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 2014–15, 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*, held by the VEWH which in 2014–15 provided a 9% share of inflows into Blue Rock Reservoir, equating to a long-term average of 18,737 ML per year.
- 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.

In 2014–15, a total of 3,984 ML of environmental water was delivered in the Latrobe basin.

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 electricity generators and Australian Paper. In 2014–15, these entities accounted for more than half the surface water diversions in the Latrobe basin. They also returned 36,123 ML to the Latrobe River system.

Table 6-83 Balance of surface water in the Latrobe basin

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	241,433	240,813
Volume in storage at end of year	244,694	241,433
Change in storage	**3,261**	**620**
Inflows		
Catchment inflow(1)	703,080	789,922
Rainfall on major storages	9,373	9,134
Return flow from power stations and major industry	36,123	45,193
Treated effluent discharged back to river	3,676	3,687
Total inflows	**752,252**	**847,935**
Outflows		
Diversions		
Urban and industrial diversions	113,451	108,873
Licensed diversions from regulated streams	4,685	5,196
Licensed diversions from unregulated streams	5,731	6,145
Small catchment dams	20,547	20,547
Total diversions	***144,414***	***140,761***
Losses		
Evaporation losses from major storages	12,025	13,475
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	***17,637***	***19,087***
Water passed at outlet of basin		
River outflows to the Gippsland Lakes (excluding Thomson River)	586,940	687,467
Total water passed at outlet of basin	***586,940***	***687,467***
Total outflows	**748,991**	**847,315**

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.

6.14.2.2 Storages and flows

Storage levels for all major storages in the basin totalled 244,694 ML (almost 100% of capacity) in June 2015 compared to 241,433 ML in July 2014 (Table 6-84). The volume reported in the 'catchment inflow less regulated releases' column in Table 6.14-3 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 an operating capacity of 208,188 ML. The volume of water held in Blue Rock Lake at the end of the year was 208,098 ML (just under 100% of operating capacity).

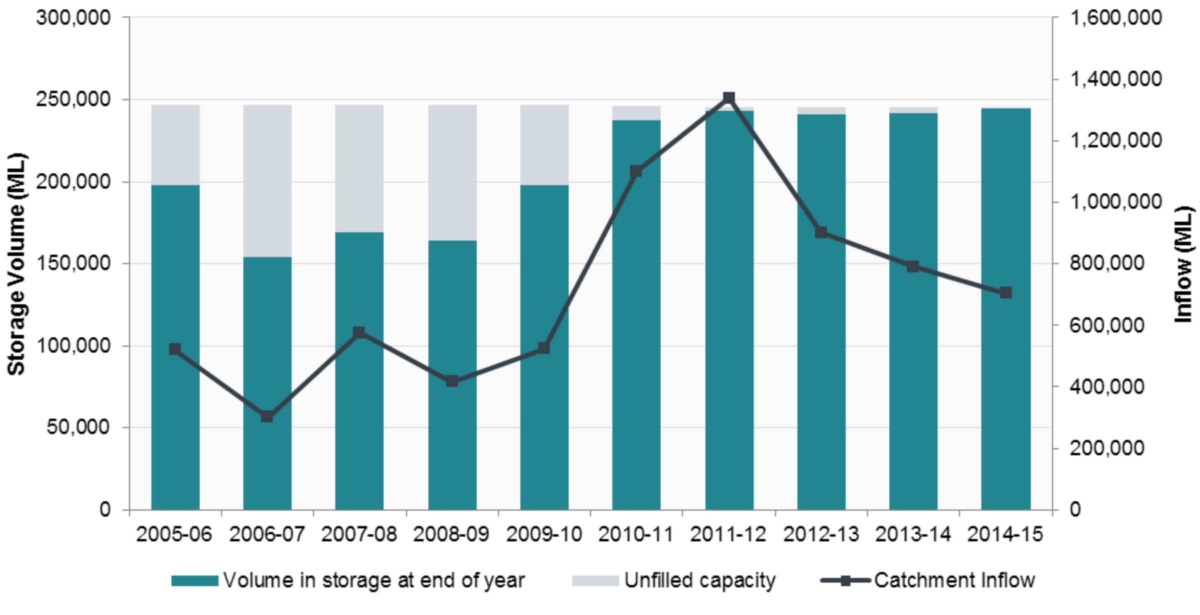
Latrobe basin

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	208,595	5,949	7,571	1,125	208,098
Lake Narracan	7,230	3,736	1,899	2,012	2,515	6,138
Moondarra Reservoir	29,853	29,102	1,525	2,442	2,273	30,458
Total	**245,271**	**241,433**	**9,373**	**12,025**	**5,913**	**244,694**

Catchment inflows were 83% of the long-term average (of 847,400 ML), compared to 93% in 2013–14 (Table 6-26). The amount of water flowing from the Latrobe basin into the Gippsland Lakes (excluding the Thomson River) decreased to 586,940 ML in 2014–15 from 687,467 ML in 2013–14.

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 (for example, bulk entitlements granted to water corporations 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(2)(3)	20,000
Bulk Entitlement (Erica) Conversion Order 1997	340
Bulk Entitlement (Latrobe - Southern Rural) Conversion Order 1996(4)	13,400
Latrobe River Environmental Entitlement 2010(5)	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
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 (6)	n/a
Take and use licences - unregulated surface water	18,916
Total volume of water entitlements in the Latrobe basin	**240,608**

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 upon inflow conditions.
(2) The Bulk Entitlement (Gippsland Water – Blue Rock) Conversion Order 1997 was amended on 31 July 2014 to account for Gippsland Water's purchase of the 3.87% unallocated share of Blue Rock Reservoir in accordance with Action 6.7 of the Gippsland Sustainable Water Strategy. As a result of this, Gippsland Water's entitlement increased from 15,150 ML to 20,000 ML.
(3) The citation for the Bulk Entitlement (CGRWA – Blue Rock) Conversion Order 1997 was changed to Bulk Entitlement (Gippsland Water – Blue Rock) Conversion Order 1997 on 1 July 2013.
(4) This entitlement supplies water for take and use licences on the Tanjil River and Latrobe River Lower, 11,237 ML of entitlement was allocated for take and use licences for the 2014–15 year.
(5) Use of this entitlement is dependent on suitable river heights, as specified in the entitlement.
(6) The Latrobe Reserve consists of a 22.73% share of inflows into Blue Rock Reservoir after passing flow requirements have been met.

Allocation available under bulk entitlements by water corporations, the Latrobe Valley power stations and licences in 2014–15 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.

Licence holders diverted a volume of 5,731 ML from unregulated streams in 2014–15, less than the 2013–14 volume of 6,145 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)	22,350	0	3,984	18,366
Boolarra	145	0	0	145
Gippsland Water - Blue Rock	20,000	0	1,786	13,364
Erica	340	0	93	247
Latrobe - Southern Rural Water(2)	12,868	0	4,685	8,183
Latrobe River Environmental Entitlement(3)	-	-		-
Mirboo North	270	0	182	88
Moe - Narracan Creek	3,884	0	1,822	2,062
Moondarra Reservoir	62,000	0	47,677	14,323
Noojee(4)	73	0		73
Thorpdale	80	0	9	71
Latrobe - Loy Yang B	20,000	0	15,374	4,626
Latrobe – Loy Yang A	40,000	0	19,512	20,488
Latrobe - Loy Lang 3/4 Bench	25,000	0	0	25,000
Yallourn Energy Ltd	36,500	0	26,996	9,504
Latrobe Reserve	n/a	0	-	-
Take and use licences - unregulated surface water	18,916	0	5,731	13,185

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 6.19-2 as it is not an actual diversion from the waterway. Unused water is available to carry over in this system. For details refer to Chapter 4, Table 4.1.
(2) This represents the water allocated and used by take and use licence holders.
(3) Use of this entitlement is dependent 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**

n/a: Information not available.

6.14.3 Recycled water

Gippsland Water treated over 12,579 ML of wastewater in the Latrobe basin, the majority of which was highly saline and unsuitable for recycling and was discharged to Bass Strait. The volume of water recycled in 2014–15 increased, compared to 2013–14, and represents around 6% of the wastewater produced.

Table 6-88 shows the volumes of water recycled in the Latrobe basin in 2014–15.

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	73	73	100%	21	52	0	0	0	0
Moe	2,088	0	0%	0	0	0	0	2,088	0
Morwell	596	596	100%	0	0	596	0	0	0
Dutson Downs (regional outfall sewer)	21	21	100%	21	0	0	0	0	0
Saline wastewater outfall pipeline	8,196	0	0%	0	0	0	0	0	8,196
Warragul	1,587	0	0%	0	0	0	0	1,587	0
Willow Grove	18	18	100%	0	18	0	0	0	0
Total 2014–15	**12,579**	**708**	**6%**	**42**	**70**	**596**	**0**	**3,675**	**8,196**
Total 2013–14	21,021	678	3%	10	60	608	0	3,686	16,657

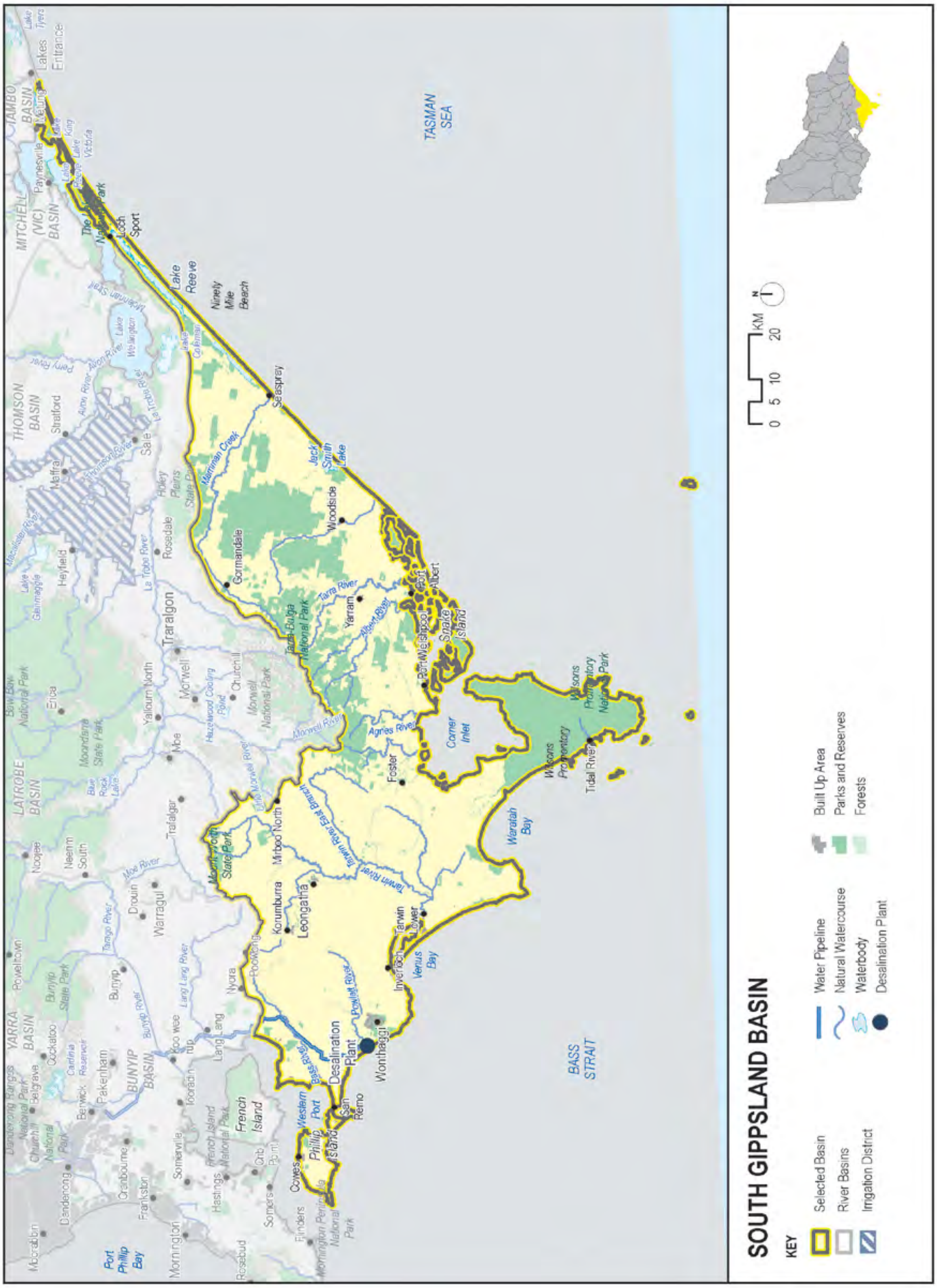
Notes:

(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 2014–15, most of the South Gippsland basin experienced rainfall between 80% and 100% of the long-term average. Wilson's Promontory was drier, and only received between 60% and 80% of average rainfall.

Catchment inflows were 80% of the long-term average, a decrease when compared to 149% in 2013–14. The amount of water flowing from the South Gippsland basin into Westernport Bay and Bass Strait represented 94% of the total inflows to the basin in 2014–15.

No urban water use restrictions applied in the South Gippsland basin in 2014–15, 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 are dependent 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 2014–15, 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 make up a relatively small proportion of total inflows, with around 5% of basin inflows diverted for consumptive use in 2014–15. Most inflows leave the basin and flow into Bass Strait or Westernport Bay.

Table 6-90 Balance of surface water in the South Gippsland basin

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	8,640	6,459
Volume in storage at end of year	7,961	7,968
Change in storage	**(679)**	**1,509**
Inflows		
Catchment inflow(1)	726,782	1,361,864
Rainfall on major storages	1,563	1,845
Treated effluent discharged back to river	4,563	5,266
Total inflows	**732,908**	**1,368,975**
Outflows		
Diversions		
Urban diversions	7,527	7,429
Licensed diversions from unregulated streams	2,928	2,708
Small catchment dams	24,256	24,256
Total diversions	***34,711***	***34,393***
Losses		
Evaporation losses from major storages	1,624	1,503
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	***6,759***	***6,638***
Water passed at outlet of basin		
River outflows to Bass Strait and Western Port	692,117	1,326,435
Total water passed at outlet of basin	***692,117***	***1,326,435***
Total outflows	**733,587**	**1,367,466**

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.

6.15.2.2 Storages and flows

Storage levels for all major storages in the basin were 6,829 ML (65% of capacity) by the end of June 2015 compared to 7,968 ML in July 2014 (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

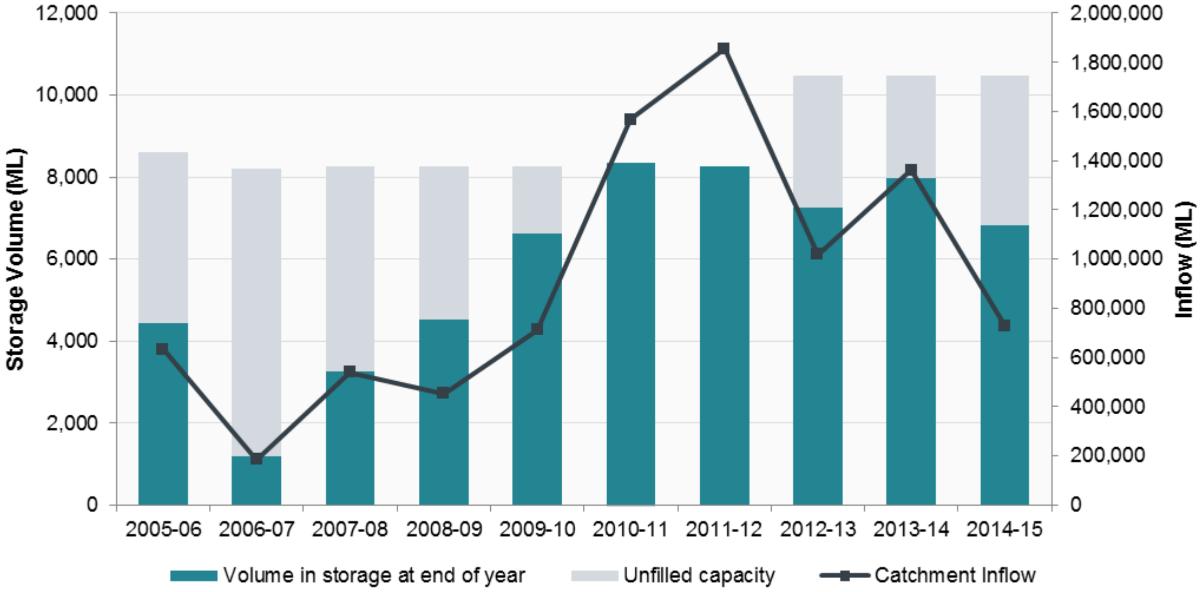
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Candowie Reservoir	4,463	3,417	734	839	(574)	2,738
Hyland Reservoir	671	500	72	68	(219)	285
Lance Creek Reservoir	4,200	3,304	622	589	(348)	2,989
Western Reservoir	1,137	747	136	129	63	817
Total	**10,471**	**7,968**	**1,563**	**1,624**	**(1,078)**	**6,829**

South Gippsland basin

Catchment inflows were 726,782 ML, or 80% of the long-term average (of 911,500 ML), a decrease from 149% of the average in 2013–14 (Figure 6-28).

The amount of water flowing from the South Gippsland basin into Westernport Bay and Bass Strait was 692,117 ML in 2014–15. This represents 94% 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 (for example, bulk entitlements granted to water corporations or the VEWH). Rights to water in the South Gippsland basin are outlined in Table 6-92.

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 - City West Water Limited) Order 2014	39,595
Bulk Entitlement (Desalinated Water - South East Water Limited) Order 2014	53,454
Bulk Entitlement (Desalinated Water - Yarra Valley Water Limited) Order 2014	56,951
Take and use licences - unregulated surface water	12,812
Total volume of water entitlements in the South Gippsland basin	181,627

Allocation available under bulk entitlements and licences for 2014–15 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 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	537	316
Dumbalk	100	0	13	87
Fish Creek	251	0	109	142
Foster	326	0	170	156
Korumburra	1,000	0	658	342
Leongatha	2,476	0	1,583	893
Loch, Poowong and Nyora	420	0	246	174
Meeniyan	200	0	59	141
Seaspray	61	0	26	35
Toora Port Franklin-Welshpool and Port Welshpool	1,617	0	506	1,111
Westernport	2,911	0	1,848	1,063
Westernport-Bass River	3,000	0	0	3,000
Wonthaggi-Inverloch	3,800	0	1,771	2,029
Take and use licences - unregulated surface water	12,812	0	2,928	9,884
Desalinated water - City West Water(1)	0	0	0	0
Desalinated water - South East Water(1)	0	0	0	0
Desalinated water - Yarra Valley Water(1)	0	0	0	0

Note:
(1) The Minister for Water made a zero desalinated water order for the 2014–15 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 the Waratah Bay, Welshpool and Yarram/Tarraville treatment plants, the three sites where all wastewater is recycled. Recycling opportunities are limited, due to a small industrial base and crop types that are not suited to recycled water.

Westernport Water reuses water from its treatment plants at Coronet Bay and Cowes for sporting fields and gardens of significance. Gippsland Water operates Seaspray treatment plant and reuses all recycled water to irrigate pasture.

Across the basin, 8% of wastewater was reused in 2014–15, compared to 7% in 2013–14 (Table 6-95).

South Gippsland basin

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	191	192	101%	0	192	0	0	0	-1
Cowes	1,202	67	5%	11	52	0	4	1,092	43
Foster	136	0	0%	0	0	0	0	136	0
Korumburra	610	0	0%	0	0	0	0	610	0
Leongatha Domestic	550	0	0%	0	0	0	0	550	0
Leongatha Trade Waste	872	0	0%	0	0	0	0	872	0
Meeniyan	30	11	35%	1	10	0	0	19	0
Seaspray	9	9	100%	0	9	0	0	0	0
Toora	33	4	11%	4	0	0	0	29	0
Waratah Bay	10	10	100%	0	10	0	0	0	0
Welshpool	55	3	5%	0	3	0	0	52	0
Wonthaggi/Cape Paterson/Inverloch	1,203	0	0%	0	0	0	0	1,203	0
Yarram/Tarraville	119	119	100%	0	119	0	0	0	0
Total 2014–15	**5,018**	**413**	**8%**	**16**	**393**	**0**	**4**	**4,563**	**42**
Total 2013–14	5,656	389	7%	62	317	0	10	5,267	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.

6.16 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 2014–15, rainfall in the majority of the basin was between 80% and 100% of the long-term average with a small area in the north west of the basin experiencing conditions, with 60% to 80% of average rainfall. Inflows to the Bunyip basin in 2014–15 were 92% of the long-term average, compared to 158% in 2013–14. The amount of water flowing from the Bunyip basin into Port Phillip Bay and Westernport Bay represented approximately 95% of the catchment inflows in the basin.

No urban water use restrictions applied in the Bunyip basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 dependent on water from the EWR in the Bunyip basin. The bay is listed as an internationally significant wetland under the Ramsar Convention and relies on the freshwater inputs from the Bunyip basin to function ecologically. Additionally, there is a nationally threatened population of Dwarf Galaxias and Australian Grayling in the Tarago and Bunyip systems.

In 2014–15, 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.

In 2014–15, a total of 1,842 ML of held environmental water was used in the Bunyip basin.

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.

Table 6-97 Balance of surface water in the Bunyip basin

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	38,038	31,355
Volume in storage at end of year	37,652	38,038
Change in storage	**(386)**	**6,683**
Inflows		
Catchment inflow(1)	497,668	854,730
Rainfall on major storages	3,186	3,365
Treated wastewater discharged back to river	8,239	9,631
Total inflows	**509,093**	**867,726**
Outflows		
Diversions		
Urban diversions	15,609	10,454
Licensed diversions from unregulated streams	4,593	4,485
Small catchment dams	15,524	15,525
Total diversions	***35,726***	***30,463***
Losses		
Evaporation losses from major storages	2,190	1,867
Losses from small catchment dams	556	556
In-stream infiltration to groundwater, flows to floodplain and evaporation	1,164	1,237
Total losses	***3,910***	***3,659***
Water passed at outlet of basin		
River outflows to Port Phillip Bay and Westernport Bay	469,843	826,921
Total water passed at outlet of basin	***469,843***	***826,921***
Total outflows	**509,479**	**861,043**

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 37,652 ML, slightly over 100% of its operating 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

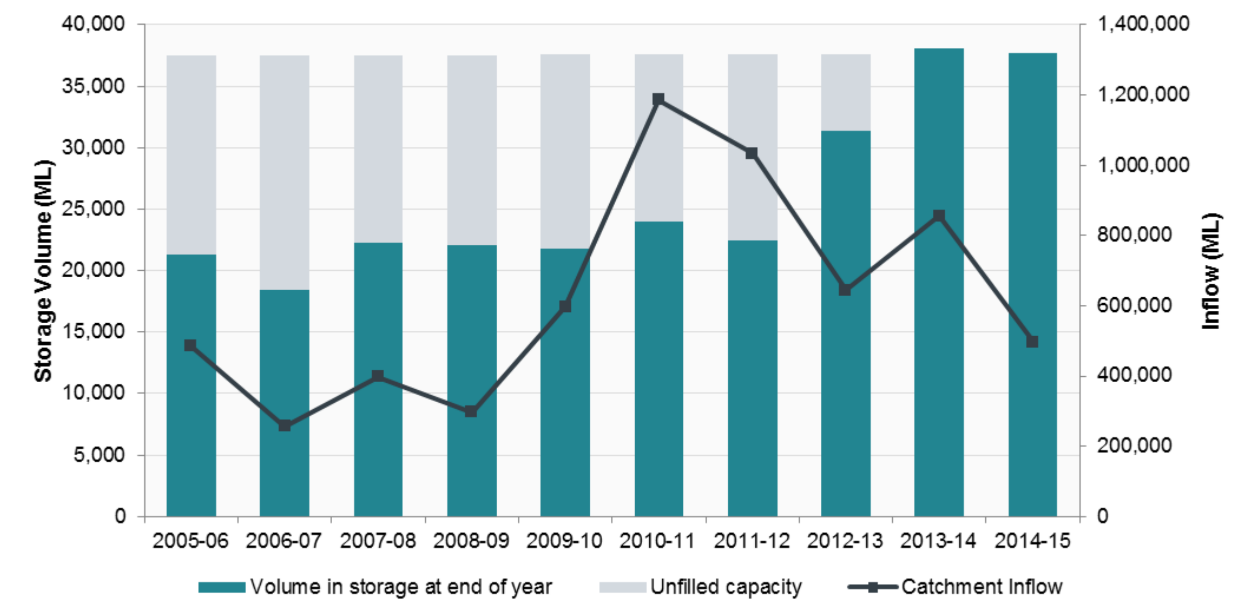
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Tarago Reservoir	37,580	38,038	3,186	2,190	(1,382)	37,652
Total	**37,580**	**38,038**	**3,186**	**2,190**	**(1,382)**	**37,652**

Catchment inflows were 497,668 ML, or 92% of the long-term average (of 541,000 ML), a decrease from 158% of the long-term average in 2013–14 (Figure 6-30).

Bunyip basin

The amount of water flowing from the Bunyip basin into Port Phillip Bay and Westernport Bay was 469,843 ML in 2014–15, compared to 826,921 ML in 2013–14. This represents 95% of the catchment inflows into the basin for 2014–15.

Figure 6-30 All major storages and catchment inflows in the Bunyip basin



6.16.2.3 Entitlement volumes and diversions

Melbourne Water, Gippsland Water and Southern Rural Water hold bulk entitlements to divert surface water in the Bunyip basin. Melbourne Water holds a bulk entitlement to divert surface water from the Bunyip and Tarago Rivers. This water is diverted into the headworks system, which also sources water from the Yarra River, Thomson River, Silver Creek and Wallaby Creek. City West Water, South East Water, Yarra Valley Water, Barwon Water, South Gippsland Water, Western Water and Westernport Water access the Melbourne Pool through the headworks system with new entitlements issued in 2014. 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 (for example, bulk entitlements granted to water corporations or environmental entitlements granted to 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)	4,550
Bulk Entitlement (Tarago River - Southern Rural Water) Conversion Order 2009(2)	1,260
Bulk Entitlement (Tarago and Bunyip Rivers - Melbourne Water) Order 2014(3)	30,510
Tarago and Bunyip Rivers Environmental Entitlement 2009(4)	3,000
Take and use licences - unregulated surface water	18,919
Total volume of water entitlements in the Bunyip basin	**58,514**

Notes:

(1) The maximum volume that can be taken each year is 285 ML plus 20,350 ML over any 5-year period (4,550 ML annual average).

(2) The maximum volume that can be taken over any 5-year period is 6,300 ML (1,260 ML annual average).

(3) Melbourne Water holds the source bulk entitlement on the Tarago and Bunyip Rivers and can take an average annual amount of up to 30510 ML over any consecutive 5 year period. This water is used to supply primary entitlement holders (City West Water, South East water, Yarra Valley water, Barwon Water, Western Water, South Gippsland Water and Westernport Water) with entitlement to the Greater Yarra System – Thomson River Pool which sources water from the Yarra River, Thomson River, Tarago River, Silver Creek and Wallaby Creek.

(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 upon inflow conditions.

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.

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-100. The volume of water diverted from unregulated streams by licence holders in the Bunyip basin in 2014–15 was similar to the amount 4,485 ML reported in the 2013–14 Victorian Water Accounts (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	4,550	0	3,105	1,445
Tarago River - Southern Rural Water(1)	1,260	0	0	1,260
Tarago River - Melbourne Water	30,510	0	12,504	18,006
Tarago and Bunyip Rivers Environmental Entitlement(2)	4,842	0	1,842	3,000
Take and use licences - unregulated surface water	18,919	0	4,593	14,326

Notes:

(1) Southern Rural Water did not take any water under this entitlement for supply to licensed diverters downstream of Tarago Reservoir in 2014–15.

(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 Chapter 4, 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, 6% 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 126,233 ML. The plant’s recycled wastewater was predominantly used on-site and this volume has not been included in the percentage of water recycled.

Table 6-102 shows the volume of water recycled in the Bunyip basin in 2014–15.

Bunyip basin

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	231	231	74%	0	170	0	0	61	0	0
Boneo	3,154	1,367	43%	0	1,367	0	0	0	1,787	0
Drouin	186	71	38%	0	0	71	0	0	115	0
Eastern Treatment Plant	126,233	13,713	4%	5,531	0	0	0	8,182	0	112,520
Kooweerup	179	97	54%	0	0	97	0	0	0	82
Lang Lang	83	19	23%	0	19	0	0	0	0	64
Longwarry	361	155	43%	0	155	0	0	0	158	48
Mt Martha	6,634	498	0%	0	11	0	0	487	6,136	0
Neerim South	43	0	0%	0	0	0	0	0	43	0
Pakenham	647	661	89%	0	137	437	0	87	0	(14)
Somers	432	369	81%	0	330	18	0	21	0	63
Total 2014–15	**138,183**	**17,181**	**6%**	**5,531**	**2,189**	**623**	**0**	**8,838**	**8,239**	**112,763**
Total 2013–14	156,486	20,924	5%	5636	1,547	754	0	12,987	9,631	125,931

Notes:

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

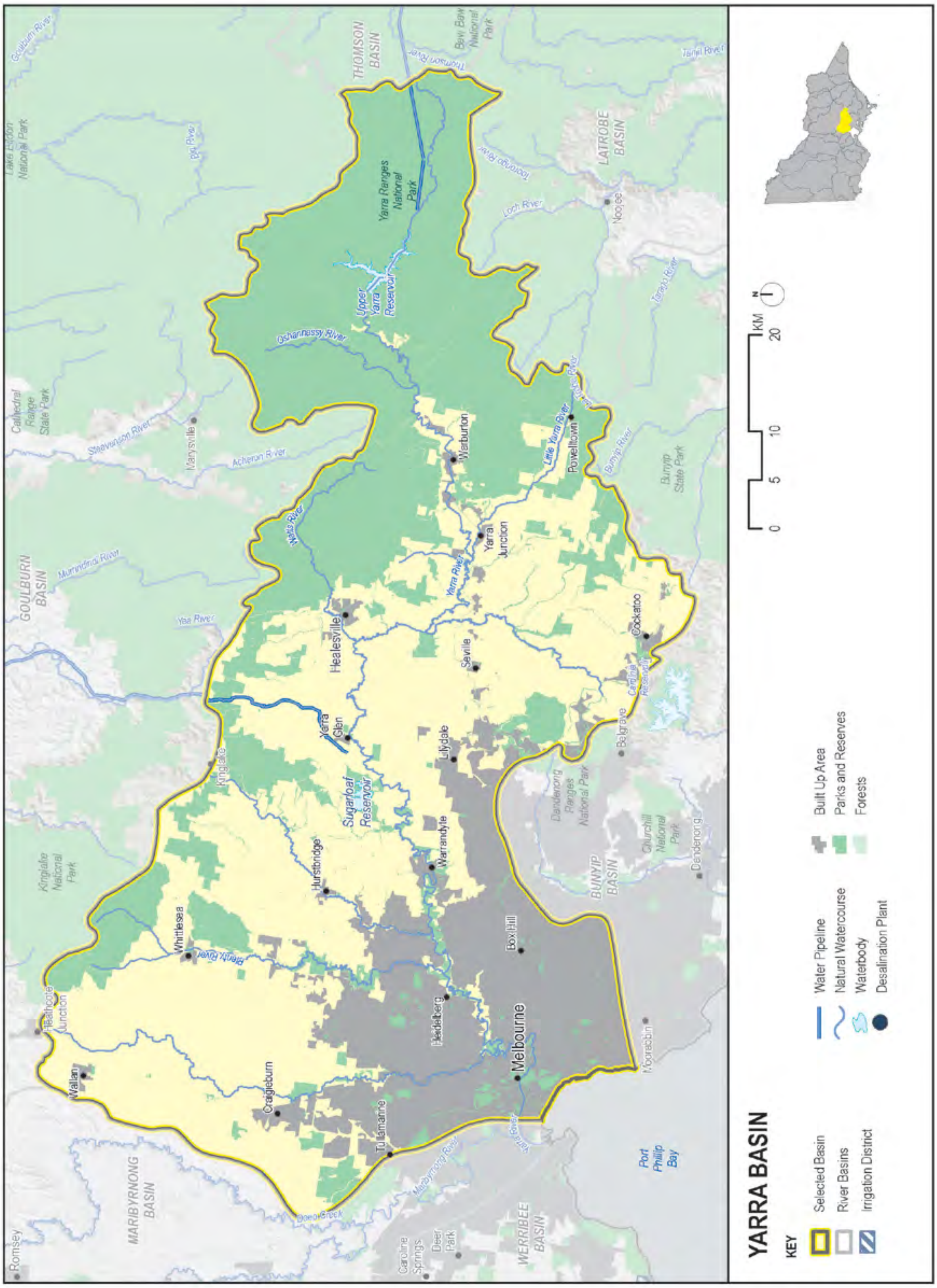
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(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 2014–15, rainfall in the western and central Yarra basin was between 60% and 80% of the long-term average, while in the south east of the basin, rainfall reached between 80% and 100% of the average. Catchment inflows were 57% of the long-term average. This was a decrease from the previous year's inflows of 66%, however was the fifth 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 lower than June 2014 at a capacity of 61%.

No urban water use restrictions applied in the Yarra basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 EWR. The Yarra River between Warburton and Warrandyte has been identified as a Victorian heritage river and depends on the EWR.

In 2014–15, the Yarra basin EWR comprised:

- the *Yarra River Environmental Entitlement 2006* comprising 17,000 ML of high-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 the Melbourne metropolitan retailers
- water set aside for the environment through the operation of Stream Flow 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.

In 2014–15, a total of 29,251 ML of held environmental water was used in the Yarra basin.

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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	144,976	133,113
Volume in storage at end of year	141,842	144,976
Change in storage	**(3,134)**	**11,863**
Inflows		
Catchment inflow(1)	597,405	699,325
Rainfall on major storages	9,193	11,078
Transfers from Thomson	148,744	132,197
Transfers from Goulburn (Sliver and Wallaby Creeks)	1,454	1,880
Transfers from Goulburn via North-South pipeline(2)	0	0
Treated effluent discharged back to river	0	0
Total inflows	**756,796**	**844,480**
Outflows		
Diversions		
Urban diversions	351,659	384,881
Licensed diversions from unregulated streams	9,588	8,624
Small catchment dams	15,824	15,824
Total diversions	**377,071**	**409,329**
Losses		
Evaporation losses from major storages	11,143	11,390
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	**12,411**	**12,658**
Water passed at outlet of basin		
River outflows to Port Phillip Bay	370,448	410,630
Total water passed at outlet of basin	**370,448**	**410,630**
Total outflows	**759,930**	**832,617**

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 2014–15 water year.
(3) No suitable model is available to make an estimate of in-stream losses.

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 to 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 430,411 ML (61% of capacity) by the end of June 2015 compared to 466,201ML in July 2014 (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.

Yarra basin

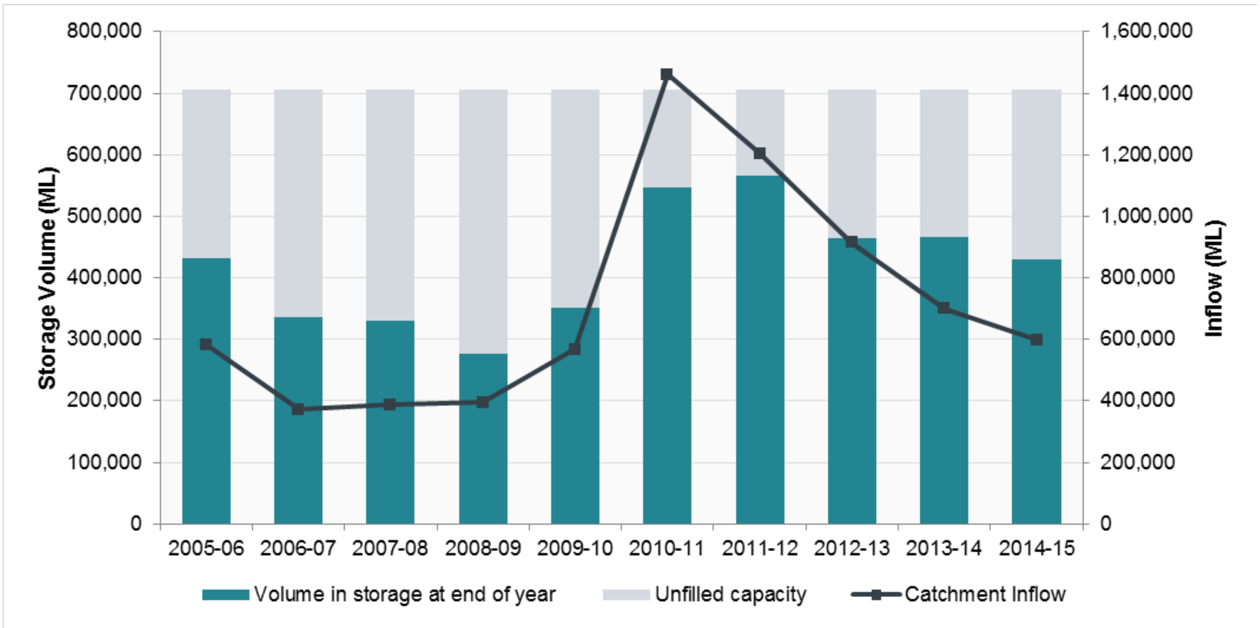
Table 6-105 Storage volumes in the Yarra basin

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	9,735	1,407	1,455	3,755	13,442
O'Shannassy Reservoir	3,123	3,240	263	210	(1,414)	1,879
Upper Yarra Reservoir	200,579	105,151	4,794	4,986	(4,176)	100,783
Yan Yean Reservoir	30,266	26,850	2,729	4,492	651	25,738
Total on-stream storages	**256,147**	**144,976**	**9,193**	**11,143**	**(1,184)**	**141,842**
Off-stream storages						
Cardinia Reservoir	286,911	184,284	8,940	7,856	(18,411)	166,957
Greenvale Reservoir	26,839	17,472	735	1,606	5,741	22,342
Silvan Reservoir	40,445	35,652	2,805	2,444	(1,992)	34,021
Sugarloaf Reservoir	96,253	83,817	2,494	4,051	(17,011)	65,249
Total off-stream storages	**450,448**	**321,225**	**14,974**	**15,957**	**(31,673)**	**288,569**
Total	**706,595**	**466,201**	**24,167**	**27,100**	**(32,857)**	**430,411**

Catchment inflows to the Yarra basin during 2014–15 were 597,405 ML, or 57% of the long-term average (of 1,054,000 ML). This is lower than 2013–14 when catchment inflows were 699,325 ML or 66% of the long-term average (Figure 6-32).

The amount of water flowing from the Yarra basin into Port Phillip Bay was 370,448 ML in 2014–15. This represents 62% of the catchment inflows to the basin, compared to 59% in 2013–14.

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 141,842 ML in June 2015 compared to 144,976 ML in July 2014.

6.17.2.3 Entitlement volumes and diversions

Melbourne Water holds a bulk entitlement to divert surface water in the Yarra basin. This water is diverted into the headworks system, which also sources water from the Thomson River, Tarago River, Bunyip River, Silver Creek and Wallaby Creek. City West Water, South East Water, Yarra Valley Water, Barwon Water, South Gippsland Water, Western Water and Westernport Water access the Melbourne Pool through the headworks system with new entitlements issued in 2014. Details of the new headworks entitlements are outlined in Chapter 3, section 3.1. 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 (for example, bulk entitlements granted to water authorities or environmental entitlements granted to 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)
Bulk Entitlement (Yarra River - Melbourne Water) 2014[1]	**400,000**
Bulk Entitlement (Yarra Environment Entitlement) 2006	
High Reliability	17,000
Unregulated surface water	55
Sub-total: Bulk Entitlement (Yarra Environment Entitlement) 2006	***17,055***
Take and use licences (Unregulated water systems)	**42,792**
Total volume of water entitlements in the Yarra basin	**459,847**

Note:

(1) Melbourne Water holds the source bulk entitlement on the Yarra River and can take an average annual amount of up to 400,000 ML over any consecutive 15 year period. This water is used to supply primary entitlement holders (City West Water, South East Water, Yarra Valley Water, Barwon Water, Western Water, South Gippsland Water and Westernport Water) with entitlement to the Greater Yarra System - Thomson River Pool which sources water from the Yarra River, Thomson River, Tarago River, Silver Creek and Wallaby Creek.

Allocation available under bulk entitlements and licences for 2014–15 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 higher in 2014–15 compared to the volume reported in the 2013–14 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 Water	400,000	0	243,584	156,416
Yarra Environment Entitlement[1][2]	17,000	(3,760)	29,251	-
Take and use licences - unregulated surface water	42,792	0	9,588	33,204

Notes:

(1) 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 be carried over in this system. Please refer to Chapter 4, Table 4.1.

(2) Use exceeded allocation due to carryover from 2013–14.

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 2014–15. Compared with 2013–14, the volume of wastewater entering the treatment plants and the volume of water recycled increased during the year. Overall, 12% of wastewater was reused in the basin, a slight increase from the 10% recycled in 2013–14.

Table 6-109 shows the volumes of water recycled in the Yarra basin in 2014–15.

Yarra basin

Table 6-109 Volume of recycled water in the Yarra basin

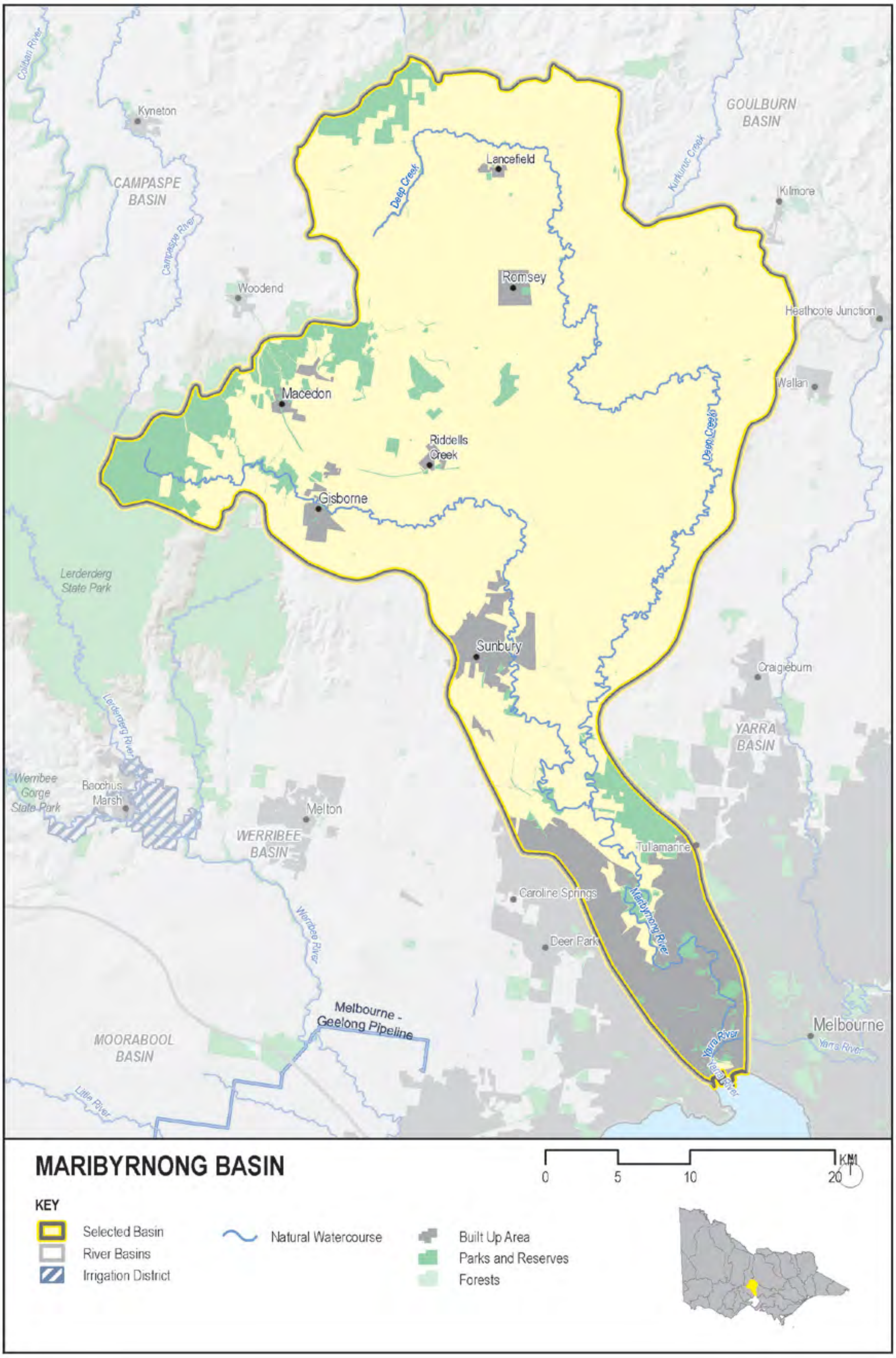
Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML): Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)	Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
Aurora	1,057	327	20%	77	130	0	120	0	730
Brushy Creek	4,083	769	1%	34	0	0	735	0	3,314
Craigieburn	1,121	630	8%	85	0	0	545	0	491
Healesville	428	85	0%	0	0	0	85	0	343
Lilydale	2,919	919	7%	209	0	0	710	0	2,000
Monbulk	24	0	0%	0	0	0	0	0	24
Upper Yarra	885	142	0%	0	0	0	142	0	743
Wallan	715	740	103%	25	715	0	0	0	(25)
Whittlesea	263	137	43%	85	29	0	23	0	126
Total 2014–15	**11,495**	**3,749**	**12%**	**515**	**874**	**0**	**2,360**	**0**	**7,746**
Total 2013–14	10,989	3,134	10%	459	612	0	2,063	0	7,855

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 the mouth of the river into Port Phillip Bay.

Figure 6-33 Map of the Maribyrnong basin



6.18.1 Water resources overview

Rainfall across the Maribyrnong basin in 2014–15 was between 60% and 80% of the long-term average. Catchment inflows were 20% of the long-term average, lower than in 2013–14 which saw inflows at 39% of the long-term average.

The storage volume in Rosslynne Reservoir started the year at 75% of capacity and held 44% at the end of June 2015.

No urban water use restrictions applied in the Maribyrnong basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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, the Jacksons Creek platypus population depend on the Maribyrnong EWR.

In 2014–15, 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)
- 629 ML of water purchased by Melbourne Water from rural customers to release equivalent environmental water for the Maribyrnong system
- all other water in the basin not allocated for consumptive use.

In 2014–15, a total of 610 ML of environmental water was used in the Maribyrnong basin.

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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	19,092	21,716
Volume in storage at end of year	11,176	19,092
Change in storage	**(7,916)**	**(2,624)**
Inflows		
Catchment inflow(1)	22,282	43,563
Rainfall on major storages	849	1,352
Treated effluent discharged back to river	1,483	1,732
Total inflows	**24,614**	**46,647**
Outflows		
Diversions		
Urban diversions	6,013	3,594
Licensed diversions from regulated streams	736	145
Licensed diversions from unregulated streams	543	329
Small catchment dams	7,782	7,782
Total diversions	***15,074***	***11,850***
Losses		
Evaporation losses from major storages	1,226	1,585
Evaporation from small catchment dams	4,861	4,861
In-stream infiltration to groundwater, flows to floodplain and evaporation	1,816	1,843
Total losses	***7,903***	***8,289***
Water passed at outlet of basin		
River outflows to the Yarra River	9,553	29,131
Total water passed at outlet of basin	***9,553***	***29,131***
Total outflows	**32,530**	**49,271**

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 25,400 ML, is the only major on stream storage located within the basin (storage over 1,000 ML). The storage volume was 11,176 ML (44% of capacity) at the end of June 2015 compared to 19,092 ML (75% of capacity) at the start of July 2014 (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.

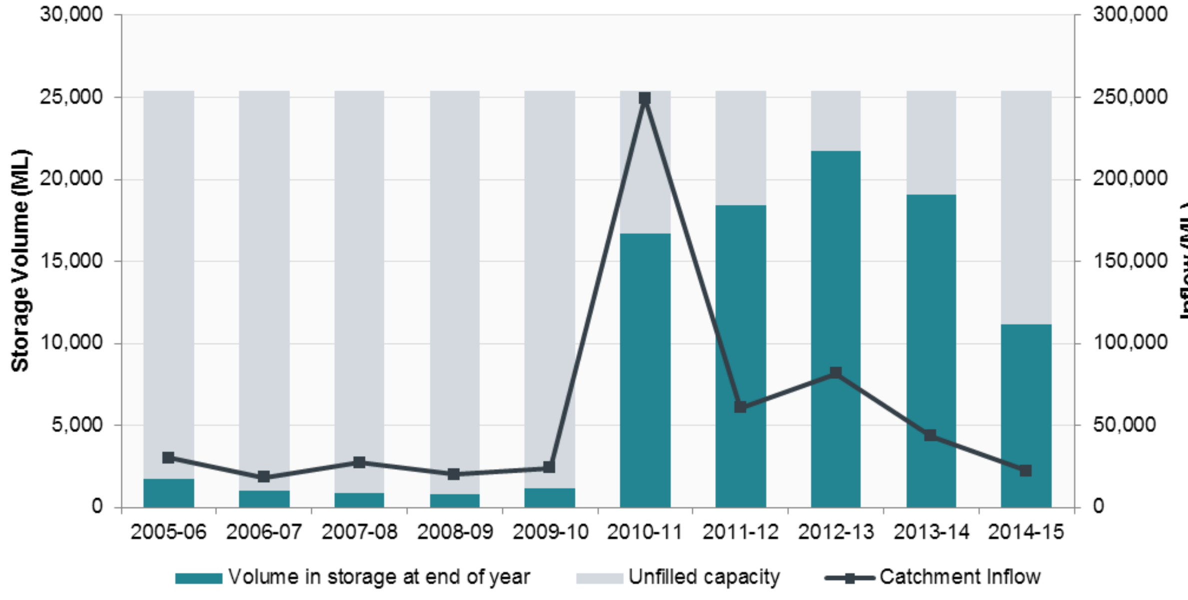
Table 6-112 Storage volumes in the Maribyrnong basin

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	25,400	19,092	849	1,226	(7,539)	11,176
Total	**25,400**	**19,092**	**849**	**1,226**	**(7,539)**	**11,176**

Catchment inflows were 22,282 ML, or 20% of the long-term average of 113,000 ML. This was a decrease from 2013–14 when inflows were 39% of the long-term average (Figure 6-34).

The amount of water flowing into the Yarra River in 2014–15 was 9,553 ML compared to 29,131 ML in 2013–14. This represents 43% 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 (for example, bulk entitlements granted to water corporations). Rights to water in the Maribyrnong 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)	1,157
Bulk Entitlement (Maribyrnong - Southern Rural Water) Conversion Order 2000 (4)	214
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	2,088
Total volume of water entitlements in the Maribyrnong basin	**12,092**

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 5-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 5-year period is 3,225 ML (645 ML annual average).
(3) This entitlement supplies water for take and use licences, 1,132 ML of entitlement was allocated for the 2014–15 year.
(4) This entitlement supplies water for take and use licences, 214 ML of entitlement was allocated for the 2014–15 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 2014–15 is presented in Table 6-114. The volume of water diverted from unregulated streams by licence holders in the Maribyrnong basin was higher in 2014–15 compared to the volume 329 ML reported in the 2013–14 Victorian Water Accounts (Table 6-114).

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	79	236
Macedon and Mount Macedon	873	0	266	607
Maribyrnong - Melbourne Water(1)	1,132	0	714	418
Maribyrnong - Southern Rural Water	214	0	22	192
Maribyrnong - Western Water	6,100	0	5,457	643
Riddells Creek	300	0	65	235
Romsey	460	0	146	314
Take and use licences - unregulated surface water	2,088	0	543	1,545

Notes:

(1) Use against the Melbourne Water entitlement includes 629 ML of water purchased by Melbourne Water from rural customers to release equivalent held environmental for the Maribyrnong system water.

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, 38% of wastewater was reused in 2014–15, an increase of 3% on the proportion reused in 2013–14. Both the volume of wastewater produced and the volume of water recycled decreased in 2014–15 compared to 2013–14.

Table 6-116 shows the volumes of water recycled in the Maribyrnong basin in 2014–15.

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	541	121	18%	68	28	0	25	420	0
Riddells Creek	177	157	88%	12	144	0	1	0	20
Romsey	294	294	100%	55	239	0	0	0	0
Sunbury	2,037	974	30%	270	337	0	367	1,063	0
Total 2014–15	**3,049**	**1,546**	**38%**	**405**	**748**	**0**	**393**	**1,483**	**20**
Total 2013–14	3,071	1,965	35%	417	645	0	903	1,732	(626)

Notes:

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

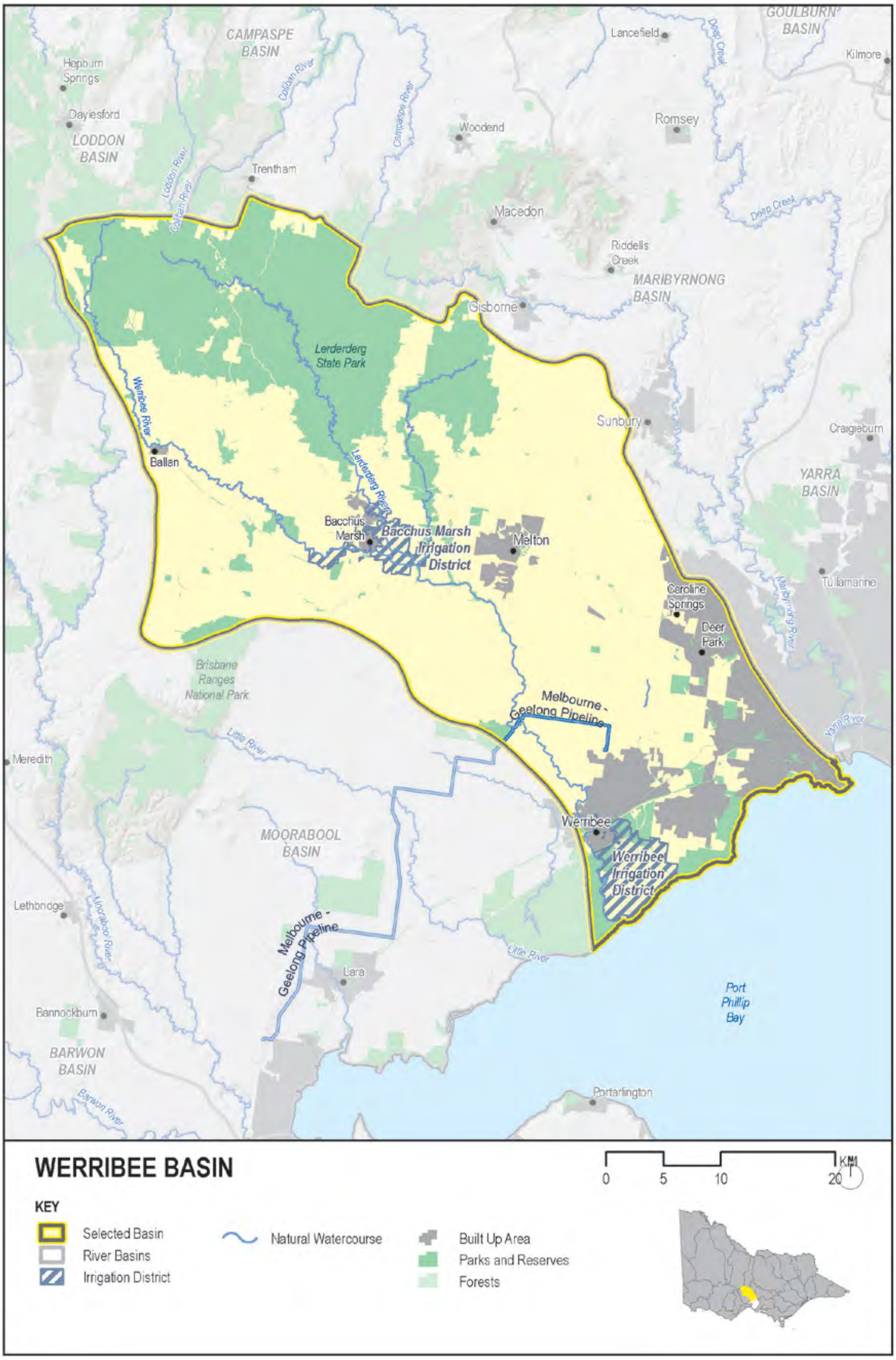
(2) Percentage recycled excludes 'within process' which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC's performance report.

(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 in 2014–15 was between 60% and 100% of the long-term average. Catchment inflows were 23% of the long-term average, lower than 2013–14 when inflows were 41% of the long-term average. The amount of water flowing from the Werribee basin into Port Phillip Bay represented 20% of the catchment flows into the basin in 2014–15.

Major storages in the Werribee basin started the year at 57% of capacity and finished the year lower at 34% by the end of June 2015.

The year began with a 50% allocation for high-reliability water shares for the Werribee system. This was gradually increased to a maximum of 70% by December. No allocation was made to low-reliability water shares.

No urban water use restrictions applied in the Werribee basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 2014–15, 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.

In 2014–15, a total of 714 ML of environmental water was used in the Werribee basin.

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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	40,005	47,683
Volume in storage at end of year	24,146	40,005
Change in storage	**(15,859)**	**(7,678)**
Inflows		
Catchment inflow(1)	23,922	41,588
Rainfall on major storages	2,072	3,850
Transfers from other basins	0	0
Return flow from irrigation	0	61
Treated effluent discharged back to river	5,095	4,878
Total inflows	**31,089**	**50,378**
Outflows		
Diversions		
Urban diversions	7,110	6,496
Irrigation district diversions and licensed diversions from regulated streams	11,587	16,994
Licensed diversions from unregulated streams	5	48
Small catchment dams	9,347	9,347
Total diversions	***28,049***	***32,885***
Losses		
Evaporation losses from major storages	5,054	8,699
Evaporation from small catchment dams	5,371	5,371
In-stream infiltration to groundwater, flows to floodplain and evaporation	3,602	3,741
Total losses	***14,027***	***17,811***
Water passed at outlet of basin		
River outflows to Port Phillip Bay	4,872	7,359
Total water passed at outlet of basin	***4,872***	***7,359***
Total outflows	**46,948**	**58,055**

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 24,146 ML (34% of capacity) at 30 June 2015 compared to 40,005 ML at 1July 2014 (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.

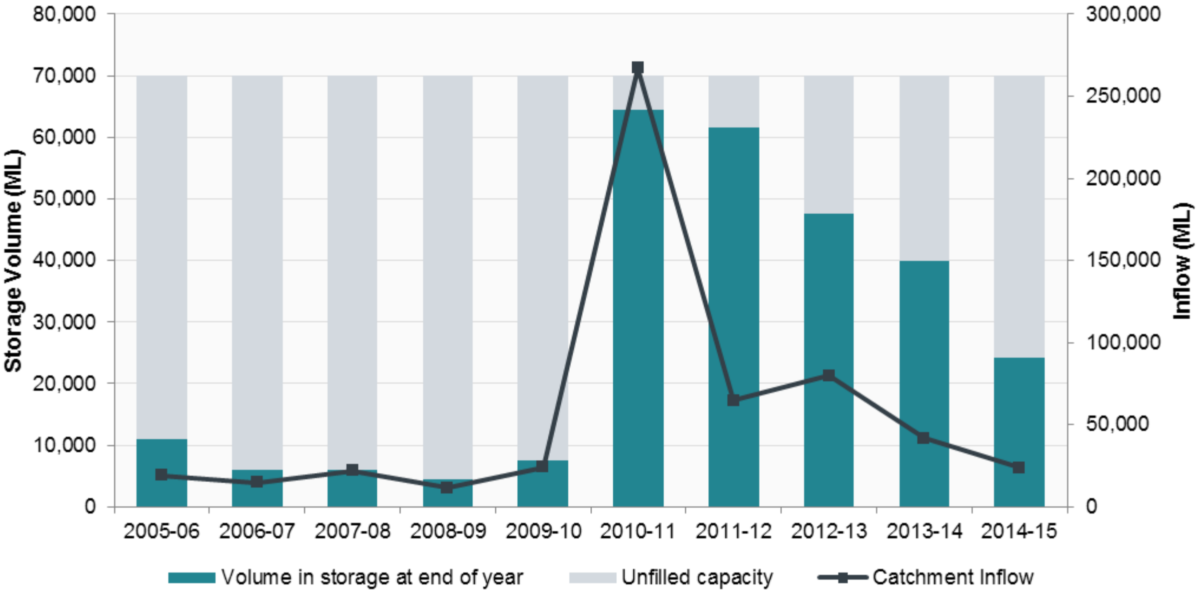
Table 6-119 Storage volumes in the Werribee basin

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	619	53	92	(25)	555
Melton Reservoir	14,360	1,257	242	924	761	1,336
Merrimu Reservoir	32,516	20,137	784	2,358	(9,081)	9,482
Pykes Creek Reservoir	22,119	17,992	992	1,680	(4,531)	12,773
Total storages	**70,009**	**40,005**	**2,071**	**5,054**	**(12,876)**	**24,146**

Catchment inflows were 23,922 ML, or 23% of the long-term average of 102,000 ML. This was lower than the 2013–14 inflows of 41,588 ML (Figure 6-36).

In 2014–15, 4,872 ML of water flowed from the Werribee basin into Port Phillip Bay. This represents 20% of the catchment inflows into the basin. About 7,359 ML flowed into Port Phillip Bay in 2013–14.

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 (for example water shares and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations or the VEWH). Rights to water in the Werribee basin are outlined in Table 6-120.

Werribee basin

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	15,447
Low reliability water shares	7,241
Bulk Entitlement (Myrniong) Conversion Order 2004	58
Operating provision	4,939
Sub-total: Bulk Entitlement (Werribee system - Irrigation) Conversion Order 1997	**27,685**
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	**39,283**

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 2014–15 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 fifty percent 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 11,632 ML to supply water share holders in the Werribee and Bacchus Marsh irrigation districts in 2014–15 (Table 6-121) compared to 17,034 ML in 2013–14.

The total volume of water of 5 ML diverted from unregulated streams by licence holders in the Werribee basin in 2014–15 was lower than the amount (48 ML) reported in the 2013–14 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	4,818	10,178	0	8,039	1,016	5,941
Myrniong	17	41	0	45	2	11
Operating provision(1)	0		0	3,503		0
Diversion: Werribee system - Irrigation - SRW(2)				**11,587**		
Ballan	0	451	0	0	451	0
Blackwood and Barry's Reef	0	140	0	30	110	0
Werribee system - Western Water	0	9,986	0	7,035	2,951	0
Werribee River Environment Entitlement(3)	865	104	0	253	0	716
Take and use licences - unregulated surface water	0	1,021	0	5	1,016	0

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 share of inflows available under this entitlement during 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 Chapter 4, Table 4.1.

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 2014–15 was 170,023 ML, a decrease of 7,681 ML compared to 2013–14. Around 21% of wastewater was reused in 2014–15.

The majority of water recycling in the basin occurs at Melbourne Water's Western Treatment Plant, which reused 20% of wastewater. This included 10,445 ML for on-site irrigation and environmental management and 18,129 ML for habitat management at Ramsar-listed wetlands.

Table 6-123 shows the volumes of water recycled in the Werribee basin in 2014–15.

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	4,949	119	0%	0	0	0	0	119	4,822	8
Ballan	118	118	100%	0	0	118	0	0	0	0
Melton	3,607	3,334	80%	0	522	2,364	0	448	273	0
Parwan (Bacchus Marsh)	505	427	85%	0	0	427	0	0	0	78
Western Treatment Plant	160,843	32,996	20%	4,337	51	10,445	18,129	34	0	127,847
Total 2014–15	**170,023**	**36,994**	**21%**	**4,337**	**573**	**13,355**	**18,129**	**601**	**5,095**	**127,933**
Total 2013–14	177,704	35,721	20%	2,601	374	12,417	19,835	494	4,878	137,105

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 most of the Moorabool basin in 2014–15 was between 60% and 80% of the long-term average. Coastal parts of the basin had more rainfall and received 80% to 100% of the long-term average.

Storage levels for the major storages in the basin started the year at 66% of capacity and held 56% at the end of June 2015. Diversion volumes were similar to 2013–14. No urban water use restrictions applied in the Moorabool basin in 2014–15, with all towns remaining on permanent water savings 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 such as River Blackfish and Australian Grayling between Lal Lal Reservoir and She Oakes Weir, as well as the Hovells Creek Estuary, which is part of Port Phillip Bay and Bellarine Peninsula Ramsar site, depend on the Moorabool basin EWR.

In 2014–15, 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.

In 2014–15, a total of 1,685 ML of environmental water was used in the Moorabool basin.

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. The majority of 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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	49,661	60,820
Volume in storage at end of year	42,930	49,661
Change in storage	**(6,731)**	**(11,159)**
Inflows		
Catchment inflow(1)	50,588	51,988
Rainfall on major storages	3,452	4,800
Treated effluent discharged back to river	0	0
Total inflows	**54,040**	**56,788**
Outflows		
Diversions		
Urban diversions(2)	8,255	9,386
Transfers to Barwon basin (White Swan Reservoir)(3)	4,147	3,808
Licensed diversions from unregulated streams	1,240	1,190
Small catchment dams	22,197	22,197
Total diversions	**35,839**	**36,581**
Losses		
Evaporation losses from major storages	5,666	6,860
Evaporation from small catchment dams	7,266	7,266
In-stream infiltration to groundwater, flows to floodplain and evaporation	6,728	6,426
Total losses	**19,660**	**20,552**
Water passed at outlet of basin		
River outflows to Port Phillip Bay (Little River) and other small coastal streams	2,546	3,720
River outflows to the Barwon River (Moorabool River)	2,726	7,094
Total water passed at outlet of basin	**5,272**	**10,814**
Total outflows	**60,771**	**67,947**

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 4,147 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 48,312 ML (56% of capacity) at the end of June 2015 compared to 56,298 ML (66% of capacity) at the beginning 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 49,661 ML and ended at 42,930 ML in June 2015.

Table 6-126 Storage volumes in the Moorabool basin

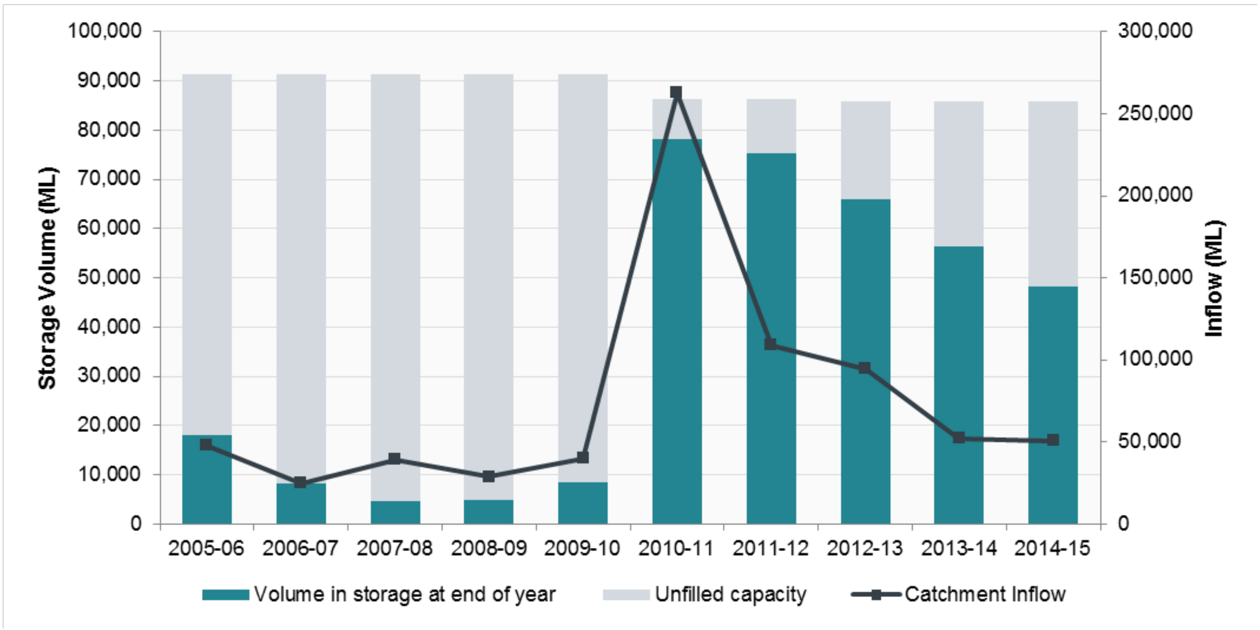
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Bostock Reservoir	7,455	1,693	717	842	(1,444)	123
Korweinguboora Reservoir	2,091	188	458	538	341	449
Lal Lal Reservoir	59,549	44,551	1,702	3,393	(2,201)	40,659
Moorabool Reservoir	6,192	3,099	546	850	(1,104)	1,691
Wilsons Reservoir	1,010	131	29	43	(109)	8
Subtotal	**76,297**	**49,661**	**3,452**	**5,666**	**(4,517)**	**42,930**
Off-stream storages						
Upper Stony Creek Reservoir	9,494	6,637	n/a	n/a	(1,255)	5,382
Subtotal	**9,494**	**6,637**	**n/a**	**n/a**	**(1,255)**	**5,382**
Total	**85,791**	**56,298**	**3,452**	**5,666**	**(5,772)**	**48,312**

n/a: information not available.

Catchment inflows were 50,588 ML or 52% of the long-term average of 97,000 ML. This was slightly lower than the 2013–14 inflows of 51,988 ML (Figure 6-38).

The amount of water flowing from the Moorabool basin into Port Phillip Bay and the Barwon River was 5,272 ML in 2014–15, or 10% 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 corporations or the VEWH). Rights to water in the Moorabool basin are outlined in Table 6-127.

Moorabool basin

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 upon inflow conditions.

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-128. The total volume of water diverted by bulk entitlement holders was slightly less in 2013–14 compared to 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 2014–15 was similar to the volume 1,190 ML reported in the 2013–14 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	1,711	4,214
Lal Lal - Central Highlands	12,575	0	3,938	8,637
Meredith	600	0	0	600
She Oaks	2,000	0	0	2,000
Upper East Moorabool System	9,000	0	2,606	6,394
Upper West Moorabool System	10,500	0	4,147	6,354
Moorabool River Environment Entitlement(1)	2,665	0	1,685	980
Take and use licences - unregulated surface water	3,571	0	1,240	2,331

Note:
(1) Allocation issued to the Moorabool River Environmental Entitlement reflects the total available water for the year including opening carryover of 2,208 ML and 457 ML of inflows during 2014–15. 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 Chapter 4, Table 4.1

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 2014–15.

Table 6-130 Volume of recycled water in the Moorabool basin

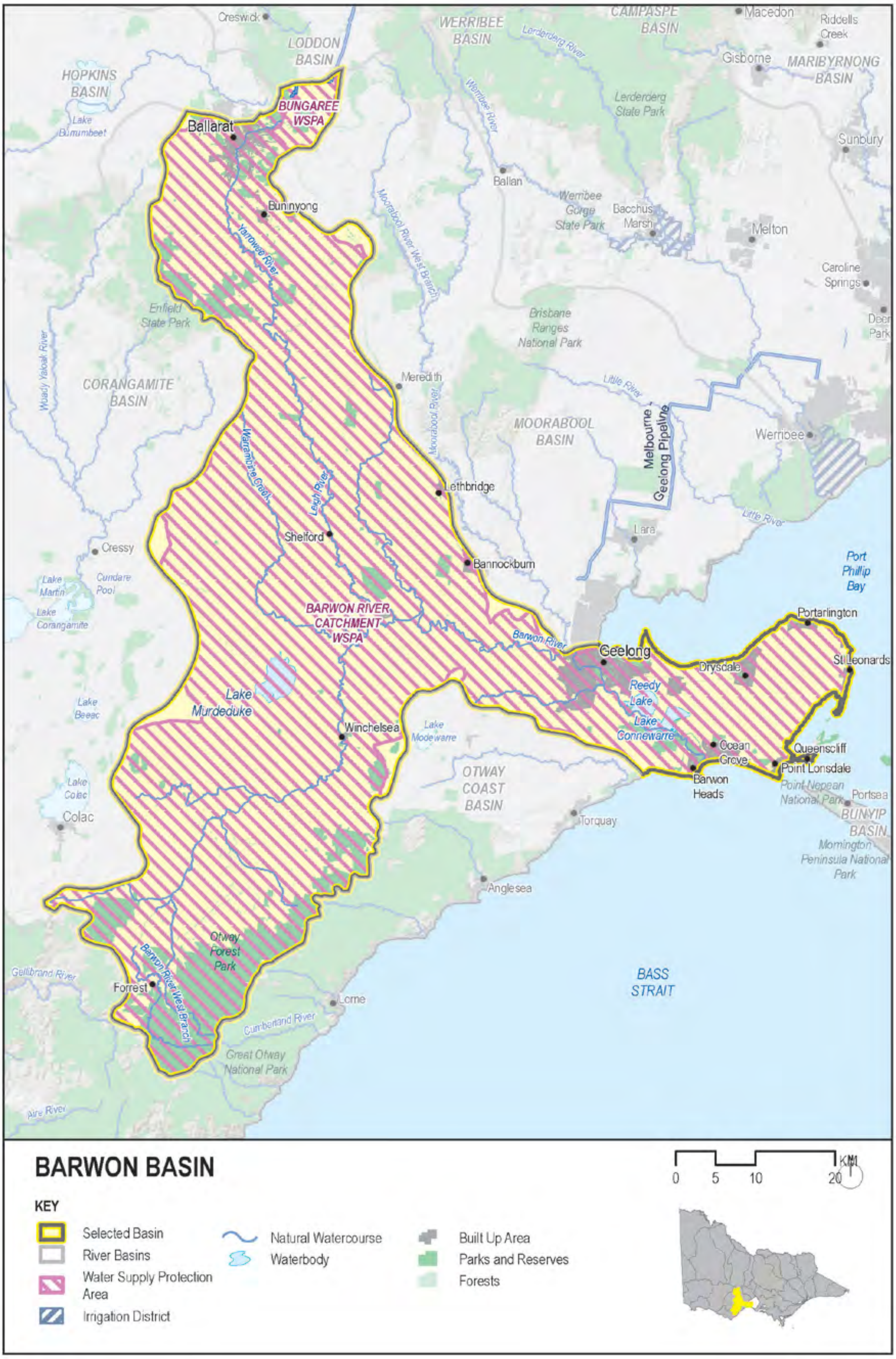
Treatment plant	Volume produced (ML)	Volume recycled (ML)	% recycled(2)	End-use type for recycled water (ML)				Volume discharged to the environment (ML)	Release to ocean / other(3) (ML)
				Urban and industrial	Agriculture	Beneficial allocation(1)	Within process(2)		
Northern Water Recycling Plant	1,410	1,410	100%	1,410	0	0	0	0	0
Total 2014–15	**1,410**	**1,410**	**100%**	**1,410**	**0**	**0**	**0**	**0**	**0**
Total 2013–14	1,242	1,242	100%	1,242	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. The Barwon River originates in the Otway Ranges and receives inflows from the north 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

Rainfall in most of the Barwon basin in 2014–15 was between 60% and 80% of the long-term average. The far east of the basin had more rainfall and received 80% to 100% of the long-term average. Catchment inflows in the Barwon basin in 2014–15 were 30% of the long-term average, a decrease from 55% in 2013–14.

Storage levels in the Barwon basin decreased from 72% to 59% of total capacity over the course of the year. No urban water use restrictions applied in the Barwon basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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, and the Melbourne system via the Geelong- Melbourne pipeline.
(2) Ballarat's water supply is mainly sourced from the Moorabool basin and the Campaspe and Goulburn basin via the Goldfields Superpipe.

Environmental Water Reserve

The Bellarine Peninsula contains internationally significant wetlands listed under the Ramsar Convention which rely on freshwater inputs from the Barwon basin to maintain good ecological function. Other important environmental assets include the Lake Connewarre complex, native fish populations such as Australian Grayling and Yarra Pygmy Perch, Australian Mudfish and Tupong, the native water bird population, particularly migratory shorebirds including the Common Greenshank, Pacific Golden Plover, Curlew Sandpiper and Red-necked Stint, and platypus populations in the upper and mid catchment.

In 2014–15, the Barwon basin Environmental Water Reserve comprised:

- the *Barwon River Environmental Entitlement 2011*
- 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 storages in the Barwon basin are the West Barwon Reservoir and Wurdee Buloc 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 increased from 3,808 ML in 2013–14 to 4,147 ML in 2014–15. This water was transferred to White Swan Reservoir and used to supply the Ballarat system. The Goldfields Superpipe was used to transfer 563 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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	27,458	25,519
Volume in storage at end of year	23,961	27,458
Change in storage	**(3,497)**	**1,939**
Inflows		
Catchment inflow(1)	106,398	198,475
Rainfall on major storages	2,247	3,144
Inflows from the Moorabool River	2,726	7,094
Transfers from the Corangamite basin via Woady Yaloak Channel	0	0
Transfers from Moorabool basin to White Swan Reservoir(2)	4,147	3,808
Transfers from Campaspe basin to White Swan Reservoir	563	207
Treated wastewater discharged back to river	27,507	28,091
Total inflows	**143,588**	**240,820**
Outflows		
Diversions		
Urban diversions	28,524	38,767
Licensed diversions from unregulated streams	1,615	1,173
Small catchment dams	30,898	30,898
Total diversions	***61,037***	***70,839***
Losses		
Evaporation losses from major storages	2,995	3,168
Evaporation from small catchment dams	12,543	12,543
In-stream infiltration to groundwater, flows to floodplain and evaporation	10,404	10,458
Total losses	***25,942***	***26,169***
Water passed at outlet of basin		
River outflows to the ocean	60,106	141,873
Total water passed at outlet of basin	***60,106***	***141,873***
Total outflows	**147,085**	**238,881**

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 4,147 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 56,155 ML in July 2014 and were 43,557 ML (58% of capacity) at the end of June 2015. Only volumes in West Barwon Dam, Gong Gong Reservoir and White Swan Reservoir are included in the water balance, 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.

Table 6-133 Storage volumes in the Barwon basin

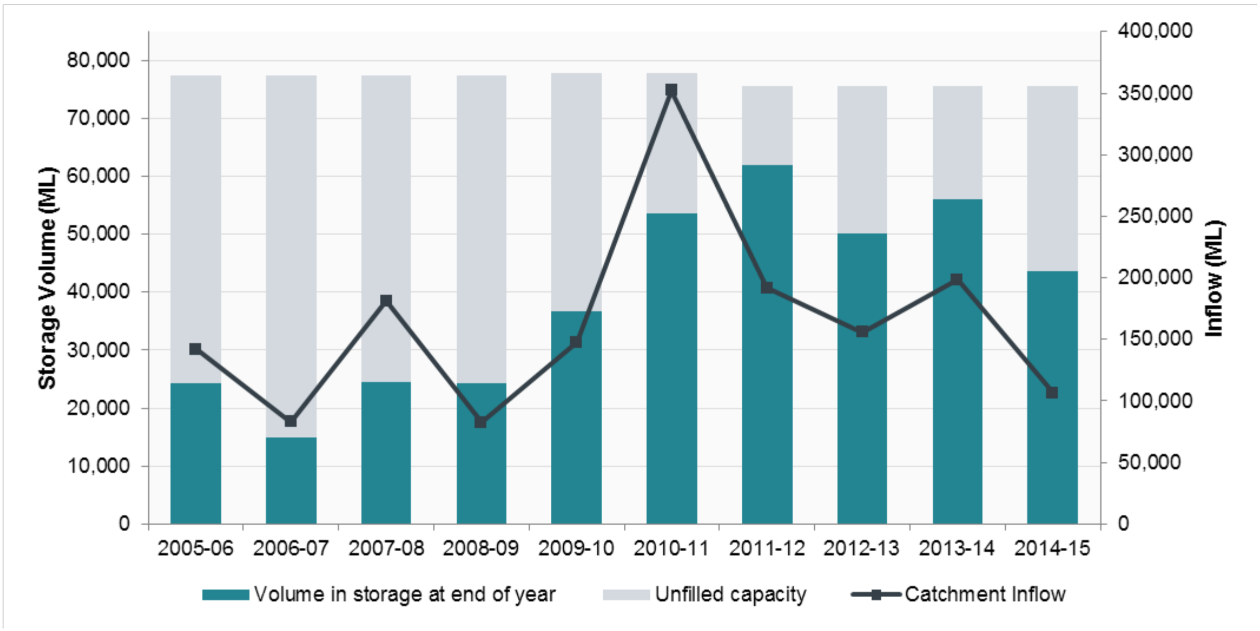
Storage	Total capacity (ML)	Start volume in store (ML)	Rainfall (ML)	Evaporation (ML)	Catchment inflow less regulated releases (ML)	End volume in store (ML)
On-stream storages						
Gong Gong Reservoir	1,902	513	71	118	36	502
West Barwon Dam	21,504	18,405	1,524	1,908	(1,478)	16,543
White Swan Reservoir(1)	14,107	8,540	652	969	(1,307)	6,916
Sub-total	**37,513**	**27,458**	**2,247**	**2,995**	**(2,749)**	**23,961**
Off-stream storages						
Wurdee Boluc Reservoir	38,056	28,697	n/a	n/a	(9,101)	19,596
Sub-total	**38,056**	**28,697**	**n/a**	**n/a**	**(9,101)**	**19,596**
Grand Total	**75,569**	**56,155**	**2,247**	**2,995**	**(11,850)**	**43,557**

Notes:
(1) White Swan Reservoir is treated as an on stream storage for the purpose of the water balance.

Catchment inflows to the Barwon basin amounted to 106,398 ML in 2014–15, which is 30% of the long-term average (of 360,000 ML). This is a decrease from inflows of 55% of the long-term average in 2013–14 (Figure 6-40).

The amount of water flowing from the Barwon basin into Corio Bay and Bass Strait was 60,106 ML in 2014–15. This represents 56% 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 (for example take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations or environmental entitlements granted to 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	5,551
Total volume of water entitlements in the Barwon basin	**61,285**

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.

Water available under bulk entitlements and licences for 2014–15 is presented in Table 6-135. The total volume of water diverted by bulk entitlement holders was greater in 2014–15 compared to the volume reported in the 2013–14 Victorian Water Accounts.

The *Barwon River Environmental Entitlement 2011* allows unregulated flows to be diverted to floodplain wetlands. The volume of unregulated flow available for diversion varies depending on seasonal conditions. No volumetric use gets recorded against this entitlement.

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	20,845	22,622
Yarrowee-White Swan system	12,267	0	7,679	4,588
Barwon River Environmental Entitlement(1)	-	-	-	-
Take and use licences - unregulated surface water	5,551	0	1,615	3,936

Note:
(1) Use under this entitlement is dependent on suitable river heights.

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 2014–15, around 8% of wastewater in the Barwon basin was recycled, similar to the amount recycled in 2013–14.

Table 6-137 shows the volumes of water recycled in the Barwon basin in 2014–15.

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	2,452	443	4%	0	0	95	348	2,009	0
Ballarat South	6,762	73	0%	0	0	0	73	6,689	0
Bannockburn	89	89	49%	0	44	0	45	0	0
Black Rock	20,847	2,974	10%	931	1,106	0	937	0	17,873
Portarlington	411	411	30%	0	125	0	286	0	0
Winchelsea	11	11	33%	0	4	0	7	0	0
Total 2014–15	**30,572**	**4,001**	**8%**	**931**	**1,279**	**95**	**1,697**	**8,697**	**17,873**
Total 2013–14[4]	32,714	4,438	8%	807	1,354	432	1,845	28,090	186

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.

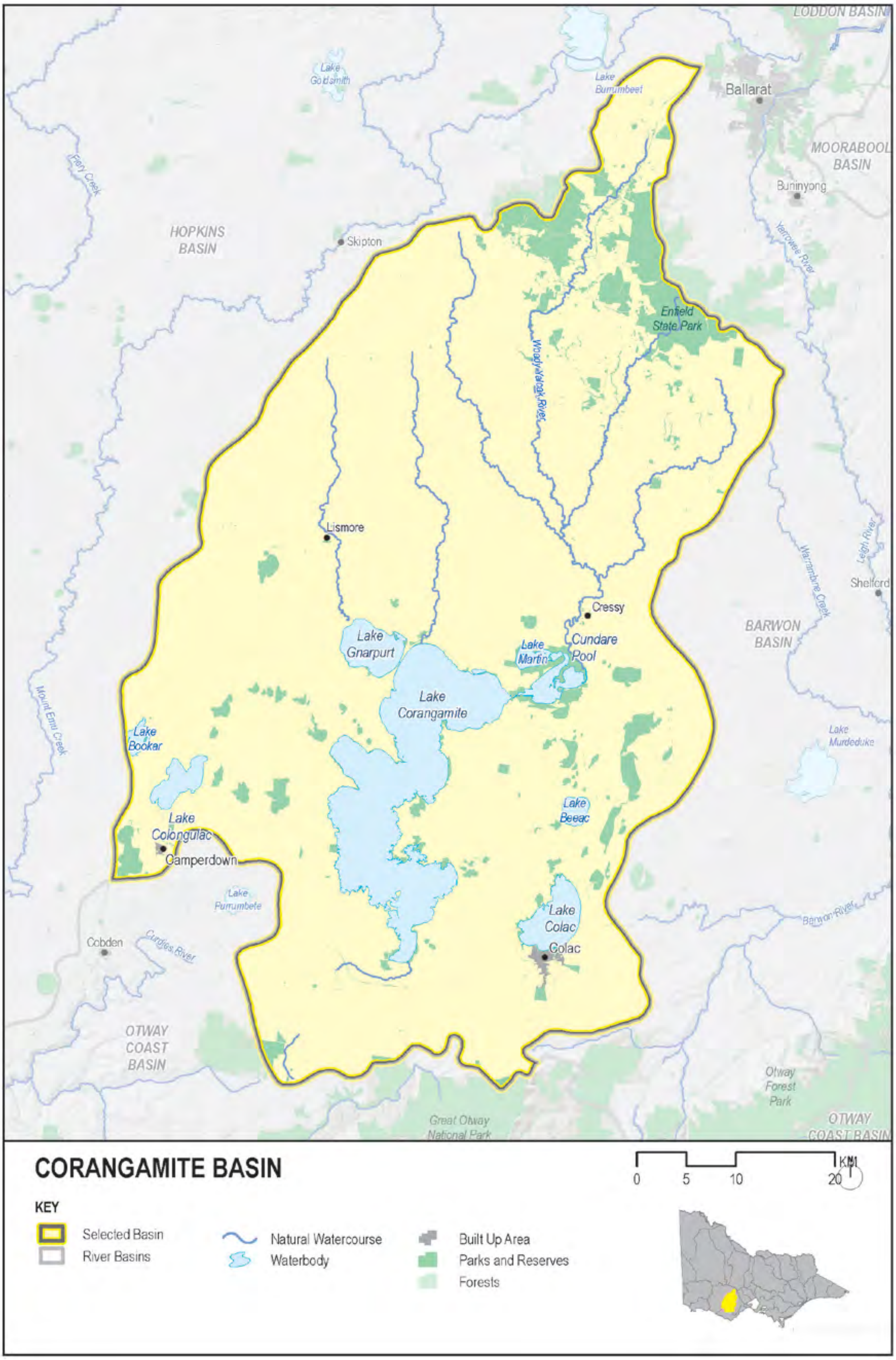
(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

(4) In the Victorian Water Accounts 2013–2014, outflows from Black Rock was reported as volume discharged to the environment. In this edition, these outflows are reported as release to the ocean.

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 2014–15, rainfall in the Corangamite basin was between 60% and 80% of the long-term average. Inflows across the basin were 47% of the long-term average, significantly lower than 2013–14 when the inflows were 97% of the long-term average. The amount of water flowing from the Corangamite basin into the Ramsar-listed Western District Lakes represented 88% of the catchment inflows in 2014–15.

No urban water use restrictions applied in the Corangamite basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 (from the Ballarat supply which is sourced in the Moorabool and Goulburn basins) (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 the 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 2014–15, 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 mostly supplied from the Otway Coast basin and the Moorabool 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	2014–15 (ML)	2013–14 (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)	147,447	307,353
Rainfall on major storages	0	0
Treated effluent discharged back to river	1,705	1,836
Total inflows	**149,152**	**309,189**
Outflows		
Diversions		
Urban diversions	0	0
Licensed diversions from unregulated streams	70	108
Small catchment dams	12,366	12,366
Total diversions	**12,436**	**12,474**
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	130,182	290,180
River outflows to Barwon Basin via Woady Yaloak Channel	0	0
Total water passed at outlet of basin	**130,182**	**290,180**
Total outflows	**149,152**	**309,189**

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.

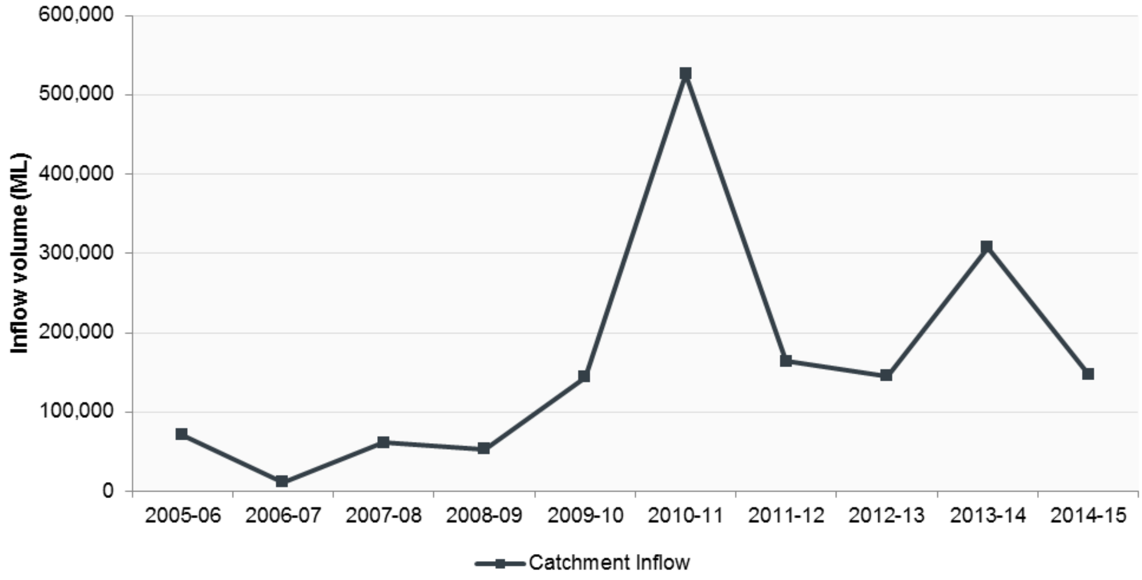
6.22.2.2 Storages and flows

Inflows across the basin were 47% of the long-term average of 316,000 ML, which is significantly lower than 2013–14 where the inflows were 97% of the long-term average (Figure 6-42).

Outflows from the Corangamite basin into the Western District Lakes were 130,182 ML in 2014–15, or 88% of the catchment inflows.

There are no major water supply storages in the 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 authorities divert surface water in this basin.

The total licensed volume and the estimated volume of water diverted by licence holders in the basin was the same in 2014–15 as the volume reported in the 2013–14 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 2014–15 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	70	1,103

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 2014–15 increased to 22%, compared to 18% in 2013–14.

Table 6-143 shows the volumes of water recycled in the Corangamite basin in 2014–15.

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(4)	15	64	425%	0	64	0	0	0	(49)
Camperdown Municipal(4)	331	393	119%	10	383	0	0	0	(62)
Colac	1,705	52	0%	0	0	0	52	1,705	(52)
Total 2014–15	**2,051**	**509**	**22%**	**10**	**447**	**0**	**52**	**1,705**	**(163)**
Total 2013–14	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.

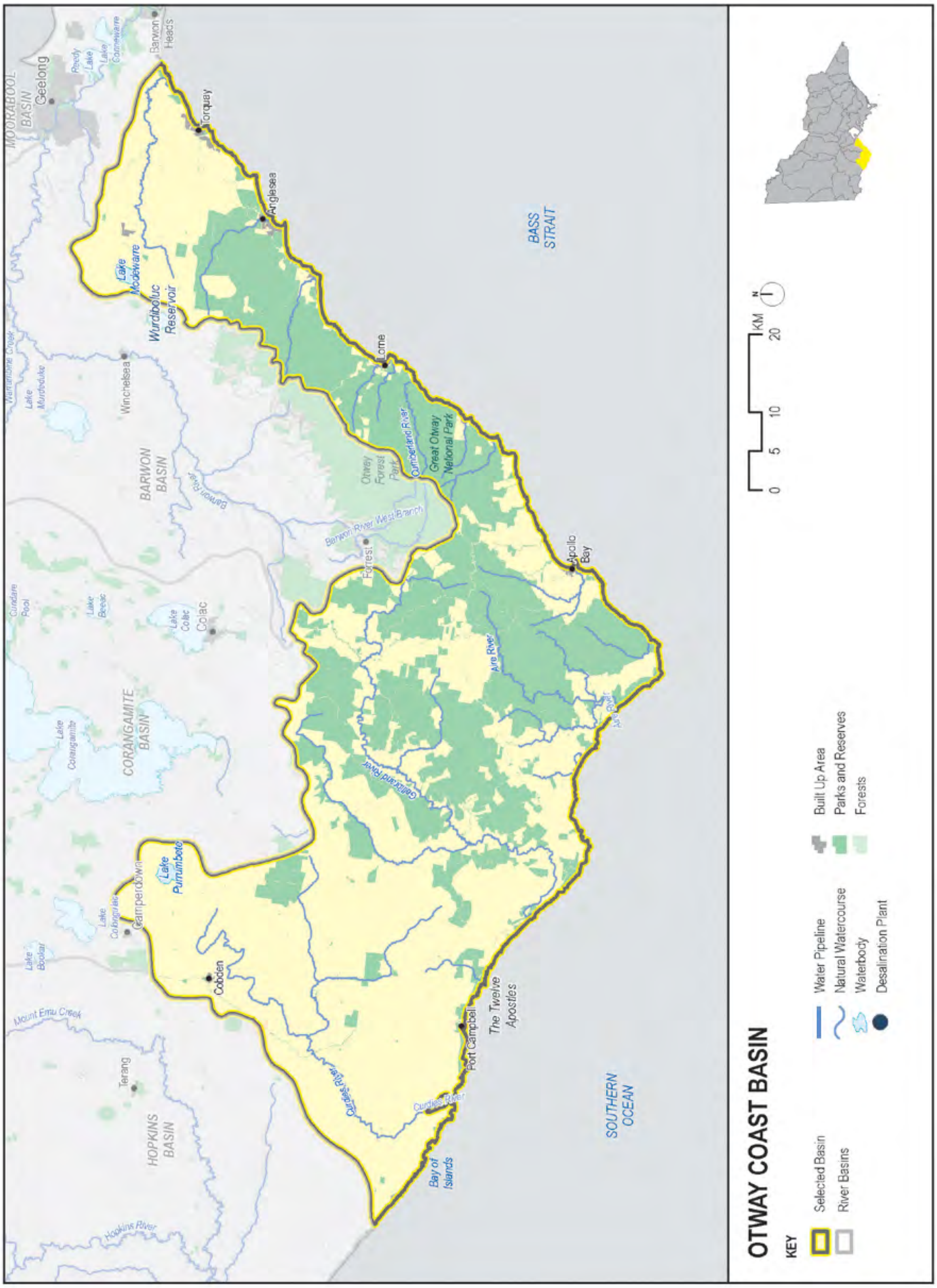
(3) 'Other' refers to a change in on-site wastewater storage, or items affecting the annual water balance for recycled water that are not otherwise accounted for.

(4) Volume recycled greater than volume produced due to water stored on-site carried over from previous year.

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 2014–15, rainfall in the southern part of the Otway Coast basin was between 80% and 100% of the long-term average, while in the northern part of the basin rainfall was between 60% and 80% of the average. Inflows in the Otway Coast basin in 2014–15 were 65% of the long-term average, compared to 109% in 2013–14. The amount of water flowing into Bass Strait represented 95% of the catchment inflows in the basin in 2014–15.

Storage levels in West Gellibrand Reservoir decreased from 100% to 74% of total capacity over the course of the year. No urban water restrictions applied during the year, with all towns subject to permanent water saving rules.

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		Supplies towns including Port Campbell, Peterborough, Simpson and Cobden	Obliged to meet passing flow requirements
Barwon Water		Supplies the majority of towns in the basin including Lorne, Aireys Inlet, Apollo Bay and towns in the northern part of the basin from Geelong's water supply which comes from the Barwon Basin. Also transfers water out of the basin to supply Colac and surrounding towns	Operates West Gellibrand Reservoir and other reservoirs used to supply towns 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
- native fish community, e.g. River Blackfish and the Australian Grayling and their 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 2014–15, 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.

Table 6-145 Balance of surface water in the Otway Coast basin

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	1,856	1,856
Volume in storage at end of year	1,374	1,856
Change in storage	**(482)**	**0**
Inflows		
Catchment inflow(1)	574,875	962,890
Rainfall on major storages	160	236
Treated effluent discharged back to river	88	1,130
Total inflows	**575,123**	**964,255**
Outflows		
Diversions		
Urban diversions	12,911	12,681
Licensed diversions from unregulated streams	691	751
Small catchment dams	12,728	12,728
Total diversions	***26,330***	***26,159***
Losses		
Evaporation losses from major storages	221	224
Evaporation from small catchment dams	3,455	3,455
In-stream infiltration to groundwater, flows to floodplain and evaporation(2)	0	0
Total losses	***3,676***	***3,679***
Water passed at outlet of basin		
River outflows to the ocean	545,599	934,417
Total water passed at outlet of basin	***545,599***	***934,417***
Total outflows	**575,605**	**964,255**

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.

6.23.2.2 Storages and inflows

The only major storage in the basin is the West Gellibrand Reservoir, began the year at full capacity and decreased to 74% by the end of June 2015 (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(1)	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	160	221	(421)	1,374
Grand Total	**1,856**	**1,856**	**160**	**221**	**(421)**	**1,374**

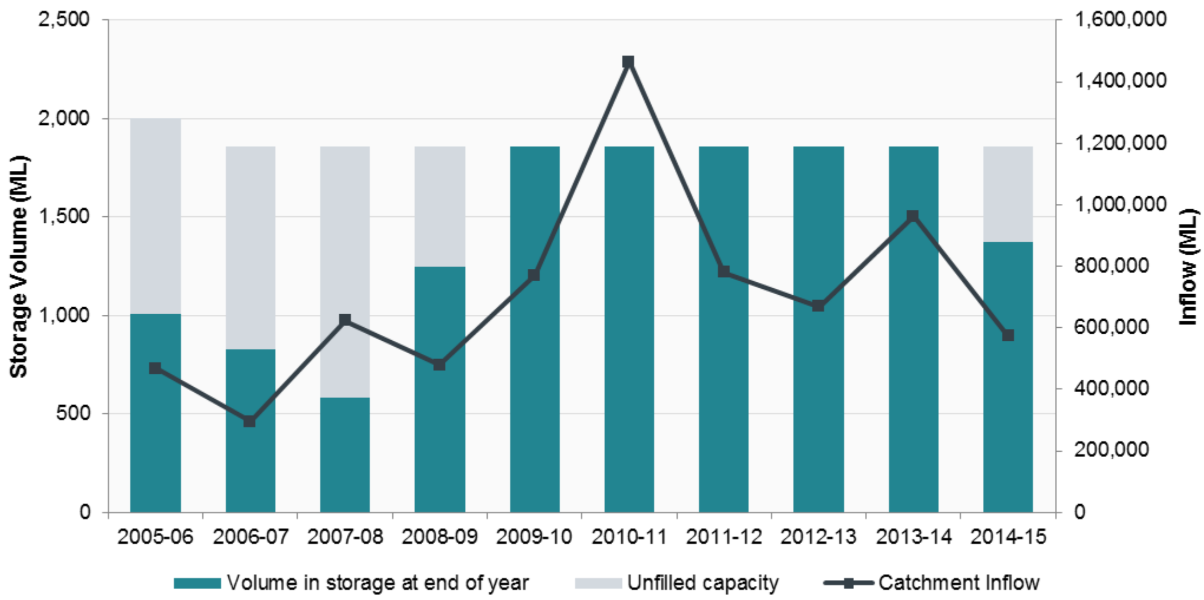
Notes:

(1) Major storgaes are greater than 1000 ML.

Catchment inflows in 2014–15 were 65% of the long-term average of 884,000 ML, compared to 109% in 2013–14 (Figure 6-44).

The amount of water flowing from the Otway Coast basin into Bass Strait decreased to 545,599 ML in 2014–15. This represented 95% of the catchment inflows into the basin, compared to 97% in 2013–14.

Figure 6-44 West Gellibrand Reservoir storage levels and catchment inflows



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 (for example, bulk entitlements granted to water corporations). 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	6,659
Total volume of water entitlements in Otway Coast basin	**26,326**

Allocation available under bulk entitlements and licences for 2014–15 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 2014–15 compared to the volume 751 ML reported in the 2013–14 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	204	113
Apollo Bay	800	0	636	164
Colac	5,400	0	3,633	1,767
Gellibrand	60	0	18	42
Lorne	510	0	393	117
Otway System	12,580	0	8,027	4,553
Take and use licences - unregulated surface water	6,659	0	691	5,968

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, 24% of wastewater was reused, more than 2013–14 (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	21	21	0%	0	0	0	21	0	0
Anglesea	290	85	26%	0	75	0	10	0	205
Apollo Bay	375	16	0%	0	1	0	15	0	359
Cobden	175	78	45%	0	78	0	0	70	27
Lorne	278	8	0%	0	0	0	8	0	270
Peterborough(4)	2	19	853%	0	19	0	0	0	(17)
Port Campbell(4)	42	63	148%	0	63	0	0	0	(21)
Simpson	18	0	0%	0	0	0	0	18	0
Timboon(4)	44	57	129%	0	57	0	0	0	(13)
Total 2014–15	**1,245**	**347**	**24%**	**0**	**293**	**0**	**54**	**88**	**810**
Total 2013–14	1,482	272	13%	0	195	0	77	1,129	81

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 throughout the Hopkins basin in 2014–15 was between 60% and 80% of the long-term average.

Catchment inflows in 2014–15 were 35% of the long-term average, less than 2013–14 which saw inflow volumes at 44% of the long-term average. The volume of water flowing from the Hopkins basin into Bass Strait represented 56% of the catchment inflows, compared to 66% in 2013–14.

No urban water use restrictions applied in the Hopkins basin in 2014–15, with all towns remaining on permanent water savings rules throughout the year.

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 salt marsh wetlands and the wetlands associated with the Merri River Estuary, depend on the Hopkins basin EWR.

In 2014–15, 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 GWMWater
- water set aside for the environment through the operation of licensed diversions in passing flow conditions, particularly for Cudgee Creek and Mt Emu Creek
- all other water in the basin not allocated for consumptive use.

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	2014–15 (ML)	2013–14 (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)	222,928	280,650
Rainfall on major storages	-	-
Treated effluent discharged back to river	0	25
Total inflows	**222,928**	**280,674**
Outflows		
Diversions		
Urban diversions	398	155
Licensed diversions from unregulated streams	2,751	1,924
Small catchment dams	64,538	64,538
Total diversions	**67,687**	**66,617**
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	125,075	183,891
Total water passed at outlet of basin	**125,075**	**183,891**
Total outflows	**222,928**	**280,674**

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.

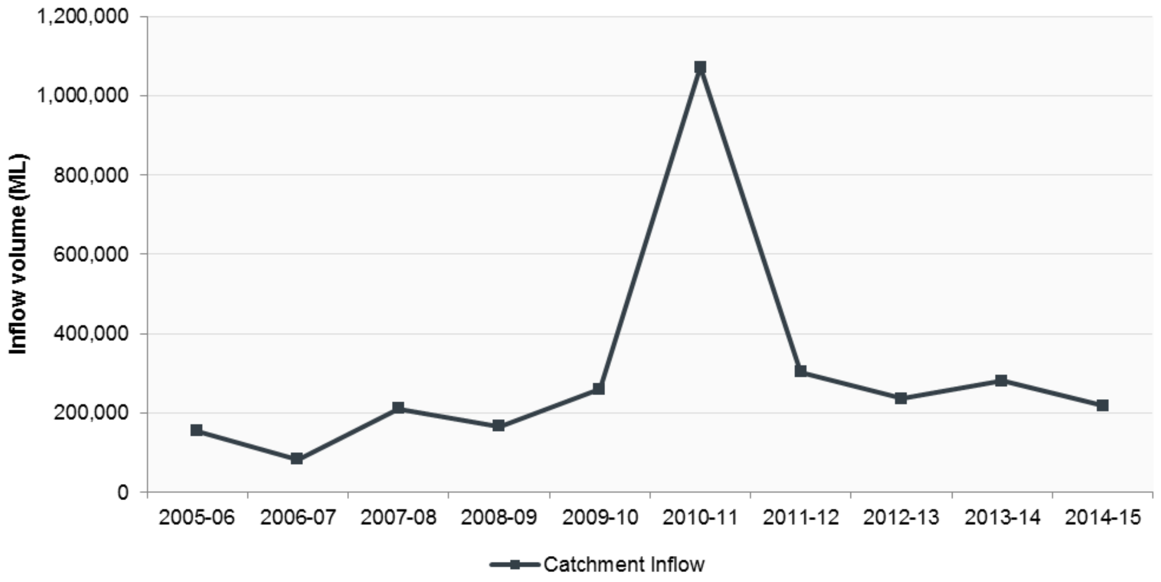
6.24.2.2 Storages and flows

Catchment inflows in 2014–15 were 34% of the long-term average (of 635,000 ML), compared to 44% in 2013–14 (Figure 6-46).

The volume of water flowing from the Hopkins basin into Bass Strait was 125,075 ML in 2014–15, which represented 56% of the catchment inflows. This is a decrease from 183,891 ML in 2013–14, which represented 66% of catchment inflows.

There are no major storages in the Hopkins basin(storages freater than 1,000 ML).

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 (for example, bulk entitlements granted to water corporations). Rights to water in the Hopkins basin are outlined in Table 6-153.

The Hopkins basin (Masons Creek) based also supplies the Willuara, Elmhurst and Buangor systems bulk entitlement. This entitlement and its use is reported in the Wimmera basin as the majority 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	210
Take and use licences - unregulated surface water	11,410
Total volume of water entitlements in the Hopkins basin	**12,039**

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-154.

The volume of water diverted from unregulated streams by licence holders in the Hopkins basin was 2,751 ML which was higher than the 2013–14 volume of 1,924 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	168	251
Skipton	210	0	0	210
Take and use licences - unregulated surface water	11,410	0	2,751	8,659

Hopkins basin

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 2014–15 increased slightly compared to 2013–14.

Table 6-156 shows the volumes of water recycled in the Hopkins basin in 2014–15.

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	553	559	99%	137	408	0	14	0	(6)
Beaufort	74	74	100%	0	74	0	0	0	0
Cardigan Village	0	0	0%	0	0	0	0	0	0
Mortlake(4)	81	99	122%	39	60	0	0	0	(18)
Skipton	0	0	0%	0	0	0	0	0	0
Terang	84	10	12%	0	10	0	0	0	74
Warrnambool	5,577	284	1%	36	0	0	248	0	5,293
Willaura	11	11	100%	11	0	0	0	0	0
Total 2014–15	**6,380**	**1,037**	**12%**	**223**	**552**	**0**	**262**	**0**	**5,343**
Total 2013–14	6,178	598	10%	188	403	0	7	25	5,555

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

Rainfall throughout the Portland Coast basin in 2014–15 was between 60% and 80% of the long-term average. Inflows in 2014–15 were 75% of the long-term average, compared to 158% in 2013–14. The amount of water flowing from the Portland Coast basin into Bass Strait represented 93% of the catchment inflows in the basin in 2014–15.

No urban water use restrictions applied in the Portland Coast basin in 2014–15, 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 2014–15, 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 6% were diverted for consumptive use, mainly from 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	2014–15(ML)	2013–14 (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)]	273,021	571,317
Rainfall on major storages	-	-
Treated effluent discharged back to river	184	238
Total inflows	**273,205**	**571,555**
Outflows		
Diversions		
Licensed diversions from unregulated streams	2	2
Small catchment dams	16,135	16,135
Total diversions	***16,137***	***16,137***
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	252,584	550,934
Total water passed at outlet of basin	***252,584***	***550,934***
Total outflows	**273,205**	**571,555**

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.

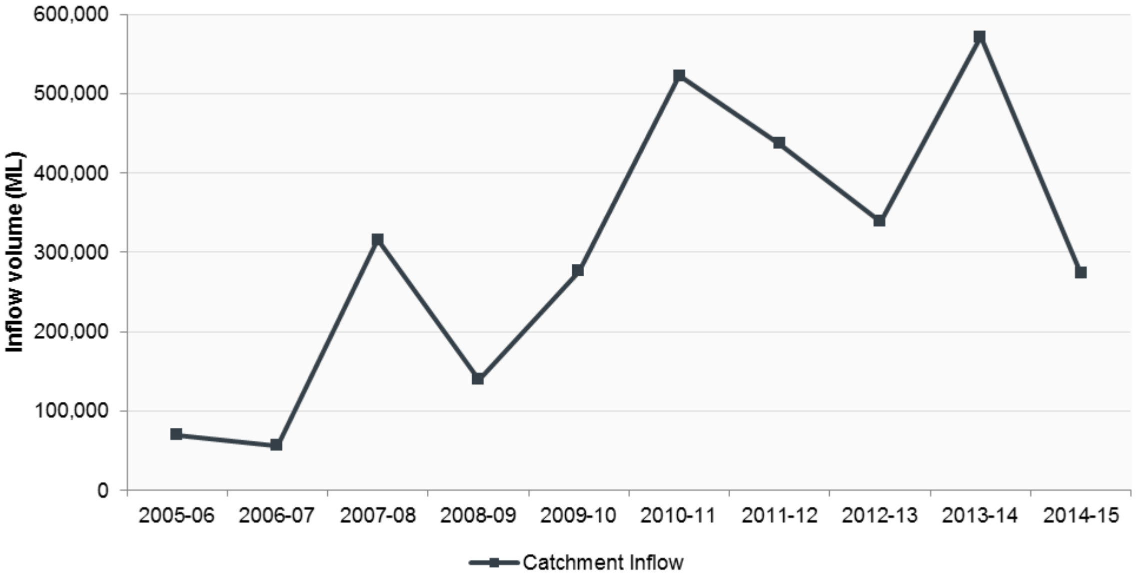
6.25.2.2 Storages and flows

There are no major storages in the Portland Coast basin.

Catchment inflows in 2014–15 were 75% of the long-term average of 361,000 ML, compared to 158% in 2013–14 (Figure 6-48).

The amount of water flowing from the Portland Coast basin into Bass Strait was 252,584 ML in 2014–15, a significant decrease from the previous year. This represents 92% 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 in Portland Coast include rights granted to individuals (take and use licences). 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 2014–15 is presented in Table 6-160. In 2014–15, out of a total licence volume of 1,079 ML, about 2 ML was diverted for use in the basin, same as the amount reported in the 2013–14 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 2014–15, 5% of the total wastewater produced in the basin was reused, including 39% of the total wastewater at the Heywood treatment plant which was used for wood lot irrigation (an increase from 22% in 2013–14).

Table 6-162 shows the volumes of water recycled in the Portland Coast basin in 2014–15.

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	330	129	39%	0	129	0	0	184	17
Port Fairy Domestic	790	0	0%	0	0	0	0	0	790
Port Fairy Industrial	182	0	0%	0	0	0	0	0	182
Portland	1,159	0	0%	0	0	0	0	0	1159
Total 2014–15	**2,461**	**129**	**5%**	**0**	**129**	**0**	**0**	**184**	**2,148**
Total 2013–14	2,779	101	4%	0	101	0	0	238	2,440

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

Most of the Glenelg basin received between 60% and 80% of long-term average rainfall. A small part of the west of the basin received more rain, with between 80% and 100% of average rainfall. Catchment inflows in the Glenelg basin in 2014–15 were approximately 36% of the long-term average, compared with 62% in 2013–14. The basin's largest water storage, Rocklands Reservoir, started the year at 24% of capacity, and finished at 17% by the end of June 2015.

All towns remained on permanent water savings rules throughout the year.

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–Glenelg 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 dependent 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* and only found in the Glenelg River basin)
- Yarra and Ewens Pygmy Perch (vulnerable under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* and threatened under the *Flora and Fauna Guarantee Act 1988*)
- Variegated Pygmy Perch (vulnerable under the *Environmental Protection and Biodiversity Conservation Act 1999*and threatened under the *Flora and Fauna Guarantee Act 1988*)
- 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 *Flora and Fauna Guarantee Act 1988* and has been nominated for listing under the *Environmental Protection and Biodiversity Conservation Act 1999*.

In 2014–15, the Glenelg 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 GWMWater and Wannon Water
- water set aside for the environment through the operation of passing flow conditions on licensed diversions, particularly Crawford River, Glenelg River, Grange Burn and Wannon River
- all other water in the basin not allocated for consumptive use.

The Glenelg basin EWR also includes the following entitlement, which is shared with the Wimmera basin:

- 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

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 21,337 ML was diverted to the Wimmera system in 2014–15.

Table 6-164 Balance of surface water in the Glenelg basin

Water account component	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	92,041	84,841
Volume in storage at end of year	62,675	92,041
Change in storage	**(29,366)**	**7,200**
Inflows		
Catchment inflow(1)	349,327	599,750
Rainfall on major storages	8,258	15,678
Treated effluent discharged back to river	131	271
Total inflows	**357,716**	**615,699**
Outflows		
Diversions		
Urban diversions	1,279	2,246
Transfers to the Wimmera basin(2)	21,337	11,878
Licensed diversions from unregulated streams	234	215
Small catchment dams	55,483	55,483
Total diversions	**78,333**	**69,822**
Losses		
Evaporation losses from major storages	18,293	31,244
Evaporation from small catchment dams	24,622	24,622
In-stream infiltration to groundwater, flows to floodplain and evaporation	40,294	54,991
Total losses	**83,209**	**110,857**
Water passed at outlet of basin		
River outflows to the ocean	225,540	427,820
Total water passed at outlet of basin	**225,540**	**427,820**
Total outflows	**387,082**	**608,499**

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, and transfer from Rocklands Reservoir via Rocklands 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 20% of capacity at the end of 2014–15. 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.

Table 6-165 Storage volumes in the Glenelg basin

Storage	Total capacity (ML)[1]	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	2,390	194	353	(234)	1,998
Konongwootong Reservoir	1,920	1,344	331	580	558	1,652
Moora Moora Reservoir	6,300	3,890	1,480	2,321	(1,859)	1,190
Rocklands Reservoir[2]	296,000	84,417	6,253	15,039	(17,797)	57,835
Total	**306,874**	**92,041**	**8,258**	**18,293**	**(19,332)**	**62,675**

Note:

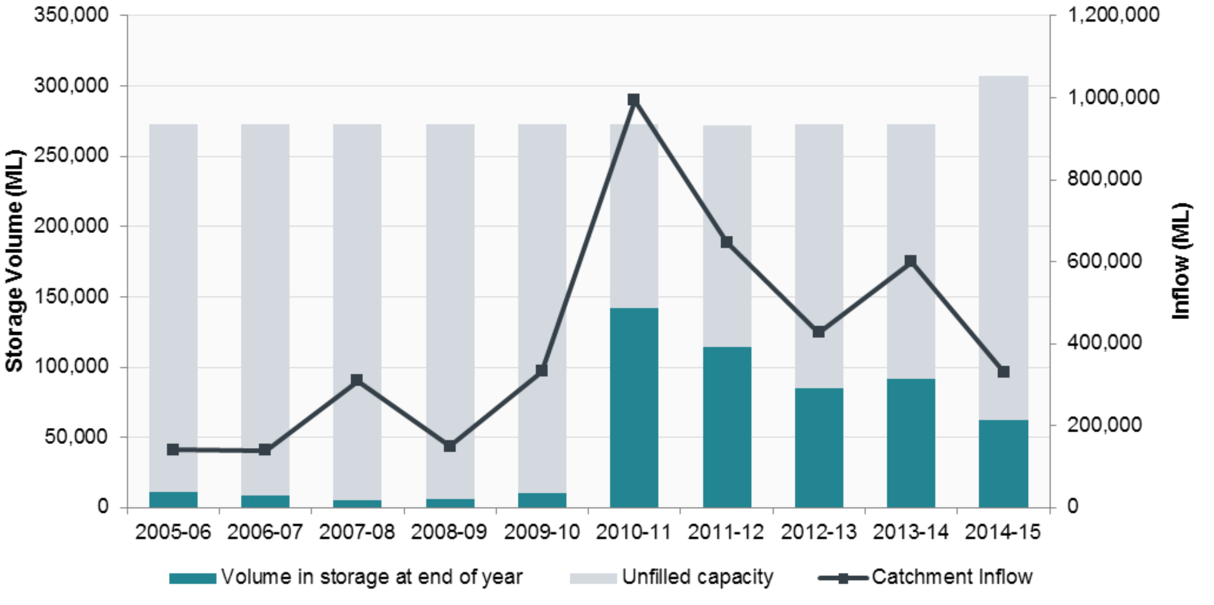
(1) Volumes provided are the maximum operating capacities of storages.

(2) The operating capacity of Rocklands Reservoir was changed during 2014–15, from 261,510 ML to 296,000 ML. The full capacity of Rocklands Reservoir is 348,300 ML.

Catchment inflows across the basin were 349,327 ML. This was 36% of the long-term average, lower than the volume of inflow in 2013–14 (Figure 6-50).

The volume of water flowing from the Glenelg basin into Bass Strait was 225,540 ML in 2014–15, a decrease from the previous year (Figure 6-50). This represented 65% of the catchment inflows into the basin, compared to 72% in 2013–14.

Figure 6-50 All major storages and catchment inflows in the Glenelg basin[1]



Note:

(1) The maximum operating capacity of Rocklands Reservoir was changed during 2014–15, from 261,510 ML to 296,000 ML. The full capacity of Rocklands Reservoir is 348,300 ML.

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 (for example, bulk entitlements granted to water corporations or environmental entitlements granted to 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–Glenelg 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.

Glenelg basin

The Wimmera-Glenelg 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	1,048
Total volume of water entitlements in Glenelg basin	**5,602**

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-167

The volume of water diverted from unregulated streams by licence holders in the Glenelg basin in 2014–15 was lower compared with the volume 348 ML reported in the 2013–14 Victorian Water Accounts.

The volume of water diverted from unregulated streams by licence holders in the Glenelg basin in 2014–15 was higher compared to the volume of 215 ML reported in the 2013–14 Victorian Water Accounts.

The *Wimmera and Glenelg Rivers Environmental Entitlement 2010* provides the VEWH with water from the Wimmera-Glenelg system headworks to provide environmental benefits in both the Wimmera and Glenelg basins. In the Glenelg basin, water available under the environmental entitlement is used to support streamflows and is not diverted out of waterways. The allocation available for use under this entitlement for 2014–15 is presented in the Wimmera basin chapter in Table 6-176.

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	99	756
Dunkeld System	170	0		170
Glenthompson	94	0	8	86
Hamilton	3,435	0	1,171	2,264
Take and use licences - unregulated surface water	1,048	0	234	814

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 2014–15 decreased compared to 2013–14, but more was recycled. In 2014–15, 86% of wastewater was recycled, compared to 29% in 2013–14.

Table 6-169 shows the volumes of water recycled in the Glenelg basin in 2014–15.

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[4]	46	60	131%	0	60	0	0	21	(35)
Coleraine[4]	18	44	247%	0	44	0	0	0	(26)
Dunkeld	26	12	44%	10	2	0	0	0	14
Hamilton	816	667	82%	118	549	0	0	109	40
Total 2014–15	**906**	**782**	**86%**	**128**	**654**	**0**	**0**	**131**	**(7)**
Total 2013–14	1,145	328	29%	50	278	0	0	271	546

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.

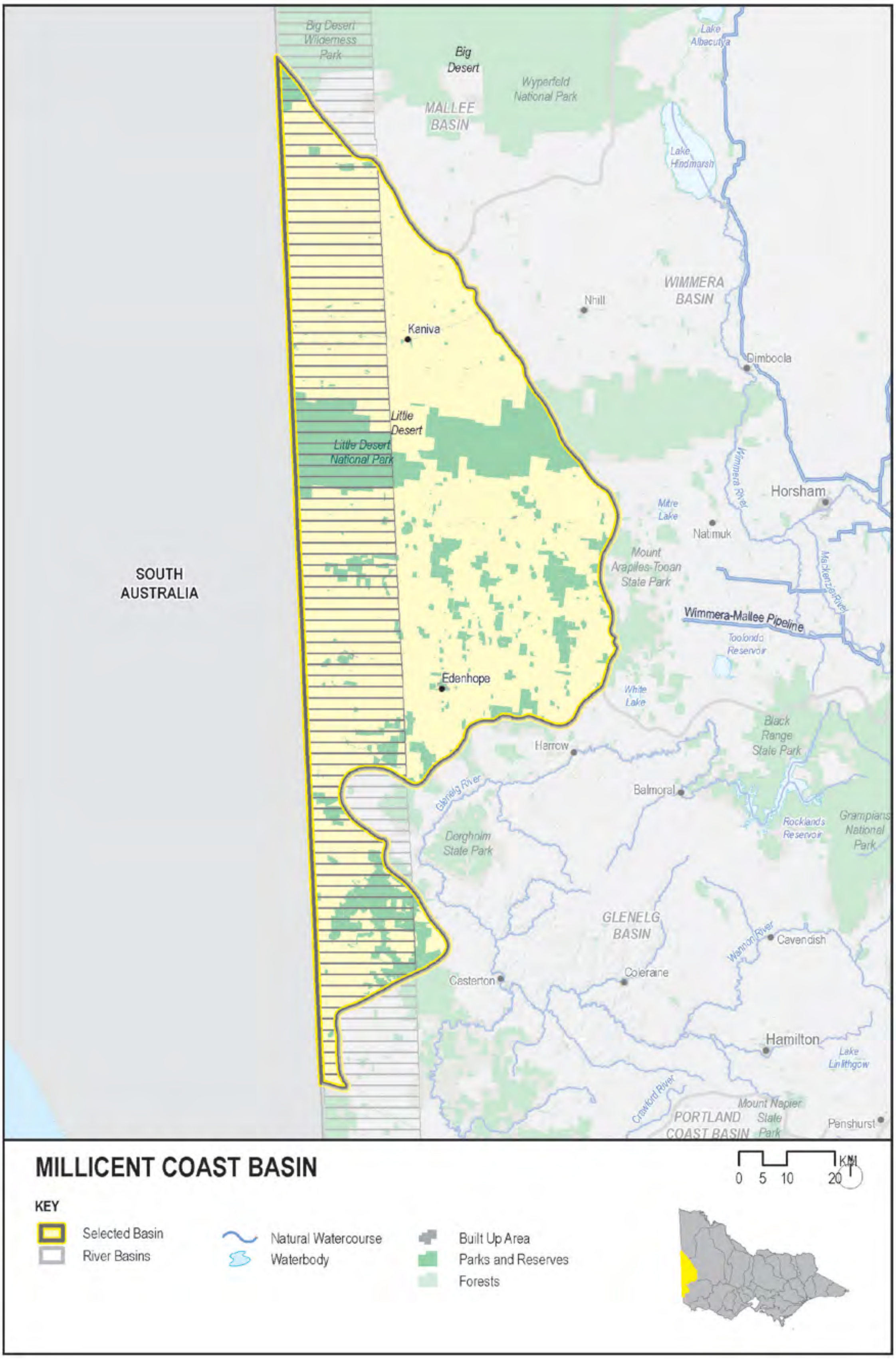
(3) 'Other' refers to a change in on-site wastewater storage or items affecting the annual water balance for recycled water that are not otherwise accounted for, such as Wannon Water holding wastewater in storage for the next year.

(4) Volume recycled greater than volume produced due to water stored on-site carried over from previous 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 2014–15, rainfall through most of the Millicent Coast basin was between 60% and 80% of the long-term average, with part of the western border of the basin receiving only 40% to 60%.

Groundwater is the main source of water supply in the Millicent Coast basin and this is covered by the West Wimmera groundwater management area. Information about groundwater licences and use in this area can be found in the West Wimmera groundwater catchment chapter 7.24.

No urban water use restrictions applied in the Millicent Coast basin in 2014–15, with all towns remaining on permanent water savings rules 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 Environmental Water Reserve (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 2014–15, 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 2014–15, 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 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	51	51	100%	51	0	0	0	0	0
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 2014–15	**51**	**51**	**100%**	**51**	**0**	**0**	**0**	**0**	**0**
Total 2013–14	88	57	65%	57	0	0	0	0	31

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 2014–15, rainfall across the Wimmera basin was generally between 60% and 80% of the long-term average, with some drier areas receiving 40% to 60% of the long-term average. In 2014–15, catchment inflows in the Wimmera basin were 13% of the long-term average, lower than the previous year, when they were 29% of the long-term average.

After beginning the year at 38% of capacity, storages in the Wimmera decreased to 30% of by the end of June 2015.

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–Glenelg 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–Glenelg 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 (*Melaleuca wimmerensis,* formerly known as *Callistemon wimmerensis*) which has recently been classified under the Victorian *Flora and Fauna Guarantee Act 1988*. This species depends on flows in the MacKenzie River for its survival and recruitment
- Lower Wimmera River, which is listed under the Heritage River Act 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 2014–15, the EWR in the Wimmera basin contained the following components:

- water set aside for the environment through the operation of passing flows released as a condition of consumptive bulk entitlements held by Grampians Wimmera Mallee Water and conditions on licensed diversions
- all other water in the basin not allocated for consumptive use.

The Wimmera basin EWR also includes the following entitlement, which is shared with the Glenelg basin:

- The Wimmera and Glenelg Rivers Environmental Entitlement 2010 comprising of 41,560 ML or high-reliability entitlement, which includes 1,000 ML or Wimmera-Mallee wetlands entitlement, held by the VEWH.

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	2014–15 (ML)	2013–14 (ML)
Major on-stream storage		
Volume in storage at start of year	126,040	128,902
Volume in storage at end of year	99,618	126,040
Change in storage	**(26,422)**	**(2,862)**
Inflows		
Catchment inflow(1)	42,143	92,907
Rainfall on major storages	14,734	22,231
Transfer from Glenelg basin	21,337	11,878
Treated effluent discharged back to river	0	0
Total inflows	**78,214**	**127,016**
Outflows		
Diversions		
Urban diversions and domestic and stock use(2)	15,557	17,785
Diversions for irrigation	0	0
Licensed diversions from unregulated streams	186	186
Environmental water diversions to wetlands	112	265
Supply to designated recreational lakes(2)	3,104	1,938
Small catchment dams	14,337	14,337
Total diversions	***33,296***	***34,511***
Losses		
Evaporation losses from major storages	35,269	49,141
Evaporation from small catchment dams	8,642	8,642
In-stream infiltration to groundwater, flows to floodplain and evaporation	14,149	20,372
Total losses	***58,060***	***78,155***
Water passed at outlet of basin		
River outflows to Lake Buloke	0	14
River outflows to Lake Hindmarsh (measured at Tarranyurk)	13,280	17,197
Total water passed at outlet of basin	***13,280***	***17,212***
Total outflows	**104,636**	**129,878**

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) In previous editions of the Victorian Water Accounts, supply to recreational lakes has been recorded combined with urban diversions. In the 2014–15 report, the supply to recreational lakes has been separated for the first time. The 2013–14 figure has also been supplied for comparison, and results in a different volume of urban diversions for 2013–14 than was reported in the V*ictorian Water Accounts 2013–2014*.

6.28.2.2 Storages and flows

Levels for all major storages in the basin started the year at 126,040 ML and finished at 99,618 ML (30% of capacity) at the end of June 2015 (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)
Storages						
Dock Lake(1)	4,420	0	0	0	0	0
Fyans Lake	18,460	15,712	1,249	4,224	(360)	12,377
Green Lake	5,350	3,010	1,058	1,607	(413)	2,048
Lake Bellfield	78,560	58,252	2,500	2,976	(6,608)	51,168
Lake Lonsdale(2)	53,300	7,370	1,673	7,726	(984)	333
Pine Lake(1)	62,000	0	0	0	0	0
Taylors Lake(3)	27,060	9,690	743	3,323	(817)	6,294
Toolondo Reservoir(4)	46,215	15,556	2,883	8,347	(713)	9,378
Wartook Reservoir	29,300	16,450	4,628	7,067	4,009	18,020
Total storages	**324,665**	**126,040**	**14,734**	**35,269**	**(5,887)**	**99,618**

Notes:

(1) Dock Lake and Pine Lake are no longer operational storages and are only used in accordance with the Storage Management Rules for flood mitigation purposes. Batyo Lake has been removed from this list as it is no longer an operational storage.

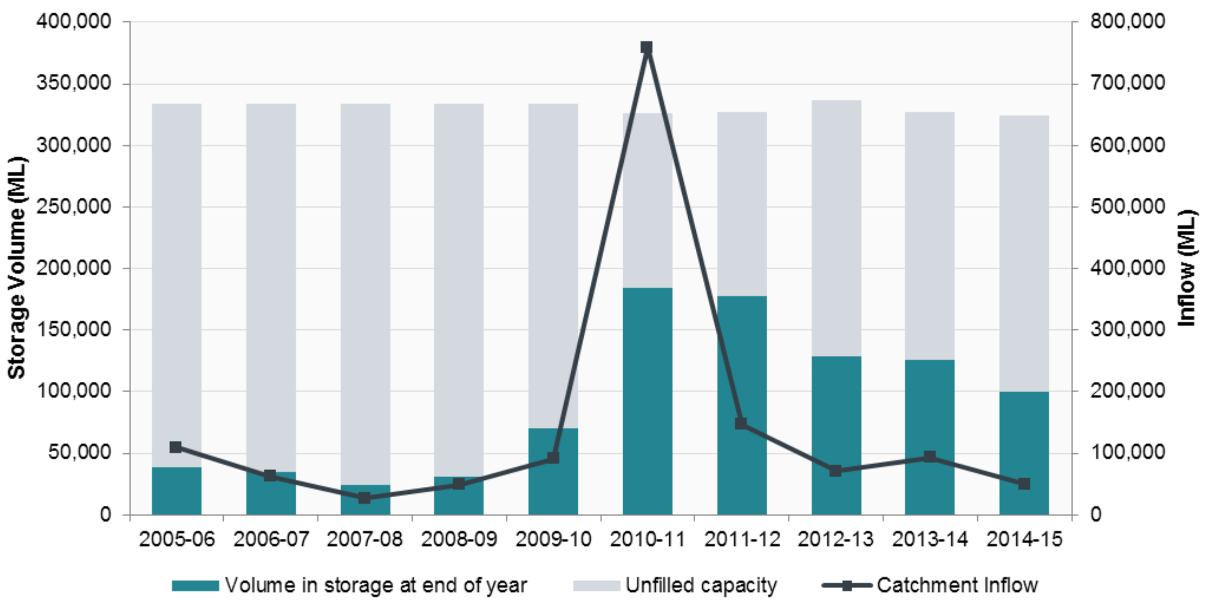
(2) Lake Lonsdale's full capacity of 65,480 ML has been reported in previous editions of the Victorian Water Accounts. The stated volume of 53,300 is the maximum operating capacity.

(3) Reliable information for rainfall and evaporation is not available for Pine Lake and Taylors Lake.

(4) Toolondo Reservoir's full capacity of 92,430 ML has been reported in previous editions of the Victorian Water Accounts. The stated volume of 46,215 ML is the maximum operating capacity.

Catchment inflows were 13% of the long-term average of 316,400 ML. This was lower compared to 2013–14, when inflows were 29% of the long-term average (Figure 6-53). The volume of water flowing from the Wimmera basin into the terminal lakes in 2014–15 was 13,280 ML.

Figure 6-53 All major storages and catchment inflows in the Wimmera basin



Note:

(1) In previous editions of the Victorian Water Accounts, the full capacities of Lake Lonsdale (65,480 ML) and Toolondo Reservoir (92430 ML) have been reported. The *Victorian Water Accounts 2014–2015* uses the operating capacities of these reservoirs.

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 (for example, water allowances and take and use licences) and rights granted to authorities (for example, bulk entitlements granted to water corporations or environmental entitlements granted to the 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-Glenelg 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 - GWMWater) Conversion Order 2012(1)	
Urban commitments - GWMWater	408
Bulk Entitlement (Willaura system - Wannon Water) Conversion Order 2012	58
Sub-total: Bulk Entitlement (Willaura, Elmhurst and Buangor systems - GWMWater) Conversion Order 2012	**466**
Bulk Entitlement (Wimmera and Glenelg Rivers - GWMWater) Conversion Order 2010(2)	
Water allowances	5,783
Urban commitments - GWMWater	26,937
Supply by agreements - Pipeline	12,000
Supply by agreement - Commonwealth Environmental Water Holder	28,000
Glenelg compensation flow	3,300
Recreation	3,090
Pipeline 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
Sub-total: Bulk Entitlement (Wimmera and Glenelg Rivers - GWMWater) Conversion Order 2010	**126,050**
Take and use licences - unregulated surface water	**2,239**
Total volume of water entitlements in the Wimmera basin	**128,815**

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-Glenelg system headworks to supply its own customers, and also Coliban Water, Wannon Water, VEWH and CEWH.

The *Wimmera and Glenelg Rivers Environmental Entitlement 2010* provides the VEWH with up to 1,000 ML for wetlands supplied from the Wimmera–Mallee Pipeline each year. It supplies wetlands throughout the region that historically to receive water from the channel system before it was decommissioned. In 2014–15, 112 ML of water was delivered to Roselyn Wetland and Barbers Swamp, which are 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 2014–15 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 2014–15; 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	0	60	0	0	60	-
Willaura, Elmhurst and Buangor systems - GWMWater						
Urban commitments - GWMWater	-	408	0	228	180	-
Willaura system - Wannon Water	-	58	0	25	33	-
Diversion: Willaura, Elmhurst and Buangor systems - GWMWater				**253**		
Wimmera and Glenelg Rivers - GWMWater						
Water allowances	0	5,783	36	1,891	3,928	0
Urban commitments - GWMWater	81,602	15,704	(2,911)	11,895	13,937	68,562
Supply by agreements – Pipeline(1)	24,257	5,772	0	5,025	3,751	21,253
Supply by agreement - CEWH	0	0	0	0	0	0
Glenelg compensation flow	109	50	0	50	16	92
Recreation(2)	229	0	2,875	3,104	0	0
Pipeline loss provision	5,687	2,960	0	1,172	1,086	6,389
Wimmera and Glenelg Rivers – Coliban Water	297	144	0	223	33	185
Wimmera and Glenelg Rivers - Wannon Water	4,878	1,020	0	47	878	4,972
Wimmera and Glenelg Rivers Environmental Entitlement(3)	25,838	19,509	0	33,720	1,744	9,883
Diversion: Wimmera and Glenelg Rivers(4)				**23,519**		
Take and use licences - unregulated surface water	-	2,239	0	186	260	-

Notes:

(1) 5000 ML use under this entitlement was supplied to Toolondo reservoir.

(2) In 2014–15, GWMWater traded holdings of carryover water allocation to supply the 10 nominated recreation lakes and weir pools under this entitlement.

(3) Water use of 33,608 ML reported reflects environmental in-stream use, 112 ML of the use reported here was diverted to off-stream wetlands. 33,608 ML is not included in the water balance in Table 6.173 as it does not reflect an actual diversion from the waterway. Unused water is available to carryover in this system, please refer to Chapter 4, Table 4-1.

(4) 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, excluding the environmental 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 2014–15.

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	0	0	0%	0	0	0	0	0	0
Donald	78	78	100%	0	78	0	0	0	0
Halls Gap	7	7	100%	7	0	0	0	0	0
Hopetoun	0	0	0%	0	0	0	0	0	0
Horsham	534	534	100%	108	426	0	0	0	0
Jeparit	0	0	0%	0	0	0	0	0	0
Minyip	0	0	0%	0	0	0	0	0	0
Murtoa	40	40	100%	0	40	0	0	0	0
Natimuk	0	0	0%	0	0	0	0	0	0
Nhill	115	115	100%	0	115	0	0	0	0
Ouyen	0	0	0%	0	0	0	0	0	0
Rainbow	0	0	0%	0	0	0	0	0	0
Stawell	434	434	100%	205	229	0	0	0	0
Warracknabeal	178	178	100%	161	17	0	0	0	0
Wycheproof	58	58	100%	0	58	0	0	0	0
Total 2014–15	**1,475**	**1,475**	**100%**	**481**	**994**	**0**	**0**	**0**	**0**
Total 2013–14	2,054	1,800	88%	476	1,324	0	0	0	254

Notes:

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

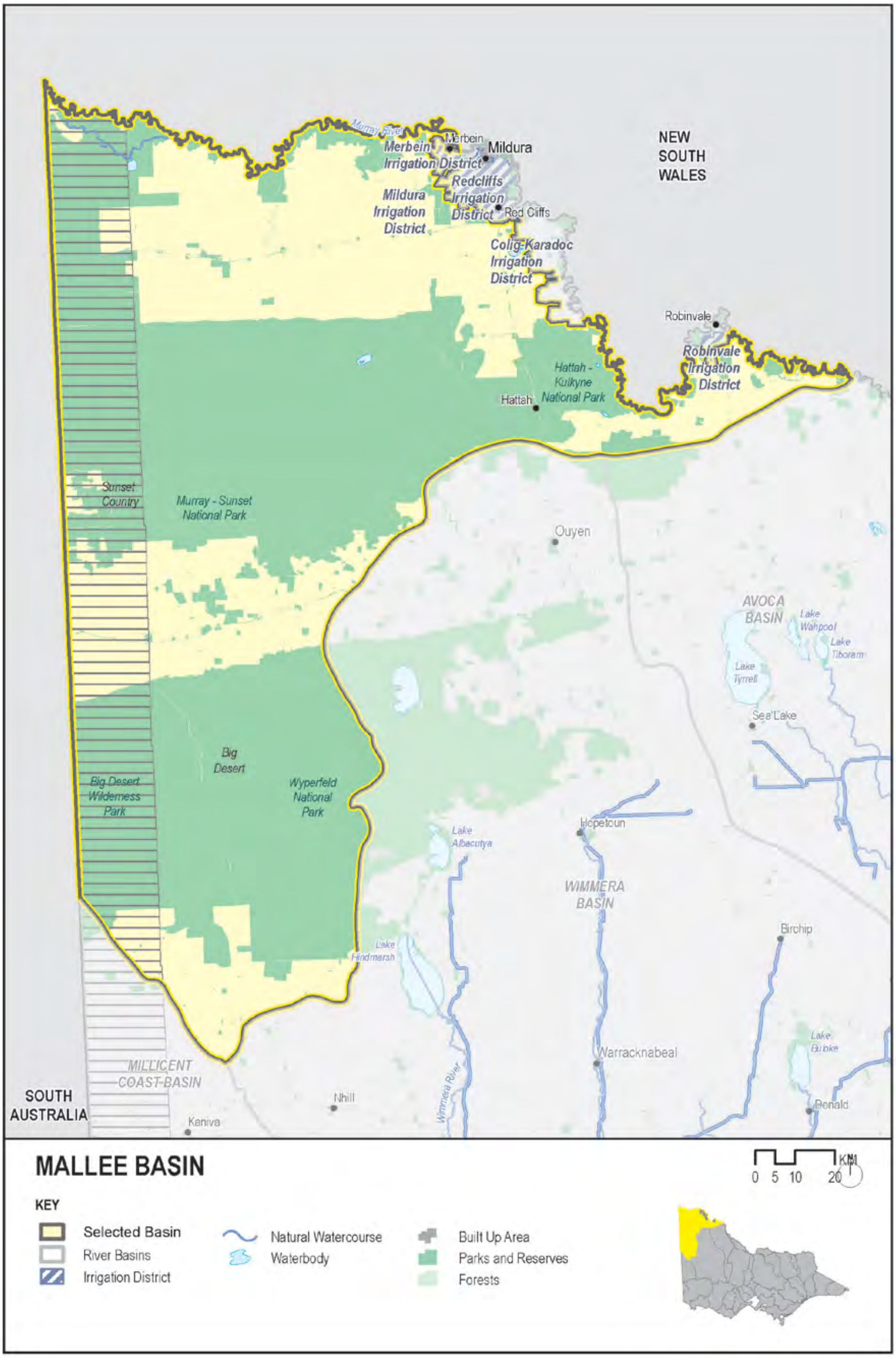
(2) Percentage recycled excludes ‘within process’ which refers to water reused in sewage treatment processes, for example back-flushing of filters. This value is not included in the total percentage recycled, consistent with its treatment in the ESC’s performance report.

(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.

6.29 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 2014–15, most of the Mallee basin received between 60% and 80% of long-term average rainfall, with a small part of its north east receiving between 80% and 100%.

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 2014–15, with all towns remaining on permanent water savings 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 2014–15 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-Glenelg wetlands entitlement. Some wetlands in the Mallee source water from VEWH bulk entitlements in the Wimmera and Glenelg, via the Wimmera-Mallee Pipeline.

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 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 2014–15 was between 40% and 80% of the long-term average. The north of the basin was drier, receiving only 40% to 60% of average rainfall, compared to 60% top 80% in the south. Catchment inflows were 16.5% of the long-term average, slightly lower than the previous year. No outflows into the terminal lakes in the north of the basin were recorded in 2014–15.

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. All 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 similar to use 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 2014–15 the Environmental Water Reserve 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. Urban diversion and licensed diversion volumes were much lower than in 2013–14, but represent a small proportion of the total water consumption in the basin. Volumes recorded for surface water availability and usage in 2014–15 remained similar to 2013–14 (Table 6-181).

Table 6-181 Balance of surface water in the Avoca basin

Water account component	2014–15 (ML)	2013–14 (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)	22,507	24,253
Rainfall on major storages	-	-
Treated wastewater discharged back to river	-	-
Total inflows	**22,507**	**24,253**
Outflows		
Diversions		
Urban diversions	33	94
Licensed diversions from unregulated streams	9	18
Small catchment dams	12,693	12,693
Total diversions	***12,735***	***12,804***
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(2)	n/a	1,655
Total losses	***9,772***	***11,427***
Water passed at outlet of basin		
Avoca River flow at Sandhill Lake Road (outflow to terminal lakes)	0	22
Avoca River overflow from the terminal lakes to the Kerang Lakes	0	0
Total water passed at outlet of basin	***0***	***22***
Total outflows	**22,507**	**24,253**

Notes:

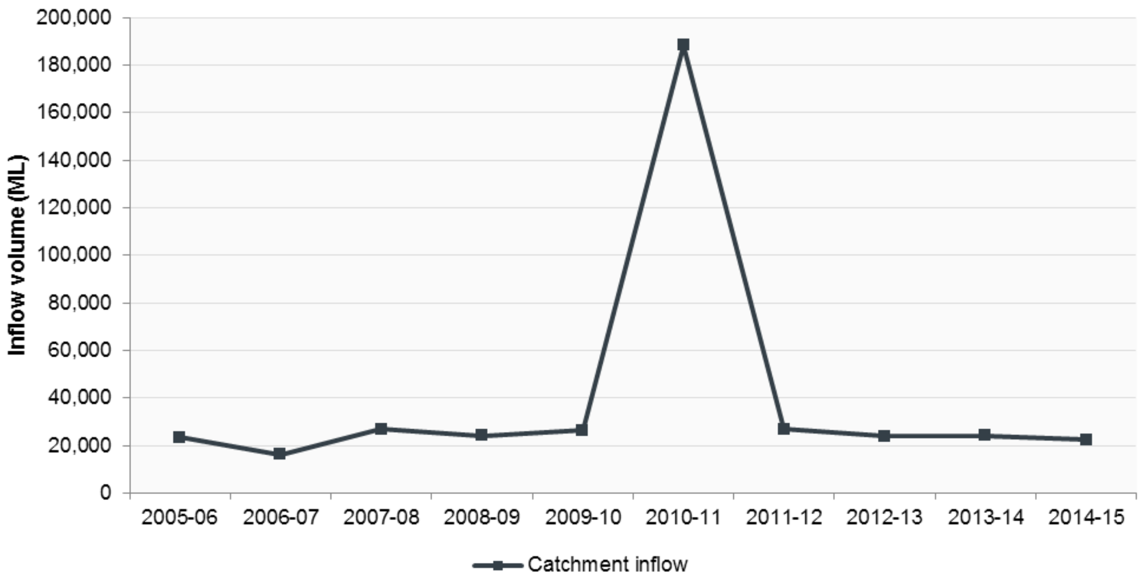
(1) Catchment inflow is the balancing item in this water balance. It is the difference between the total outflows and the known inflows.

(2) In-stream infiltration not available due to poor quality water flow data.

6.30.2.2 Storages and flows

In 2014–15, the catchment inflows were 16.5% of the long-term average of 136,200 ML. This is lower than the previous year's inflow (Figure 6-56). No water flowed into the terminal lakes (Lake Bael Bael and The Marsh), compared to 22 ML in the previous year. There are no major storages in the 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 (for example, bulk entitlements granted to water corporations or environmental entitlements granted to 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	2,689
Total volume of water entitlements in the Avoca basin	**2,967**

Allocation available under bulk entitlements and licences for 2014–15 is presented in Table 6-183. There were no diversions for irrigation in 2014–15; 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	12	13
Avoca	233	0	21	212
Redbank	20	0	0	20
Take and use licences - unregulated surface water	2,689	0	9	2,680

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 2014–15 was slightly lower than that produced in 2013–14. The proportion of wastewater recycled in the Avoca basin treatment plants increased to 100% in 2014–15. 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 2014–15.

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	21	21	100%	0	21	0	0	0	0
Charlton	0	0	0%	0	0	0	0	0	0
Sea Lake	0	0	0%	0	0	0	0	0	0
St Arnaud	136	136	100%	38	98	0	0	0	0
Total 2014–15	**157**	**157**	**100%**	**38**	**119**	**0**	**0**	**0**	**0**
Total 2013–14	194	159	82%	43	116	0	0	0	35

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 methodology 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 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 2014–2015 presents the groundwater accounts by these catchment boundaries to reflect Victoria's current approach to groundwater management.

The groundwater catchment accounts are compiled from information obtained from: 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

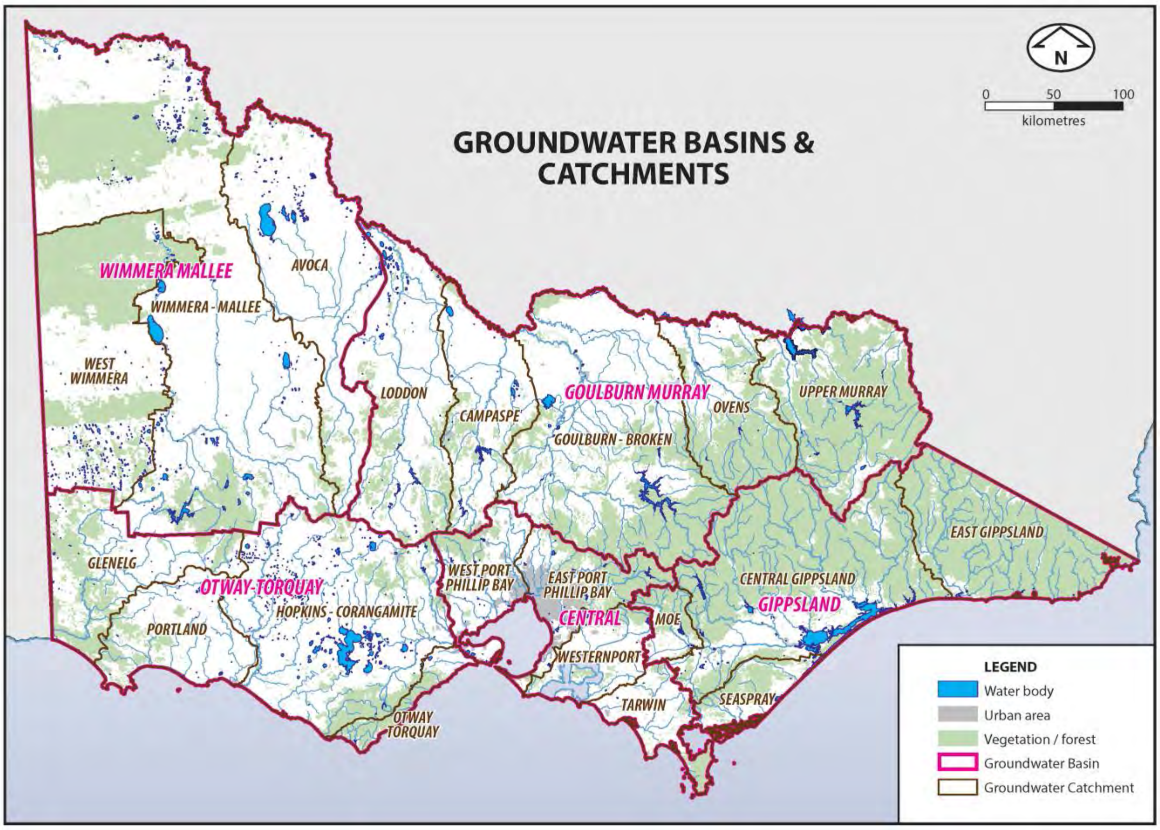
Victoria's groundwater resources are contained in five major groundwater management basins and each groundwater basin has several groundwater catchments (Figure 7-1):

- **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 WSPA or a 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 east, the Central and Otway-Torquay basins 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 Quarternary 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. These water resources are generally low yielding.

In the north, the plain of the Goulburn–Murray basin gradually thickens into several geological layers:

- The Upper Tertiary Quarternary 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 Nurmurkah. Along the Murray the UTQA is accompanied by the Calvil formation Upper Tertiary Aquifer fluvial, containing fluvial sand, gravel and clay. These are major water resources in the region.
- 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. These are major water resources in the region.
- Cretaceous Permian sediments made of fractured rock, sand and minor coal. They appear from Shepparton to parts of the north near Nathalia and Nurmurkah.
- 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 lies within 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 Upper Murray and Kiwea GMAs, for which plans were approved in June 2014, a small part of the Upper Ovens WSPA, and unincorporated areas. Groundwater resources supply licences, domestic and stock use and also the town of Dinner Plain. The Mullindolingong GMA was revoked in June 2014, and was replaced by the Kiewa GMA.

The groundwater level trend in Upper Ovens WSPA was categorised as stable throughout 2014–15, and there was insufficient information to obtain a trend for the Kiewa and Upper Murray GMAs.

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

WSPA/GMA	GMA/WSPA aquifer depth limits (m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Kiewa GMA	All depths	2,807	74	0
Upper Murray GMA	All depths	3,347	449	
Unincorporated area	-	218	79	39
Total		**6,422**	**602**	**39**

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 the 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

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Kiewa GMA	288	576
Upper Murray GMA	208	416
Unincorporated area	0	0
Total	496	992

Groundwater is used to provide urban water supply to the township of Dinner Plains. The licensed entitlements and metered use for these supplies are presented in Table 7-3.

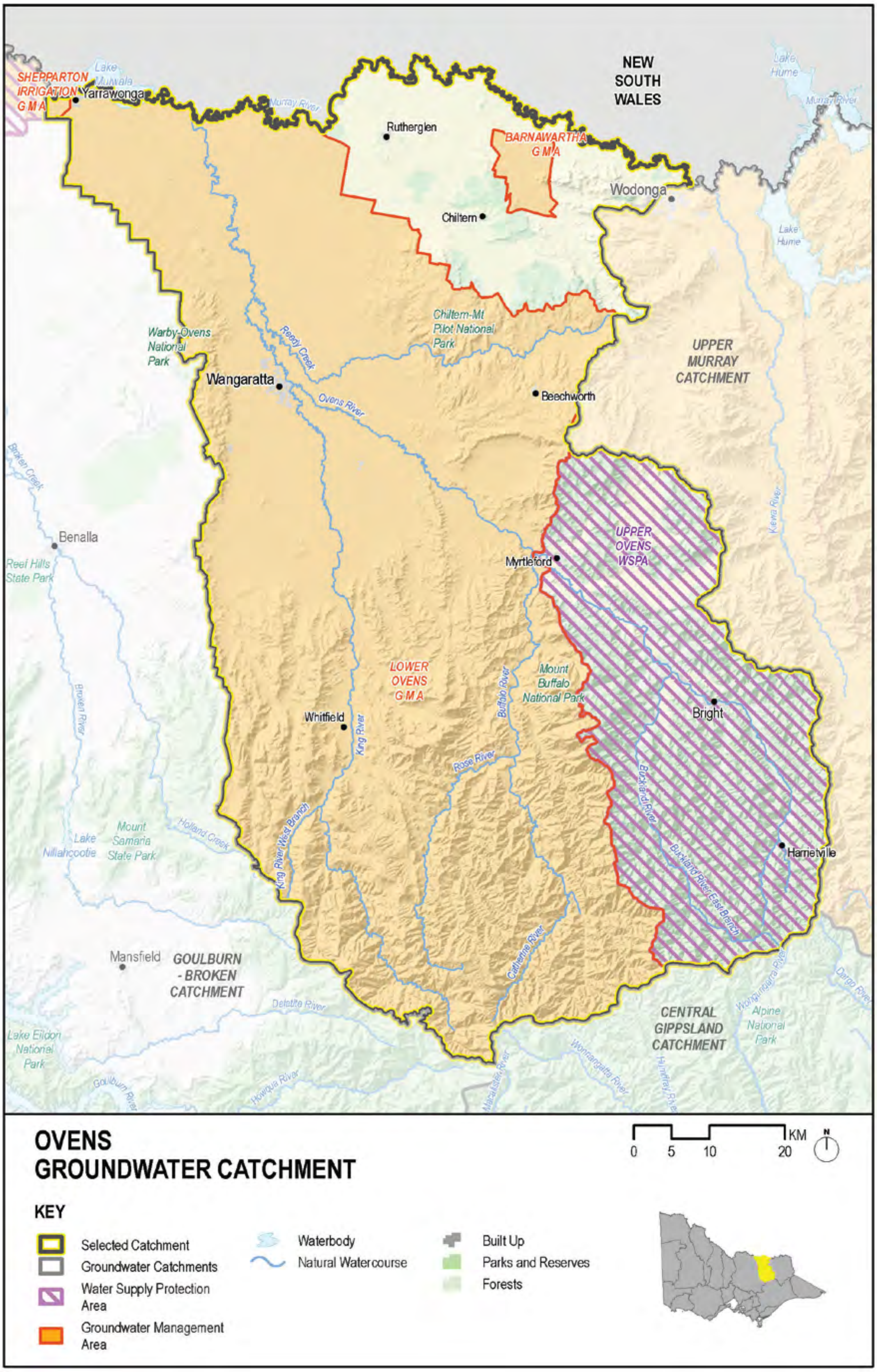
Table 7-3 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Dinner Plains	120	0	39
Total	**120**	**0**	**39**

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 unincorporated areas. 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.

In 2014–15, 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 in the catchment was similar in 2014–15 compared to 2013–14.

Table 7-4 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Barnawartha GMA	All depths	375	0	39
Lower Ovens GMA	All depths	20,003	4,722	5,104
Upper Ovens WSPA	All depths	3,693	674	743
Unincorporated area	-	2,538	1,153	998
Total		**26,609**	**6,549**	**6,884**

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 the 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

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Barnawartha GMA	22	44
Lower Ovens GMA	1572	3144
Shepparton Irrigation GMA	1	2
Upper Ovens WSPA	271	542
Unincorporated area	121	242
Total	1,987	3,974

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 2014–15, 75 ML was available for use in Bright. The volume of licenced entitlements and metered use for these groundwater supplies are provided in Table 7-6.

In 2014–15, no groundwater was supplied to the towns of Barnawartha, Chiltern, Moyhu, Myrtleford and Springhurst. Urban groundwater supply to Wangaratta in 2014–15 was roughly half of the volume supplied in 2013–14.

Table 7-6 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Barnawartha	293	0	0
Bright[(1)]	75	27	75
Chiltern	25	0	0
Moyhu	15	0	0
Myrtleford	75	0	0
Springhurst	20	0	0
Wangaratta	665	46	100
Total	**1,168**	**73**	**175**

Notes:
(1) A temporary trade of 75 ML was made from the Myrtleford take and use licence to the Bright take and use licence 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 surface water 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. Goulburn–Murray Water 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 Shepparton Irrigation GMA (which also extends into the Campaspe catchment), Strathbogie GMA, Upper Goulburn GMA, Katunga WSPA and unincorporated areas. The management plan for the Shepparton Irrigation GMA was approved on 3 June 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.

In 2014–15, the groundwater level trends in the Mid Goulburn and Shepparton Irrigation GMAs and Katunga WSPA are categorised as rising, while insufficient information was available for the Strathbogie and Upper Goulburn GMAs.

7.6.2 Groundwater entitlements and use

Licenced groundwater entitlements and use from GMUs are presented in Table 7-7. Extractions from the Katunga WSPA are limited to 70% of licensed entitlement volume in 2014–15.

Groundwater use was around 50% higher in 2014–15 than in 2013–14, with the largest increase in extraction in the Shepparton Irrigation GMA.

Table 7-7 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Mid Goulburn GMA	Zone 1070: >25 Zone 1071: All depths	12,470	2,682	2,989
Shepparton Irrigation GMA(1)	≤ 25	177,642	64,170	34,581
Strathbogie GMA	?	1,487	169	135
Upper Goulburn GMA	?	6,076	424	699
Katunga WSPA	>25	60,459	26,598	25,123
Unincorporated areas	-	5,800	3,273	873
Total		**263,934**	**97,316**	**64,400**

Notes:

(1) The management plan for the Shepparton Irrigation GMA was approved on 3 June 2015. The values for the 2013–14 year include the Shepparton WSPA, revoked in February 2014, and the time under interim arrangements before the approval of the new GMA.

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 the use from these bores is reported in the licensed volume in Table 7-7.

Table 7-8 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Mid Goulburn GMA	160	320
Shepparton Irrigation GMA(1)	1,213	2,426
Strathbogie GMA	267	534
Upper Goulburn GMA	508	1,016
Katunga WSPA	737	1,474
Unincorporated areas	946	1,892
Total	3,831	7,662

Notes:

(1) The management plan for the Shepparton Irrigation GMA was approved on 3 June 2015. The values for the 2013–14 year include the Shepparton WSPA, revoked in February 2014, and the time under interim arrangements before the approval of the new GMA.

The licenced entitlements and metered use for these supplies are presented in Table 7-9. Groundwater use for Goorambat and Katunga was almost the same in 2014–15 compared to 2013–14.

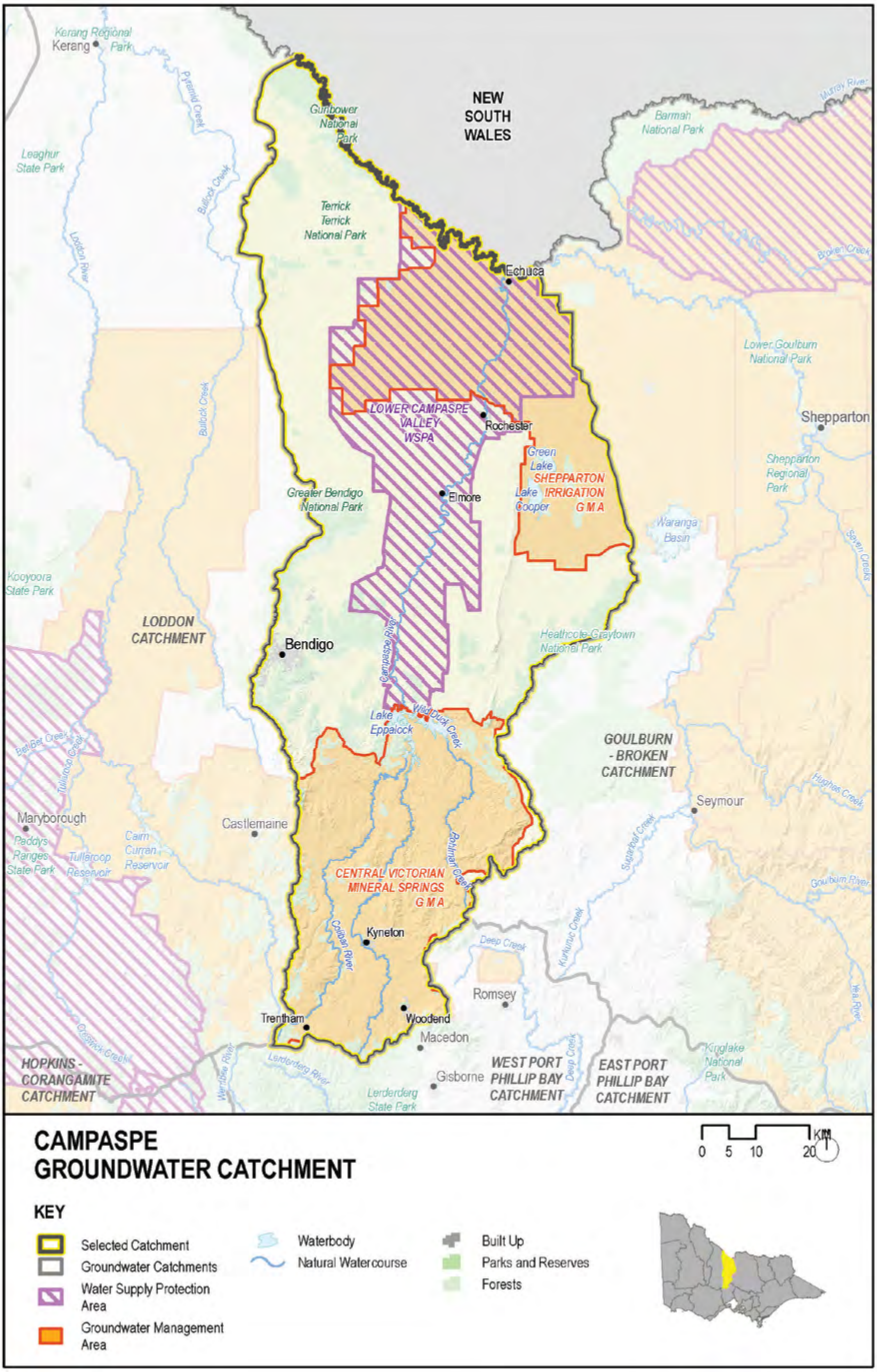
Table 7-9 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Goorambat	24	11	11
Katunga	110	42	44
Strathmerton	730	0	0
Total	**864**	**53**	**55**

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 Valley WSPA, part of the Shepparton Irrigation GMA (which extends into the Goulburn-Broken catchment), part of the Central Victorian Mineral Springs GMA (which extends into the Loddon catchment), and unincorporated areas. 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 management plan for the Shepparton Irrigation GMA was approved on 3 June 2015.

In 2014–15, the groundwater level trend in the Lower Campaspe Valley WSPA was categorised as rising to stable, while insufficient observation bores were available to determine a trend for Central Victorian Mineral Springs GMA. The trend in Shepparton Irrigation GMA was rising.

7.7.2 Groundwater entitlements and use

A summary of the licenced entitlements and use from GMUs within the Campaspe catchment, excluding domestic and stock use, is presented in Table 7-10. Groundwater use was more than 50% higher in 2014–15 compared to 2013–14, with increases in extraction in all GMUs except for the Central Victorian Mineral Springs GMA. .

Table 7-10 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Central Victorian Mineral Springs GMA		6,024	0	288
Lower Campaspe Valley WSPA	All depths	55,875	36,057	26,534
Shepparton Irrigation GMA(1)	≤25	17,143	7,886	929
Unincorporated areas	-	4,595	1,746	499
Total		**83,637**	**45,689**	**28,250**

Notes:

(1) The management plan for the Shepparton Irrigation GMA was approved on 3 June 2015. The values for the 2013–14 year include the Shepparton WSPA, revoked in February 2014, and the time under interim arrangements before the approval of the new GMA.

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 the 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

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Central Victorian Mineral Springs GMA	981	1,962
Lower Campaspe Valley WSPA	514	1,028
Shepparton Irrigation GMA(1)	131	262
Unincorporated areas	254	508
Total	1,880	3,760

Notes:

(2) The management plan for the Shepparton Irrigation GMA was approved on 3 June 2015. The values for the 2013–14 year include the Shepparton WSPA, revoked in February 2014, and the time under interim arrangements before the approval of the new GMA.

In the Campaspe catchment, groundwater is an option for urban water supply to the townships of Elmore and Trentham. Urban groundwater use in the catchment was almost the same in 2014–15 compared to 2013–14. The licensed entitlements and metered use for this supply are provided in Table 7-12.

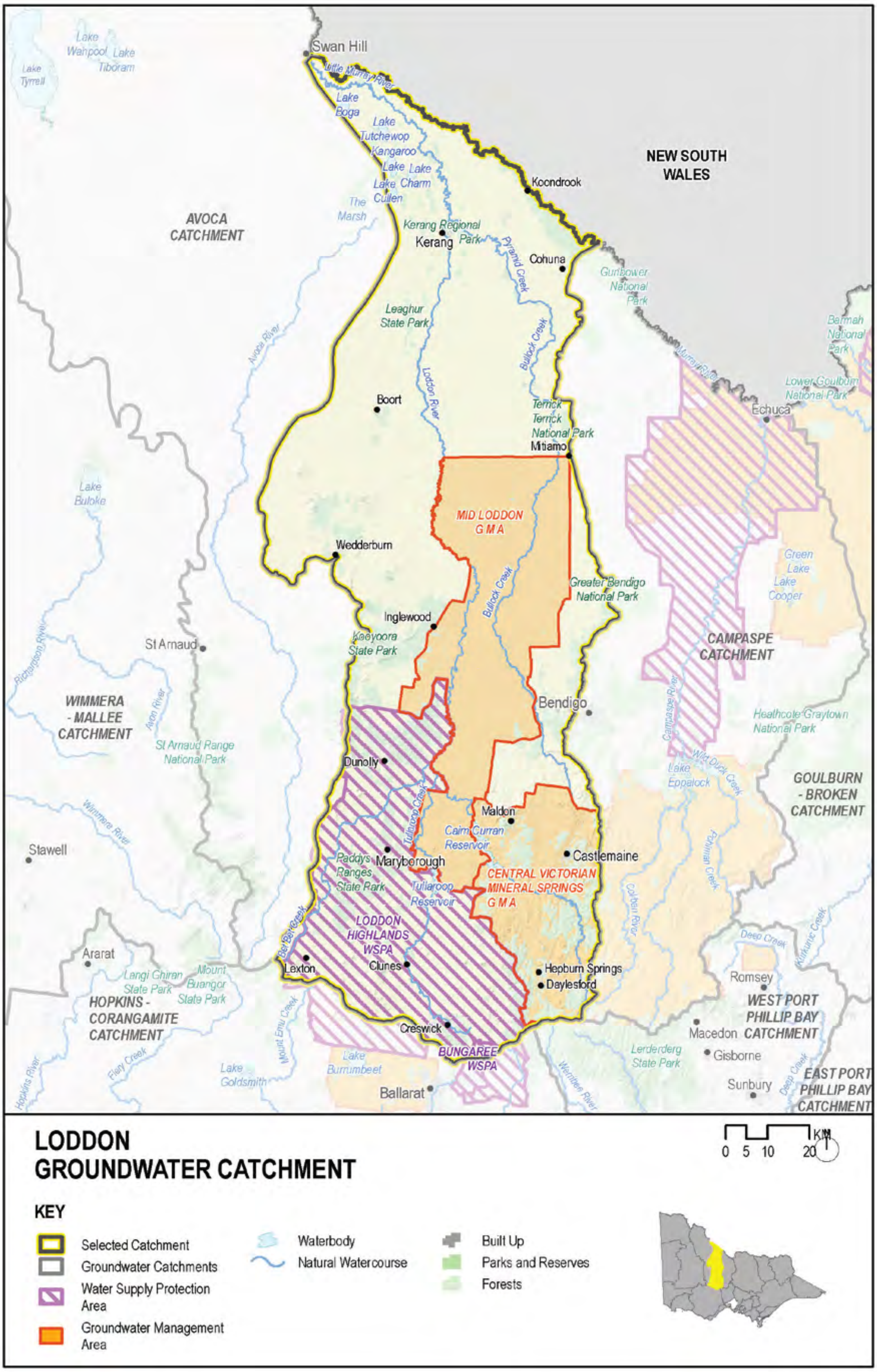
Table 7-12 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Elmore	284	122	124
Trentham	48	20	20
Total	**332**	**142**	**144**

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, most of Loddon Highlands WSPA (which extends into the Hopkins-Corangamite catchment), part of the Central Victorian Mineral Springs GMA (which extends into the Campaspe catchment), and parts of the unincorporated areas. Groundwater resources supply licences, domestic and stock use and also the six townships in the area.

The groundwater level trend in 2014–15 is categorised as rising for the Mid Loddon GMA and Loddon Highlands WSPA, and there is insufficient information to determine a trend in the Central Victorian Mineral Springs GMA.

7.8.2 Groundwater entitlements and use

Licenced groundwater entitlements and use from GMUs are presented in Table 7-13. Groundwater use in the catchment was around 30% higher in 2014–15 than it was in the previous year.

Table 7-13 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Central Victorian Mineral Springs GMA		2,712	395	176
Mid Loddon GMA	All depths	33,831	17,165	12,654
Loddon Highlands WSPA	All depths	20,691	6,904	6,229
Unincorporated area	-	4,819	339	34
Total		**62,053**	**24,803**	**19,093**

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 the 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

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Central Victorian Mineral Springs GMA	519	1,038
Mid Loddon GMA	326	652
Bungaree WSPA[1]	10	15
Loddon Highlands WSPA	528	1,056
Unincorporated area	101	202
Total	1,484	2,963

Notes:
(1) 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 only around 25% of the licensed volume was used in 2014–15, and even less in the previous year. The licensed entitlements and metered use for urban groundwater supplies in the Loddon catchment are provided in Table 7-15.

Table 7-15 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Clunes	353	209	189
Daylesford	273	0	1
Forest Hill	350	165	159
Learmonth	100	46	48
Maryborough	1,071	122	29
Waubra	70	30	29
Total	**2,217**	**572**	**455**

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.

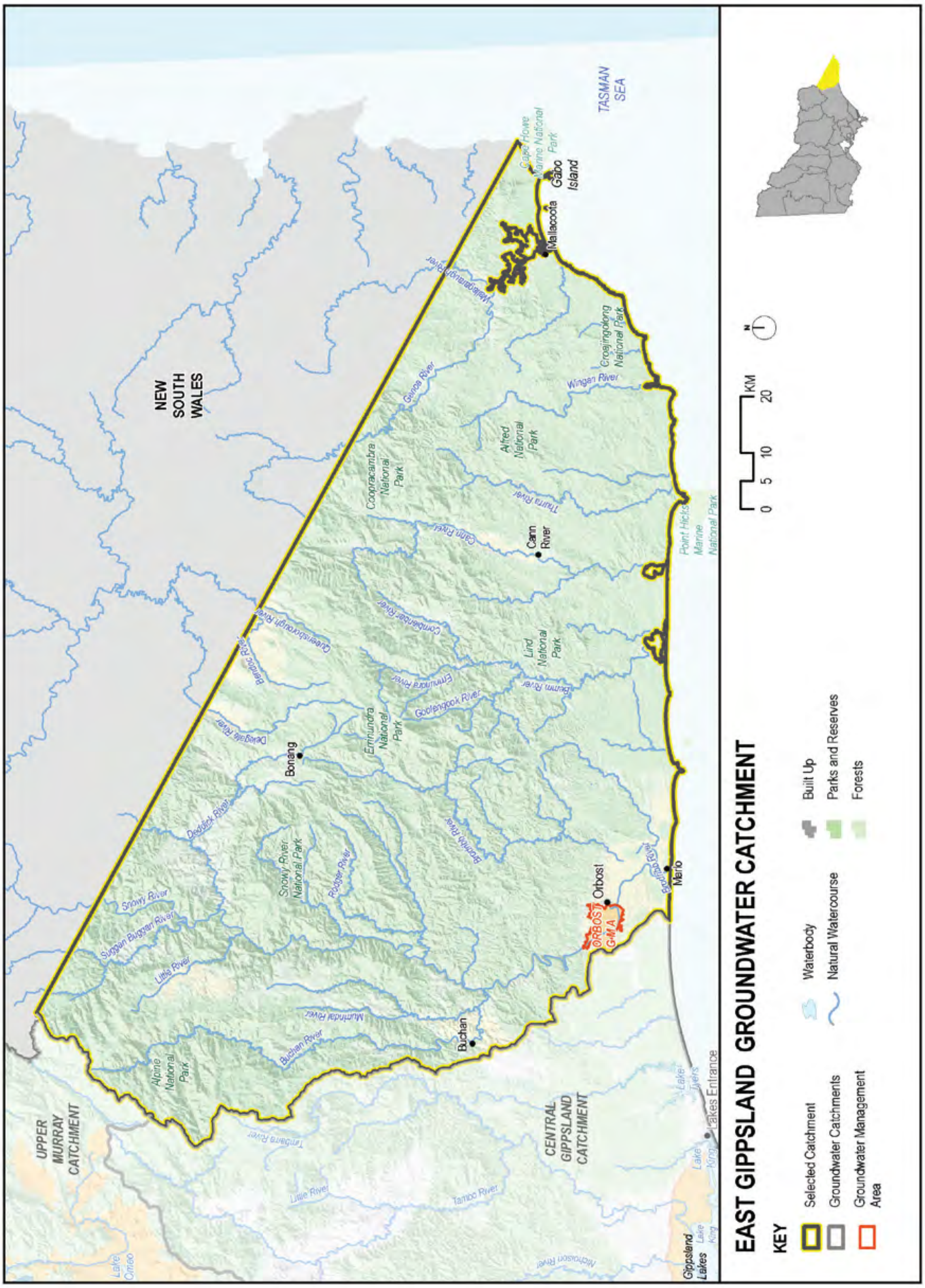
Middle aquifers cover a large part of the Gippsland groundwater basin from Moe to Bairnsdale. They comprise thick seams of sand aquifers separated by aquitards. The aquitards are generally clay or coal seams in the north-west of the Gippsland groundwater basin, and limestone in the east and centre of 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 the 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. Southern Rural Water is responsible for issuing bore construction licenses and licensing groundwater extractions under take and use licences.

The East Gippsland groundwater catchment contains the Orbost GMA and unincorporated areas. 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 2014–15.

7.10.2 Groundwater entitlements and use

Licenced groundwater entitlements and use for the Orbost GMA and unincorporated areas are shown in Table 7-16. Groundwater use in 2014–15 was around half of use in 2013–14, largely due to decreased extraction in the Orbost GMA.

Table 7-16 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Orbost GMA	20-45	1,217	150	257
Unincorporated areas	-	537	8	57
Total		**1,754**	**158**	**314**

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 the use from these bores is reported in the licenced volume in Table 7-16.

Table 7-17 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Orbost GMA	6	9
Unincorporated areas	60	90
Total	**66**	**99**

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 much lower in 2014–15 than in 2013–14. The licensed entitlements and metered use for this supply are provided in Table 7-18.

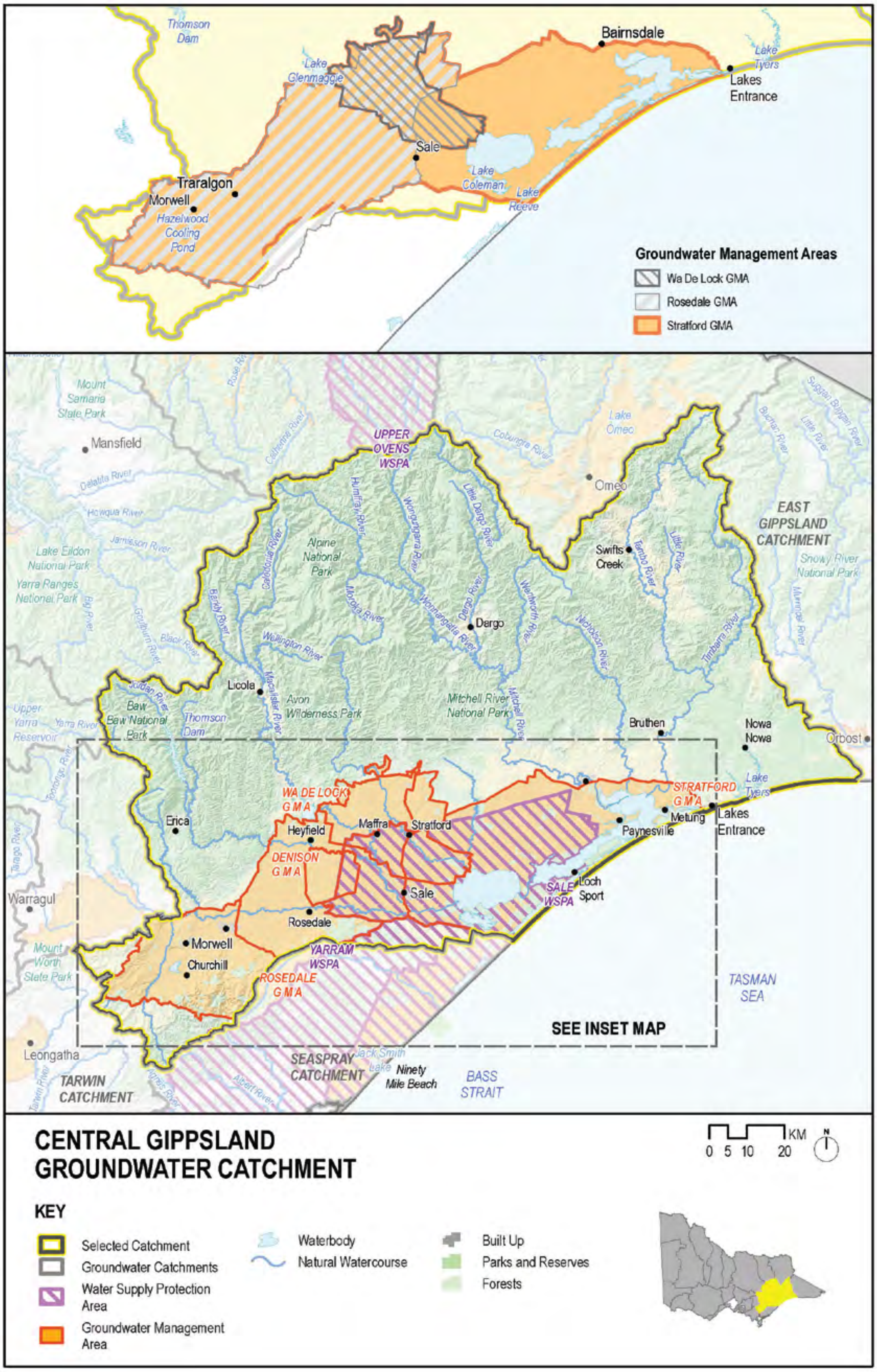
Table 7-18 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Mallacoota	220	8	57
Total	**220**	**8**	**57**

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. Southern Rural Water is responsible for issuing bore construction licences and for the licensing of 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 unincorporated areas. 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 (the majority of which is in the Moe groundwater catchment) and Yarram WSPA (the majority of which is in the Seaspray groundwater catchment).

Groundwater resources supply licences, domestic and stock use and also some urban use. While the majority of 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.

Throughout 2014–15, the groundwater level trends in the Wa De Lock GMA and Wy Yung WSPA were generally stable to rising, while levels were stable in the Rosedale GMA, declining in Moe GMA and Stratford GMA, and declining to stable in Yarram WSPA.

7.11.2 Groundwater entitlements and use

A summary of the licenced entitlements and use from GMAs in the Central Gippsland catchment are shown in Table 7-19. Groundwater use in the Central Gippsland groundwater catchment was slightly lower in 2014–15 compared to 2013–14.

Table 7-19 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Moe GMA	>25	28	10	8
Rosedale GMA	Zone 1: 50-150 Zone 2: 25-350 Zone 3: 200-300	23,217	10,303	9,698
Stratford GMA	Zone 1: >150 Zone 2: >350	36,273	21,523	22,251
Wa De Lock GMA	≤25	29,286	6,098	5,960
Denison WSPA	≤25	18,501	8,509	7,609
Sale WSPA	25-200	21,218	8,762	10,037
Wy Yung WSPA	≤25	7,462	528	765
Yarram WSPA	Zone 1: >200 Zone 2: All depths	6,889	3,864	3,940
Unincorporated areas	-	20,162	1,963	2,001
Total		**163,036**	**61,560**	**62,269**

Notes:

(1) The use volume reported in Rosedale GMA and Stratford GMA includes metered extractions from Latrobe Valley mines (Rosedale GMA 4,351 ML and Stratford GMA 21,521 ML).

(2) The volume of use in Wa De Lock GMA and Denison WSPA includes metered extractions for salinity control (Wa De Lock GMA 735 ML and Denison WSPA 3,207 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 the use from these bores is reported in the licenced volume in Table 7-19.

Table 7-20 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Rosedale GMA	203	305
Stratford GMA	45	68
Wa De Lock GMA	312	468
Denison WSPA	164	246
Sale WSPA	540	810
Wy Yung WSPA	0	0
Yarram WSPA	90	180
Unincorporated areas	623	935
Total	1,977	3,012

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

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Boisdale	37	0	0
Briagolong	160	91	116
Lindenow	120	0	0
Sale	3,480	1,705	1,910
Total	**3,797**	**1,796**	**2,026**

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 licenced groundwater entitlements and use from GMUs in the Seaspray catchment is shown in Table 7-22. Groundwater use was higher by approximately 10% in 2014–15 compared to 2013–14, due to increased extraction in the Yarram WSPA.

Table 7-22 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Giffard GMA	50-200	5,689	877	1,436
Stratford GMA	Zone 1: >150 Zone 2: >350	362	1	20
Yarram WSPA	Zone 1: >200 Zone 2: All depths	18,800	7,445	6,137
Unincorporated areas	-	518	115	105
Total		**25,369**	**8,438**	**7,698**

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 the use from these bores is reported in the licenced volume in Table 7-22.

Table 7-23 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Giffard GMA	53	80
Rosedale GMA	3	5
Yarram WSPA	231	347
Unincorporated areas	77	116
Total	**364**	**548**

Groundwater supplies are available for the town of Yarram. The licenced entitlements and metered use for the supply is presented in Table 7-24.

Table 7-24 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Yarram	214	44	0
Total	**214**	**44**	**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. Southern Rural Water is responsible for issuing bore construction licences and for licensing groundwater extractions under take and use licences.

The Moe catchment contains the Moe GMA and unincorporated areas. Groundwater resources supply licences and domestic and stock use and are also available for the town of Trafalgar. While the majority of groundwater licensed in the Moe GMA is used for irrigation purposes, some is also used for dairy wash-down.

The groundwater level trend in the Moe GMA was categorised as declining throughout 2014–15.

7.13.2 Groundwater entitlements and use

A summary of the licenced groundwater entitlements and use from GMUs is presented in Table 7-25. Groundwater use was around 25% lower in 2014–15 compared to 2013–14, largely due to decreased extraction in the Moe GMA.

Table 7-25 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Moe GMA	>25	3,861	436	790
Unincorporated areas	-	1,153	321	219
Total		**5,014**	**757**	**1,009**

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 the use from these bores is reported in the licenced volume in Table 7-25.

Table 7-26 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Moe GMA	122	183
Unincorporated areas	99	149
Total	221	332

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

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (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 contained within the Central 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 flood plains 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. Southern Rural Water 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 unincorporated areas. Groundwater resources supply licences, domestic and stock use and also the township of Leongatha.

Throughout 2014–15, the groundwater level trend in the Tarwin GMA was stable while levels in the Leongatha GMA were stable to declining.

7.15.2 Groundwater entitlements and use

Licenced groundwater entitlements and use from GMUs are presented in Table 7.-28. Groundwater use was lower by around a third in 2014–15 compared to 2013–14, due to decreased extraction throughout the catchment.

Table 7-28 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Leongatha GMA	All depths	1,803	128	209
Tarwin GMA	≤25	38	8	21
Unincorporated areas	-	346	59	63
Total		**2,187**	**195**	**293**

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 the 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

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Leongatha GMA	74	111
Tarwin GMA	593	890
Unincorporated areas	299	449
Total	**966**	**1,450**

Groundwater supply is available for the township of Leongatha, however there was no metered use of groundwater for urban supply in 2014–15 (Table 7-30).

Table 7-30 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Leongatha	715	0	2
Total	**715**	**0**	**2**

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, most of the Koo Wee Rup WSPA (which extends into the East Port Phillip Bay catchment) and unincorporated areas. Groundwater resources supply licences, domestic and stock use and also the townships of Corinella/Grantville and Lang Lang.

In 2014–15, 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 licenced entitlements and use from GMUs within the Westernport catchment is presented in Table 7-31.

Total groundwater use was higher by nearly 10% in 2014–15 compared to 2013–14. Extraction decreased in Corinella GMA and the unincorporated areas, but increased in Koo Wee Rup WSPA.

Table 7-31 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Corinella GMA	All depths	662	49	76
Koo Wee Rup WSPA	All depths	12,486	3,693	3,277
Unincorporated areas	-	4,076	561	580
Total		**17,224**	**4,303**	**3,933**

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 the use from these bores is reported in the licenced volume in Table 7-31.

Table 7-32 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Corinella GMA	60	90
Koo Wee Rup WSPA	1,061	1,592
Unincorporated areas	480	720
Total	**1,601**	**2,402**

Groundwater is available as an urban water supply to the townships of Corinella/Grantville and Lang Lang, however there was no metered use of groundwater for urban supply at either location in 2014–15 (Table 7-33).

Table 7-33 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Corinella / Grantville	490	0	22
Lang Lang	119	0	0
Total	**609**	**0**	**22**

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, Moorabbin GMA, Nepean GMA, Wandin Yallock WSPA, a small part of Koo Wee Rup WSPA (which is mainly within the Westernport catchment), and unincorporated areas. 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.

In 2014–15, the trends for groundwater levels of most GMUs in this catchment are categorised as increasing or stable, the same as in 2013–14. There was insufficient information to predict trends for the Moorabbin GMA.

7.17.2 Groundwater entitlements and use

Licenced groundwater entitlements and use from GMUs are presented in Table 7-34.

Groundwater use across the East Port Phillip Bay catchment decreased slightly in 2014–15 compared to 2013–14, largely due to decreased extraction from the Nepean GMA.

Table 7-34 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Frankston GMA	50-200	1,516	50	122
Moorabbin GMA	All depths	2,612	1,171	1,132
Nepean GMA	All depths	6,110	2,418	3,004
Koo Wee Rup WSPA	All depths	111	0	0
Wandin Yallock WSPA	All depths	2,995	509	366
Unincorporated areas	-	12,092	2,322	2,253
Total		**25,436**	**6,470**	**6,877**

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 the use from these bores is reported in the licenced volume in Table 7-34.

Table 7-35 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Frankston GMA	99	149
Moorabbin GMA	202	303
Nepean GMA(1)	1,861	1,861
Koo Wee Rup WSPA	0	0
Wandin Yallock WSPA	59	89
Unincorporated areas	1,194	1,791
Total	3,419	4,201

Notes:
(1) Estimated stock and domestic use in Nepean GMA is calculated using a factor 1 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 unincorporated areas. 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 in 2014–15 were categorised as increasing in the Lancefield GMA, stable to increasing in the Deutgam WSPA, and stable in the Merrimu GMA. 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 licenced entitlements and use for GMUs are shown in Groundwater use across the West Port Phillip Bay catchment was greater in 2014–15 compared to 2013–14, largely due to increased extraction from the Deutgam WSPA by nearly 75% as well as the unincorporated areas by 50%.

Table 7-36.

Groundwater use across the West Port Phillip Bay catchment was greater in 2014–15 compared to 2013–14, largely due to increased extraction from the Deutgam WSPA by nearly 75% as well as the unincorporated areas by 50%.

Table 7-36 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Cut Paw Paw GMA	>50	514	246	424
Lancefield GMA	All depths	1,378	269	623
Merrimu GMA	≤30	440	343	124
Deutgam WSPA	≤30	5,082	1,406	802
Unincorporated areas	-	8,599	1,920	1,272
Total		**16,013**	**4,184**	**3,245**

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 the use from these bores is reported in the licenced volume in Groundwater use across the West Port Phillip Bay catchment was greater in 2014–15 compared to 2013–14, largely due to increased extraction from the Deutgam WSPA by nearly 75% as well as the unincorporated areas by 50%.

Table 7-37 Number of domestic and stock bores and estimated use

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)	7	14
Lancefield GMA	58	87
Merrimu GMA	8	12
Deutgam WSPA	100	150
Unincorporated areas	1,220	1,830
Total	1,393	2,093

Notes:

(1) 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 2014–15.

Table 7-38 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Blackwood	50	0	0
Lancefield	294	26	167
Romsey	600	0	0
Total	**944**	**26**	**167**

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 the Wimmera–Mallee basin to the north and the Central basin to the east.

The upper aquifers of the Otway–Torquay groundwater basin are widely located across the south-west of the basin, 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 south of the basin, 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 pressure, the groundwater from these aquifers can reach temperatures of 50 – 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

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. Southern Rural Water is responsible for issuing bore construction licences and for the licensing of groundwater extractions under take and use licences.

The Otway–Torquay catchment contains the Jan Juc GMA and unincorporated areas. 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 2014–15.

7.20.2 Groundwater entitlements and use

A summary of licenced groundwater entitlements and use from GMUs within the Otway–Torquay catchment are presented in Table 7-39. Total groundwater use for 2014–15 increased compared to 2013–14. The majority of use is attributable to the Alcoa mine at Anglesea.

Table 7-39 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Jan Juc GMA	All depths	11,250	3,877	3,577
Unincorporated areas	All depths	90	0	0
Total		**11,340**	**3,877**	**3,577**

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 the use from these bores is reported in the licenced volume in Table 7-39.

Table 7-40 Number of domestic and stock bores and estimated use

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	35	53
Total	39	59

In the Otway–Torquay catchment, groundwater is used for urban water supply to the city of Greater Geelong. 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 2014–15.

Table 7-41 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Greater Geelong (Anglesea Bore Field)(1)	7,000	0	0
Total	**7,000**	**0**	**0**

Note:

(1) The groundwater supply for Greater Geelong (Anglesea, Torquay, Lorne) is split into a bulk entitlement for Greater Geelong (Anglesea Bore Field) located in the Otway-Torquay catchment, and a groundwater license issued by SRW for Greater Geelong (Barwon Downs Bore Field) 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. Southern Rural Water is responsible for issuing licenses for groundwater use and bore construction.

The Hopkins–Corangamite catchment contains a number of Groundwater Management Units: 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, the majority of which is within the Loddon groundwater catchment.

Groundwater resources in the Hopkins–Corangamite catchment are predominantly used for urban supply and irrigation.

In 2014–15, the groundwater level trend for most GMUs in the Hopkins–Corangamite catchment was categorised as increasing to stable. There was insufficient information to predict trends for the Colongulac and Glenormistan GMAs.

7.21.2 Groundwater entitlements and use

A summary of the licenced entitlements and use for GMUs are shown in Table 7-42.

Total groundwater use for 2014–15 increased compared to 2013–14, with increased extraction from the majority of GMUs.

Table 7-42 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Cardigan GMA	All depths	3,878	2,262	462
Colongulac GMA	All depths	4,407	1,459	1,134
Gerangamete GMA(1)	>60	8,000	0	0
Glenormiston GMA	≤60	2,636	1,459	1,210
Newlingrook GMA	All depths	1,958	738	44
Paaratte GMA	>120	3,212	340	323
Bungaree WSPA(2)	All depths	5,333	2,262	3,094
Nullawarre WSPA	≤250	22,627	13,273	9,060
Warrion WSPA	All depths	14,081	5,261	3,426
Unincorporated areas	-	16,106	5,508	4,641
Total		**82,238**	**32,562**	**23,394**

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 the use from these bores is reported in the licenced use in Table 7-42.

Table 7-43 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Cardigan GMA	90	135
Colongulac GMA	107	161
Gellibrand GMA	1	2
Gerangamete GMA	3	5
Glenormiston GMA	74	111
Newlingrook GMA	2	3
Paaratte GMA	1	2
Bungaree WSPA	178	267
Loddon Highlands WSPA(1)	92	184
Nullawarre WSPA	0	0
Warrion WSPA	265	398
Unincorporated areas	2,240	3,360
Total	**3,053**	**4,628**

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

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Ballarat - Bungaree Bore	120	1	0
Ballarat West(1)	1,700	562	236
Beaufort	200	26	48
Caramut	50	27	39
Darlington	10	4	5
Dean	30	16	21
Greater Geelong (Barwon Downs borefield)(2)	8,000	0	0
Mortlake (part)	335	24	25
Otway System (Carlisle)	1,800	712	4
Port Campbell, Timboon and Peterborough	3,159	340	327
Streatham	60	31	38
Total	**15,464**	**1,743**	**743**

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 groundwater supply for Greater Geelong (Anglesea, Torquay, and Lorne) is split into a bulk entitlement for Greater Geelong (Anglesea Bore Field) located in the Otway-Torquay catchment, and a groundwater license issued by SRW for Greater Geelong (Barwon Downs Bore Field) located in the Hopkins-Corangamite catchment.

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. Southern Rural Water is responsible for issuing licenses for groundwater use and bore construction.

The Portland groundwater catchment contains the Condah WSPA, Hawkesdale GMA, Heywood GMA, Portland GMA and Yangery WSPA and unincorporated areas. 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. The majority of 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 2014–15, the groundwater level trends in the GMUs of the Portland groundwater catchment were generally categorised as stable or rising. There was insufficient information to predict trends for the Heywood GMA.

7.22.2 Groundwater entitlements and use

Licenced groundwater entitlements and use from GMUs are presented in Table 7-45.

Groundwater use within the catchment was almost a third higher in 2014–15 compared to 2013–14, with increased extraction in most GMUs.

Table 7-45 Licenced groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Hawkesdale GMA(1)	As per plan	12,451	6,274	4,540
Heywood GMA(1)	<-70	7,011	1,874	1,359
Portland GMA	>200	7,794	2,514	2,645
Condah WSPA	70-200	7,475	3,208	2,148
Nullawarre WSPA(1)	≤250	106	12	8
Yangery WSPA(1)	<-100	14,341	3,693	2,815
Unincorporated areas	-	7,199	1,385	836
Total		**56,377**	**18,960**	**14,351**

Note:

(1) The Nullaware and Yangery WSPAs and the Hawkesdale and Heywood GMAs were revoked during the 2014–15 year. The South West Limestone GMA was approved in their place. Because the changes were not in place until very late in the year, the new arrangements were not used for accounting in the *Victorian Water Accounts 2014–15*.

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 the use from these bores is reported in the licenced volume in Table 7-45.

Table 7-46 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Hawkesdale GMA(1)	1,072	1,608
Heywood GMA(1)	1,117	1,676
Portland GMA	1	2
Condah WSPA	54	81
Glenelg WSPA	12	18
Yangery WSPA(1)	0	0
Unincorporated areas	2,577	3,866
Total	**4,833**	**7,251**

Note:

(1) Yangery WSPA and the Hawkesdale and Heywood GMAs were revoked during the 2014–15 year. The South West Limestone GMA was approved in their place. Because the changes were not in place until very late in the year, the new arrangements were not used for accounting in the *Victorian Water Accounts 2014–15*.

Portland groundwater catchment

Groundwater is used as an urban water supply for some townships in the Portland groundwater catchment. The licenced entitlements and metered use for these supplies are presented in Table 7-47.

Table 7-47 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Hamilton, Tarrington, Dunkled	1,102	0	6
Heywood	333	135	155
Koroit	524	3	4
Macarthur	130	0	36
Penshurst	250	65	70
Port Fairy	1,026	590	620
Portland	6,222	1,789	1,879
Warrnambool, Allansford and Koroit (part)	750	387	443
Total	**10,337**	**2,969**	**3,213**

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 kilometres 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 Water, Land and Biodiversity Conservation.

The Glenelg groundwater catchment contains the Glenelg WSPA and unincorporated areas, along with very small parts of the Portland GMA and West Wimmera GMA (which are mostly within the Portland and West Wimmera catchments respectively). 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 2014–15.

7.23.2 Groundwater entitlements and use

A summary of the licenced entitlements and use for GMUs are presented in Table 7-48.

Groundwater use within the catchment was approximately 45% higher in 2014–15 compared to 2013–14.

Table 7-48 Licenced groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Glenelg WSPA	All depths	33,261	7,787	4,904
Unincorporated areas	-	2,085	210	613
Total		**35,346**	**7,997**	**5,517**

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 the use from these bores is reported in the licenced volume in Table 7-48.

Table 7-49 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 1.5 ML per bore) (ML)
Glenelg WSPA	1,078	1,617
West Wimmera GMA(1)	2	4
Unincorporated areas	279	419
Total	1,359	2,040

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 licenced entitlements and metered use for these supplies is presented in Table 7-50.

Table 7-50 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Casterton	1,000	409	456
Dartmoor	150	14	17
Merino	100	0	0
Total	**1,250**	**423**	**473**

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.

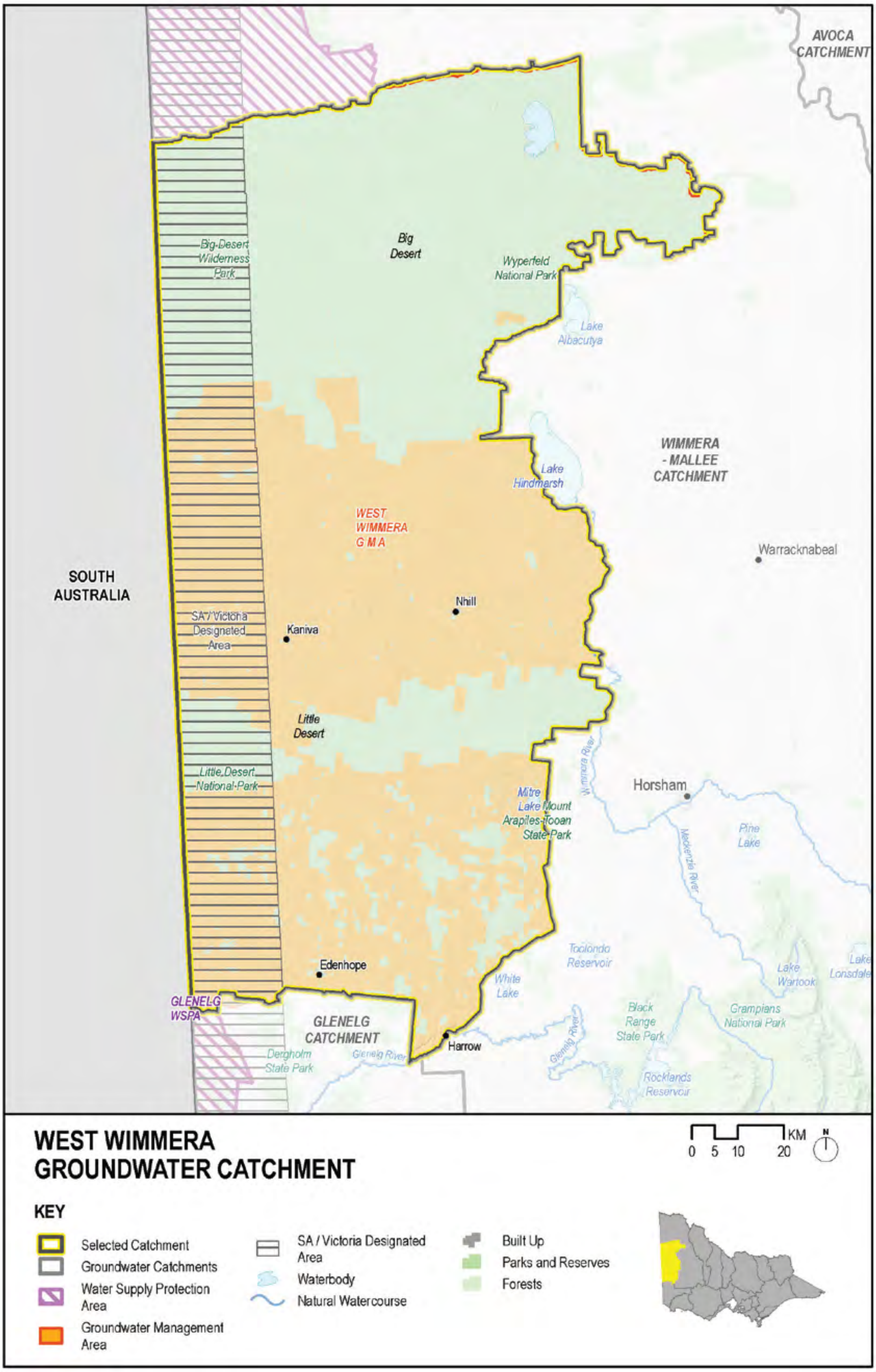
In most areas the aquifers are all considered to be connected, with thin aquitards between the aquifers in part or all of the catchment. The exception to this is the Renmark Group Aquifer in the West Wimmera GMA, which is considered to be disconnected from the water above it.

The majority of groundwater is extracted from the Murray Group aquifers along the border with South Australia. The water in the Murray Group 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 kilometres 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 licenses for groundwater use and bore construction, as well as for surface water licensed diversions. 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 the state government of South Australia.

Groundwater resources supply licenced use, domestic and stock use and the townships of Apsley, Harrow, Miram, Serviceton, Edenhope, Kiata, Goroke, Lillimur, Kaniva, and Nhill.

Groundwater level trends in 2014–15 were 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 84% of their licence volume during 2014–15.

7.25.2 Groundwater entitlements and use

A summary of the licensed entitlements and use from GMUs within the West Wimmera groundwater catchment is shown in Table 7-51.

Groundwater use within the catchment was higher in 2014–15 than in 2013–14.

Table 7-51 Licensed groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
West Wimmera GMA	All depths	53,357	21,851	16,965
Total		**53,357**	**21,851**	**16,965**

An estimate of domestic and stock groundwater use is provided in Table 7-52. A number of groundwater licenses also incorporate domestic and stock use, and in these cases the 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

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2.0 ML per bore) (ML)
West Wimmera GMA	594	1,188
Unincorporated areas-GWMWater	1	2
Total	595	1,190

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

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Apsley	40	24	29
Edenhope(1)	250	260	158
Goroke	86	55	51
Harrow(2)	29	37	35
Kaniva	600	230	248
Kiata	40	5	4
Lillimur	32	9	8
Miram	7	1	2
Nhill	1,000	220	290
Serviceton	25	8	9
Total	**2,109**	**849**	**834**

Note:

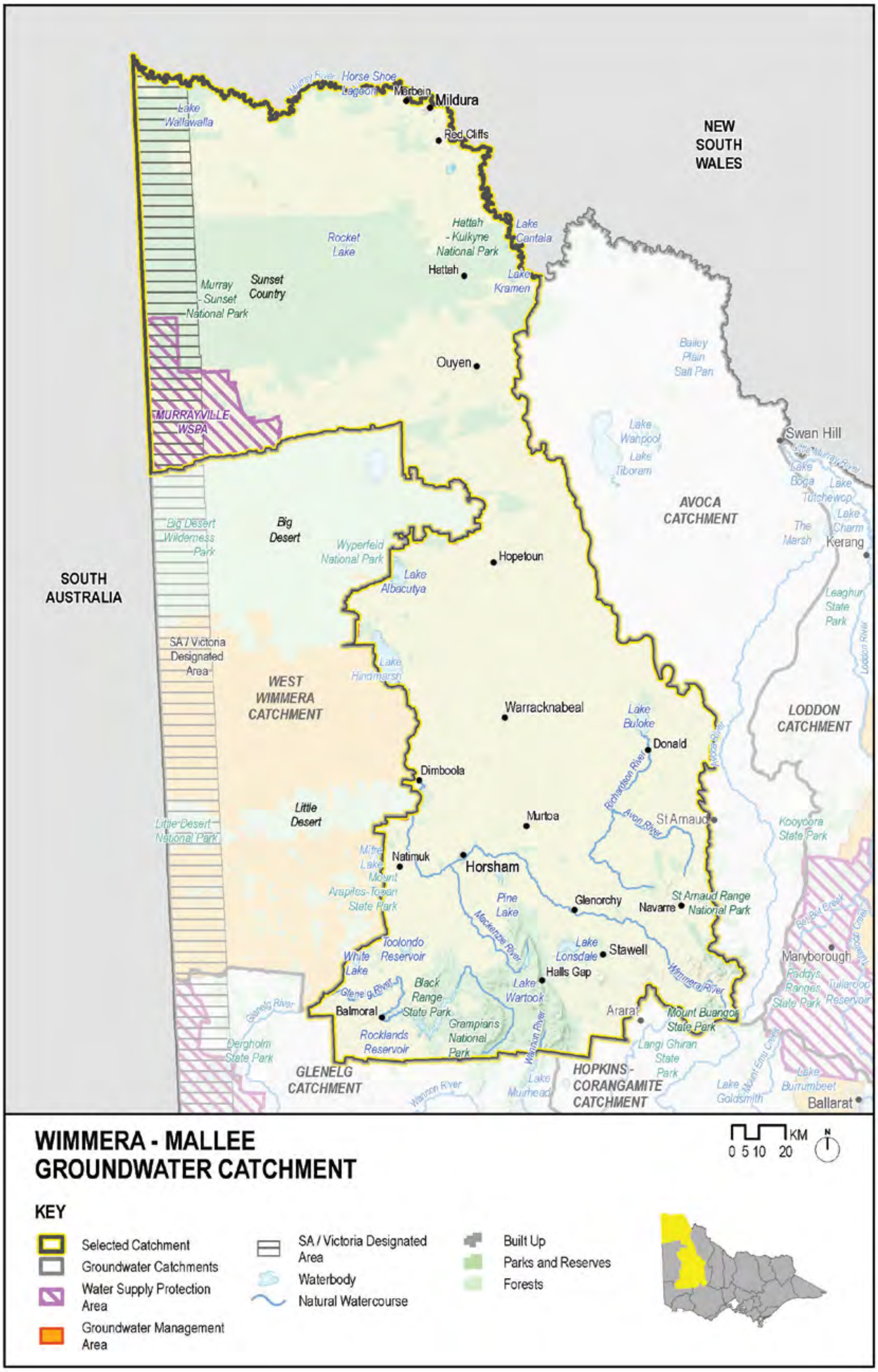
(1) Usage exceeded licensed volume in Edenhope, as there was an opening carryover of 75 ML.

(2) Usage exceeded licensed volume in Harrow, as 11 ML was traded in.

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 kilometres 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*, The Wimmera–Mallee catchment contains the Murrayville WSPA and unincorporated areas. 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.

In 2014–15, 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

Licenced groundwater entitlements and use from GMUs are presented in Table 7-54.

Groundwater use within the catchment increased by approximately 46% in 2014–15 compared to 2013–14.

Table 7-54 Licenced groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Murrayville WSPA	70-200	9,634	5,511	3,586
Unincorporated areas	-	10,484	5,922	4,223
Total		**20,118**	**11,433**	**7,809**

An estimate of domestic and stock groundwater use is provided in Table 7-56. A number of groundwater licences also incorporate domestic and stock use, and in these cases the use from these bores is reported in the licenced volume in Table 7-54.

Table 7-55 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2.0 ML per bore) (ML)
Murrayville WSPA	107	214
Unincorporated areas	354	708
Total	**461**	**922**

Groundwater is used as an urban water supply to the townships of Cowangie, Horsham, Mt Zero, Landsborough, Murrayville and Willaura. The licenced entitlements and metered use for these supplies is presented in Table 7-56.

Table 7-56 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Cowangie	40	9	8
Horsham Mt Zero	1,200	41	3
Landsborough	150	35	30
Murrayville	475	124	116
Willaura system(1)	220	80	74
Total	**2,085**	**289**	**231**

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 licenses 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

Licenced groundwater entitlements and use from parts of unincorporated areas are presented in Table 7-57.

Groundwater use within the catchment increased by approximately 19% in 2014–15 compared to 2013–14.

Table 7-57 Licenced groundwater volumes and use

WSPA/GMA	GMA/WSPA aquifer depth limits(m)	Licensed entitlement (ML/year)	Total licensed groundwater use (ML) 2014–15	Total licensed groundwater use (ML) 2013–14
Unincorporated areas	-	2,572	1,033	865
Total		**2,572**	**1,033**	**865**

An estimate of domestic and stock groundwater use is provided in Table 7-58. A number of groundwater licences also incorporate domestic and stock use, and in these cases the use from these bores is reported in the licenced volume in Table 7-57.

Table 7-58 Number of domestic and stock bores and estimated use

WSPA/GMA	No. of domestic and stock bores	Estimated domestic and stock use (assuming 2 ML per bore) (ML)
Unincorporated areas	65	130
Total	65	130

Groundwater is used to provide urban water supply to some towns in the Avoca groundwater catchment. The licenced entitlements and metered use for these supplies are presented in Table 7-59. Groundwater use for Avoca and Redbank increased in 2014–15 compared to 2013–14, and no groundwater was used for urban supply to Amphitheatre during the year.

Table 7-59 Urban groundwater use

Town supplied	Licensed volume (ML)	Metered use 2014–15 (ML)	Metered use 2013–14 (ML)
Amphitheatre	0	0	0
Avoca	250	172	99
Redbank	50	6	4
Total	**300**	**178**	**103**

8 Distribution system water accounts 2014–15

8.1 Overview of methodology

A distribution system is the infrastructure owned by a water corporation which is used to distribute water from its source to a user. Distribution systems begin where water is taken from a source waterway or aquifer, and end where the water is delivered to a customer.

These distribution system accounts include off-stream storages, bulk supply channels, treatment plants and the like, as well as reticulation networks to supply customers. On-stream storages (for example, Lake Eildon) are not considered to be part of distribution systems, and are covered in the Basin Water Accounts section.

Sometimes the accounts partition a distribution system into its bulk (or feeder) and reticulation components.

An off-stream storage often has a certain amount of catchment inflow (that is, 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.

As far as possible, the accounts have been prepared on a consistent basis, while recognising the substantial differences between systems.

8.1.1 Groupings of distribution systems

Distribution system reporting is grouped by ownership. This reflects the fact that as water is moved from its source to a user, it may pass through more than one distribution system. For example, Melbourne Water uses its distribution system to divert water from its source and supply it to retail water corporations. Then, retail water corporations take that water into their own distribution systems, and supply it to the customer.

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.

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.

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 (for example, 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 GWMWater) each operate rural distribution systems that supply several towns as well as rural customers. While deliveries to different customer groups can usually be separated (for example, 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. For example, though some accounting approaches would report net evaporation from a storage as a loss, these accounts treat data on rainfall and evaporation as separate inflows and outflows. This may affect efficiency and loss measures, but the differences when compared to traditional figures are generally 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.

Distribution systems: Methodology

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.

8.2 Northern region

8.2.1 North East Water

North East Water provides water and sewerage services to 41 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 more than 123,000 people in an area of about 20,000 square kilometres. 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 8-1North 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 summarises 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		Total outflows		
			To urban residential	To urban non-residential	From treatment plants	From distribution systems (1)			
Alpine area									
Bright system	2	929	277	140	18	194	629	302	66%
Harrietville	.4	61.9	26.9	19.0	2.7	13.3	61.9	.4	74%
Mount Beauty System	4	408	141	91	13	162	407	5	57%
Myrtleford(2)	369	603	274	212	18	100	604	368	80%
Broken River									
Benalla	18	1,390	923	332	54	82	1,390	18	90%
Kings and Ovens Rivers									
Moyhu	.1	31.7	22.8	3.5	3.9	1.5	31.7	.1	83%
Oxley	.2	61.1	30.5	1.2	8.3	21.1	61.1	.2	52%
Wangaratta group	19	3,358	1,690	1,168	118	376	3,352	25	85%
Whitfield	.6	16.0	10.3	5.5	0.0	.4	16.1	.5	98%
Mitta Mitta River									
Dartmouth	.3	23.8	9.0	7.1	2.5	5.2	23.8	.3	68%
Eskdale	.2	13.5	8.2	3.5	1.0	.9	13.6	.1	86%
Murray River									
Bellbridge	1	56	39	2	6	9	56	1	72%
Rutherglen/Wahgunyah system	6	724	368	164	59	132	723	7	74%
Tallangatta	2	151	75	40	13	22	149	2	77%
Wodonga system	81	6,270	3,409	2,156	175	545	6,285	66	89%
Yarrawonga system	11	1,279	905	183	66	125	1,279	11	85%
Sub-alpine area									
Beechworth(2)	761	725	278	137	27	282	724	762	57%
Yackandandah	25	220	66	38	6	111	220	25	47%
Upper Murray River									
Corryong system	68	260	121	56	13	82	271	57	65%
Walwa	.4	18.1	8.1	8.3	2.3	(.8)	17.9	.6	92%
Supplied from Groundwater									
Goorambat	.9	10.5	9.8	.5	0.0	.3	10.6	.8	97%

Notes:
(1) Where an account does not balance exactly, any unaccounted-for flows have been added to distribution system losses.
(2) For the Mrytleford 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 over 136,000 people. It services around 57,500 properties in 53 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.

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	Euro
	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					
			To urban residential	To urban non-residential	From treatment plants (1)	From distribution systems	Passed to other systems (3)	Total outflows		
Broken Creek										

Nathalia	0	424	221	66	10	64	63	424	0	82%
Numurkah system	0	1,034	622	359	4	44	5	1,034	0	95%
Goulburn Channels										
Towns supplied from Central Goulburn IA(1)	638	5,462	1,733	2,815	14	816	84	5,462	638	85%
Towns supplied from Rochester IA	0	39	20	6	7	2	4	39	0	77%
Towns supplied from Shepparton IA	0	155	74	38	26	12	5	155	0	76%
Goulburn River										
Alexandra	0	573	177	98	4	51	243	573	0	90%
Murchison	0	176	115	33	1	12	15	176	0	93%
Nagambie system	0	618	199	347	(13)	80	5	618	0	89%
Seymour system	0	1,692	876	342	94	176	204	1,692	0	84%
Shepparton system	0	12,398	6,033	4,449	113	993	810	12,398	0	91%
Woods Point	0	4	3	1	0	0	0	4	0	100%
Goulburn River Tributaries										
Broadford system	90	541	392	120	9	48	0	569	62	90%
Euroa system	0	747	434	160	49	104	0	747	0	80%
Kilmore system	69	1,244	663	144	60	297	90	1,255	58	72%
Longwood	15	56	41	10	(17)	9	1	44	27	n/a
Mansfield	557	525	355	143	(6)	162	0	654	428	76%
Marysville & Buxton(1)	94	189	67	29	(64)	150	9	191	92	55%
Pyalong(1)	40	38	28	2	15	14	5	64	14	55%
Thornton	0	49	28	10	0	11	0	49	0	77%
Upper Delatite system	0	73	35	9	3	8	18	73	0	85%
Yea system	0	226	139	53	2	32	0	226	0	85%
Lake Eildon										
Eildon and Bonnie Doon	43	255	148	37	3	62	3	253	45	74%
Murray Channels										
Katamatite and Picola	16	1,105	44	11	8	6	1,037	1,105	16	99%
Murray River										
Barmah	0	53	29	11	3	8	2	53	0	80%
Cobram system(1)	0	2,953	678	1,836	69	20	350	2,953	0	97%
Supplied from Groundwater										
Katunga	0	43	31	6	0	2	4	43	0	95%

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 square kilometres 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
- 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 (D&S) 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 2014)					
Waranga basin	258,807				258,807
Greens Lake		20,370			20,370
End volume in store (30 June 2015)					
Waranga basin	151,694				151,694
Greens Lake		22,370			22,370
Change in storage	**(107,113)**	**2,000**			**(105,113)**
Inflows					
From Goulburn River	857,988				857,988
Rainfall on Waranga basin	15,254				15,254
From WWC Goulburn segment		476,881		(476,881)	0
From Cornella Creek		122			122
Rainfall on Greens Lake		1,466			1,466
From WWC Campaspe segment			253,213	(253,213)	0
From Loddon River			30,305		30,305
Unattributed inflows		5,382			
Total inflows	**873,242**	**483,851**	**283,518**	**(730,094)**	**910,517**
Outflows					
Passed to other systems					
To Central Goulburn Irrigation area	380,957				380,957
To Goldfields superpipe	150				150
To WWC Campaspe segment	476,881			(476,881)	0
To Rochester Irrigation Area		201,722			201,722
To WWC Loddon segment		253,213		(253,213)	0
To Pyramid-Boort Irrigation Area			253,956		253,956
To Campaspe River		22,068			22,068
To Loddon River			29,562		29,562
Total passed to other systems	***857,988***	***477,003***	***283,518***	***(730,094)***	***888,415***
Losses					
Evaporation from Waranga basin	50,315				50,315
Evaporation from Greens Lake		4,848			4,848
Unattributed Outflows	72,052				72,052
Total losses	***122,367***	***4,848***	0		127,215
Total outflows	**980,355**	**481,851**	**283,518**	**(730,094)**	**1,015,630**

Notes:
(1) The balancing item for the Campaspe segment is outflows to Rochester Irrigation Area.
(2) The balancing item for the Loddon segment is outflows to Pyramid–Boort Irrigation Area.

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 active capacity of nearly 58,000 ML. They are connected by a number of bulk carriers, for which losses are apportioned.

Each year, an average of 22,100 ML a year is harvested into Lake Boga, Lake Charm and Kangaroo Lake, and released. The capture of water offsets the reduction of the Snowy Required Annual Release to the upper Murray by retaining some unregulated flows within Victoria, is 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 2014)	
Total Kow Swamp, Lake Charm, Kangaroo Lake, Lake Boga	122,141
End volume in store (30 June 2015)	
Total Kow Swamp, Lake Charm, Kangaroo Lake, Lake Boga	115,908
Change in storage	**(6,233)**
Inflows	
Rain on all storages	10,657
Murray to Lake Boga	
Torrumbarry Irrigation Area to Lake Boga	1,350
Torrumbarry Irrigation Area to Lake Charm	8,513
Torrumbarry Irrigation Area to VMMS	
Unattributed inflow	134,350
Total inflows	**154,870**
Outflows	
Passed to other systems	
Lake Charm to Murray River	2,235
Lake Boga to Murray River	3,127
6/7 channel to Murray River	1,210
Kerang Weir to Murray River	85,246
VMMS to TIA	6,371
Total passed to other systems	***98,189***
Losses	
Evaporation on storages	51,472
Distribution losses(1)	11,442
Total losses	***62,914***
Total outflows	**161,103**

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.

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 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	Waranga Western Channel
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	Waranga Western Channel
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	Waranga Western Channel

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(1)	Passed to other systems	Total outflows		
			To rural customers	To other					
Irrigation districts									
Central Goulburn Irrigation area		423,548	342,773		75,671	5,104	423,548		82%
Murray Valley Irrigation area		325,894	209,995		56,543	59,357	325,894		83%
Nyah Irrigation area		6,169	5,399		770		6,169		88%
Loddon Valley Irrigation Area		253,213	203,808	2,707	15,384	31,314	253,213		94%
Rochester Irrigation area	20,370	478,469	173,461		301,422	1,585	476,468	22,370	n/a
Shepparton Irrigation area		209,000	128,006		27,128	53,866	209,000		87%
Torrumbarry Irrigation area	11,324	762,181	343,199	45,959	136,058	235,963	761,179	12,326	82%
Tresco Irrigation area		6,808	6,288		520		6,808		92%
Woorinen Irrigation area		14,919	10,981		3,938		14,919		74%
Other rural distribution systems									
East Loddon D&S		822		788	34		822		96%
Lower Broken Creek(1)		86,595		17,085	(23,359)	92,869	86,595		127%

Normanville D&S	61	344		193	43	121	357	48	88%
Tungamah D&S[(1)]		328		290	39		328		88%
Upper Broken Creek		6,045	724	887	3,070	1,364	6,045		n/a
West Loddon D&S		324		324			324		100%

Notes:

(1) The balancing item in Lower Broken Creek and Tungamah is an unattributed inflow

The Shepparton Irrigation Area had early take-up of modernisation, i.e. 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 73%.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 146,000 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 kilometres 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 Waranga Western Channel 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 2014)	0
End volume in store (30 June 2015)	0
Change in storage	**-**
Inflows	
From Lake Eppalock - Coliban Water	11,995
From Lake Eppalock - Central Highlands Water	534
From Waranga Western Channel at Colbinabbin - Coliban Water	118
From Waranga Western Channel at Colbinabbin - Central Highlands Water	32
From Sandhurst Reservoir[(1)]	0
Total inflows	**12,679**
Outflows	
Deliveries to customers	
Direct deliveries to rural customers	351
Total deliveries to customers	**351**
Passed to other systems	
To Emu Valley rural channel sub-system	195
To Axe Creek rural channel sub-system	362
To Specimen Hill rural channel sub-system	1,854
Transfer to Central Highlands Water (to White Swan Reservoir)	566

To Heathcote urban system (Caledonia Reservoir)	437
To Sandhurst Reservoir-Coliban Water	6,182
To Spring Gully Reservoir	2,732
Total passed to other systems	***12,328***
Total outflows	**12,679**
System efficiency (%)	97%

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 2014)	0
End volume in store (30 June 2015)	0
Change in storage	**-**
Inflows	
From Malmsbury reservoir	15,761
Total inflows	**15,761**
Outflows	
Deliveries to customers	
Direct deliveries to rural customers	370
Total deliveries to customers	***370***
Passed to other systems	
To Coliban North system at Sandhurst Reservoir	6,352
To Poverty Gully rural sub-system	2,830
To Harcourt rural sub-system	4,190
To Emu Valley rural Sub-system	1,018
To Spring Gully rural sub-system	281
To Specimen Hill rural sub-system	6
Total passed to other systems	***14,677***
Losses	
System losses	714
Total losses	***714***
Total outflows	**15,761**
System efficiency (%)	95%

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	1,129	929	200	0	1,129	0	82%
Axe Creek(2)	0	362	149	213	0	362	0	41%
Cockatoo Hill	0	669	313	356	0	669	0	47%
Emu Valley	0	1,213	603	610	0	1,213	0	50%
Harcourt	1,160	4,259	1,110	3,249	0	4,359	1,060	25%
Jackass Flat	0	31	8	23	0	31	0	26%
Lockwood	0	1,016	560	456	0	1,016	0	55%
Poverty Gully(3)	0	2,830	14	509	2,307	2,830	0	82%
Specimen Hill(4)	0	1,860.0	281.0	532.0	1,047.0	1,860.0	0	71%
Spring Gully Reservoir(5)	702	2,882	289	655	1,798	2,742	842	76%
Spring Gully(6)	0	281	92	141	48	281	0	50%

Notes:

(1) Losses are the balancing item in all cases.
(2) Deliveries include 26 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 2014–15.

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 Water Supply Protection Area	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

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	57	30	9	18	0	57	0	68%
Coliban Northern									
Bendigo system	1,505	12,666	7,784	2,799	1,516	0	12,099	2,072	87%
Heathcote system	174	460	151	92	229	0	472	162	51%
Coliban Southern									
Castlemaine system - McKay Reservoir	1,184	2,370	1,095	801	490	0	2,386	1,168	79%
Kyneton system	0	878	444	369	65	0	878	0	93%
Goulburn system									
Supplied from PH-Boort Irrigation Area(2)	0	364	168	66	130	0	364	0	64%
Supplied from Rochester Irrigation Area(3)	0	1,178	408	640	130	0	1,178	0	89%
Loddon system									
Bridgewater system	0	252	85	45	122	0	252	0	52%
Jarklin	0	1.0	1.0	0.0	0.0	0	1.0	0	100%
Laanecoorie system	0	129	79	25	25	0	129	0	81%
Serpentine	0	31	13	3	15	0	31	0	52%
Murray system									
Cohuna	0	740	319	276	145	0	740	0	80%
Echuca	0	3,274	1,656	1,348	270	0	3,274	0	92%
Gunbower	0	61	36	12	13	0	61	0	79%
Leitchville	0	217	46	111	60	0	217	0	72%

Distribution systems: Northern region

Wimmera system									
Borung	0	4	3	0	1	0	4	0	75%
Koorong Vale - Wedderburn	0	215	80	37	98	0	215	0	54%
Wychitella	0	4.0	2.0	1.0	1	0	4.0		75%
Supplied by groundwater									
Elmore	0	122	67	42	13	0	122	0	89%
Trentham[4]	69	251	62	20	67	102	251	69	33%

Note:
(1) Distribution system losses are the balancing item in all cases.
(2) Pyramid–Boort Irrigation Area consists of Macorna town, Pyramid Hill town, Boort town, Mysia town, Mitiamo town and Dingee town.
(3) Rochester Irrigation Area consists of Lockington town and Rochester town (part).
(4) Trentham passed to other systems is 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.

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	0	36,805	32,854	0	3,951	0	36,805	0	89%
Merbein Irrigation District	0	20,010	17,540	0	2,470	0	20,010	0	88%

Red Cliffs Irrigation District	0	31,019	27,676	0	3,343	0	31,019	0	89%
Robinvale Irrigation District	0	19,322	18,648	0	674	0	19,322	0	97%
Other rural distribution systems									
Millewa water works district[1]	119	16,219	14,938	0	1,217	63	16,218	120	92%
Yelta water works district	0	2	2	0	0	0	2	0	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	1,135	762	172	201	1,135	6	82%
Koondrook	3	220	167	20	33	220	3	85%
Mildura system	48	12,803	9,016	2,523	1,264	12,803	48	90%
Millewa system	0	63	63	0	0	63	0	100%
Murrabit	2	36	18	7	11	36	2	69%
Mystic Park[2]	0	5	5	1	(1)	5	0	120%
Piangil	1	123	46	62	15	123	1	88%
Red Cliffs	7	1,328	658	584	86	1,328	7	94%
Robinvale	5	585	363	192	30	585	5	95%
Swan Hill system	14	3,986	2,811	928	247	3,986	14	94%

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 square kilometres. 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 35,000 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		Distribution system losses	Total outflows		
			To urban residential	To urban non-residential				
Bemm River	5	19	9	11	1	21	3	95%
Buchan	0.0	23	10	13	0	23	0.0	100%
Cann River	3	36	16	18	3	37	2	91%
Dinner Plain	0	51	18	32	1	51	0	99%
Mallacoota	56	167	88	58	16	162	61	90%
Mitchell system	1,479	4,399	2,396	1,622	414	4,432	1,446	91%
Omeo	6	56	24	30	4	57	5	94%
Orbost system	47	622	220	401	11	632	37	98%
Swifts Creek	2	49	15	32	1	48	3	97%

8.3.2 Gippsland Water

Gippsland Water services an area of just over 5,000 square kilometres 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	33	93	39	23	9	23	94	(1)	33	66%
Macalister / Thomson area	41	1,422	767	452	39	161	1,419	3	41	86%
Mirboo North	2	182	105	32	5	40	182		2	75%
Moe system	44	3,557	1,605	1,682	29	241	3,557	(7)	51	92%
Moondara Reservoir system	735	47,677	4,297	41,551	321	1,508	47,677	19	716	96%
Neerim South/ Noojee	3	180	141	35	3	1	180	(1)	4	98%
Sale system	15	1,850	1,105	551	118	76	1,850	(4)	19	90%
Seaspray	3	26	19	4	3	2	28	(2)	3	82%
Thorpdale	2	13	8	3	0	2	13		2	85%
Warragul/Drouin system	91	2,926	1,850	543	138	395	2,926	1	90	82%
Willow Grove	0.1	51	33	1	6	11	51		0.1	67%

Notes:
(1) Urban other includes non-residential use and 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.

The systems with the lowest efficiency, Erica/Rawson and Willow Grove, are also comparatively small systems. This means that their effect on the overall system efficiency is minor.

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 border to the New South Wales border. The majority 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		164,271	135,489	21,360	7,422	164,271		95%

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 square kilometres.

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	0	13	9	4	0	0	13	0	100%

Fish Creek	123	109	12	89	2	19	122	110	83%
Foster	210	170	67	54	9	(14)	116	264	104%
Korrumburra	534	658	245	350	63	0	658	534	90%
Leongatha	1,336	1,583	350	1,072	77	84	1,583	1,336	90%
Loch system	219	246	75	81	81	9	246	219	63%
Meeniyan	5	59	33	12	11	3	59	5	76%
Toora system	58	506	62	268	6	171	507	57	65%
Wonthaggi system	3,304	1,771	932	575	218	46	1,771	3,304	85%
Yarram system	27	536	145	207	5	179	536	27	66%

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, and on 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 19,000 is supplied, with the population swelling to over 100,000 in peak holiday periods.

Table 8-25 summarises Westernport Water's distribution system's water balances.

Table 8-25 Westernport Water distribution system's water balance

Westernport Water	Volume (ML)
Volumes in store	
Start volume in store (1 July 2014)	-
End volume in store (30 June 2015)	-
Change in storage	-
Inflows	
From Candowie Reservoir	1,848
From Bass River	0
Recycled water	10
Unaccounted for inflows (balancing item)	59
Total inflows	**1,917**
Outflows	
Deliveries	
To residential customers	1,103
To non-residential customers	594
Owners corporations	55
Westernport Water operations	32
Total deliveries	***1,784***
Losses	
System losses(5)	133
Total losses	***133***
Total outflows	**1,917**
System efficiency (%)	93%

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 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 2014)	
Silvan Reservoir	35,652
Cardinia Reservoir	184,284
Sugarloaf Reservoir	83,817
Greenvale Reservoir	17,472
Total start volume	***321,225***
End volume in store (30 June 2015)	
Silvan Reservoir	34,021
Cardinia Reservoir	166,957
Sugarloaf Reservoir	65,249
Greenvale Reservoir	22,342
Total end volume	***288,569***
Change in storage	**(32,656)**
Inflows	
From Yarra basin to Silvan	293,343
From Yarra basin to Sugarloaf	54,266
From Goulburn River to Sugarloaf	0
From Tarago Reservoir	9,167
Rainfall on four main storages	14,974
Unaccounted for inflow (balancing item)	19,290
Total inflows	**391,040**
Outflows	
Passed to other systems	
To South East Water	145,650
To Yarra Valley Water	148,285
To City West Water	107,337
To Western Water	254
To Gippsland Water	272
To Cardinia Creek from Cardinia	1,825
To Stonyford Creek from Silvan	730
Total passed to other systems	***404,353***
Losses	
Evaporation from four main storages	15,957
System losses[(2)]	3,386
Total losses	***19,343***
Total outflows	**423,696**
System efficiency	95%

Notes:
(1) Storage figures do not include service reservoirs and tanks.
(2) System losses included treatment plant losses, but exclude aqueduct leaks as that is outside of the common distribution system.

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.

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 2014)	523
End volume in store (30 June 2015)	523
Change in storage	**0**
Inflows	
From Melbourne Water	145,700
Recycled water - imported from bulk supplier	1,588
Recycled water - imported from local treatment plant	3,397
Total inflows	**150,685**
Outflows	
Deliveries	
To residential customers	95,955
To non-residential customers	33,947
To authorised non-metered	1,807
Recycled water used	4,621
Total deliveries	***136,330***
Losses	
System losses(1)	14,355
Total losses	***14,355***
Total outflows	**150,685**
System efficiency (%)	90%

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 2014)	-
End volume in store (30 June 2015)	-
Change in storage	**-**
Inflows	
From Melbourne Water	148,334
Total inflows	**148,334**
Outflows	
Deliveries	
To residential customers	104,402
To non-residential customers	28,141
Non-revenue consumptive delivery	2,738
Total deliveries	***135,281***
Losses	
System losses	13,053
Total losses	***13,053***
Total outflows	**148,334**
System efficiency	91%

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 2014)	-
End volume in store (30 June 2015)	-
Decrease in storages	**-**
Inflows	
From Melbourne Water	107,328
Recycled water - imported from bulk supplier(1)	290
Total inflows	**107,618**
Outflows	
Deliveries	
To residential customers	55,740
To non-residential customers	41,491
Recycled water used	311
Total deliveries	***97,542***
Losses	
System losses(2)	10,076
Total losses	***10,076***
Total outflows	**107,618**
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 a separate supply to Myrniong. Romsey 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, Woodend and Lancefield	Bulk supply from Melbourne Water, Rosslynne Reservoir system, Merrimu Reservoir, Djerriwarrh Reservoir and Kerrie Reservoir, Garden Hut Reservoir and groundwater, Campaspe Reservoir and Campaspe River tributaries, Mount Macedon storages and tributaries *(indirectly supplemented from integrated system in times of drought)*	Melton, Gisborne, Romsey, Lancefield, Woodend
Myrniong	Myrniong (*Myrniong is separate and not connected to the integrated system)*	Pykes Creek Reservoir	Myrniong

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	1,430	13,913	9,798	1,788	1,465	1,003		14,054	1,289	82%
Myrniong		45	34	6		5		45		89%

8.4.7 Barwon Water

Barwon Water supplies the greater Geelong area (including the Bellarine Peninsula and towns as far west as Birregurra and Forrest), the Colac area, the Aireys Inlet area, the Lorne area and the Apollo Bay area.

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	Other system losses (1)			
Aireys Inlet	0	204	144	10	13	37	204	0	75%
Apollo Bay	102	636	18	119	97	148	382	356	36%
Colac system	628	3,669	1,525	1,214	74	907	3,720	577	74%
Geelong/Bellarine	36,182	25,165	19,282	7,773	1,552	7,027	35,634	25,713	76%
Lorne	0	393	226	90	29	48	393	0	80%

Note:
(1) 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.

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, i.e. 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		Total outflows		
			To urban residential	To urban other	Reticulation(2)	Other system losses(3)			
Amphitheatre		12	11	1			12		98%
Avoca		173	81	30	11	51	173		64%
Beaufort & Raglan		206	103	31	25	47	206		65%
Blackwood & Barrys Reef		30	24	5	6	(5)	30		97%
Clunes		209	131	37	39	2	209		80%
Daylesford system		644	350	153	141		644		78%
Dean(4)		19	4	2		13	19		27%
Forest Hill system		183	103	15	47	18	183		64%
Greater Ballarat		12,866	7,317	3,221		2,328	12,866		82%
Landsborough & Navarre		35	17	7	10	1	35		66%
Learmonth		46	21	18		7	46		85%
Lexton		39	13	3	7	16	39		41%
Maryborough and District		1,869	842	315	165	547	1,869		62%
Redbank		6	4			2	6		78%
Waubra		30	18	2		10	30		64%

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	10	3,907	2,535	121	1,251	3,907	10	68%
Werribee Irrigation district	180	14,997	7,975	235	6,817	15,027	150	55%

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 over 24,500 square kilometres from the South Australian border in the west, to Balmoral in the north, to Lismore in the east and 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	n/a
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	Delivery(1)	Reticulation(2)					
Balmoral		46	14	6	14	1	11		46			73%
Dilwyn Aquifer		2,955	1,171	1,173	80	365	166		2,955			82%
Glenthompson	64	33	8	2	22	1	8		41		56	78%
Grampians System (excl Balmoral)	2,521	1,172	773	234	90	213	231	46	1,587		2,106	72%
Konongwootong		99			43	56			99			44%
Newer Volcanic Aquifer		148	61	23	7	24	11	22	148			76%
Otway System	2,108	9,163	2,947	2,250	2,172	699	1,174		9,242		2,029	80%

Port Campbell Limestone Aquifer		804	188	75	35	79	39	388	804		85%

Notes:

(1) Delivery losses represent the loss of water from the point of extraction from the source and the reticulation system (and are balancing item)

(2) Reticulation losses represent the losses in the reticulation system

8.5.2 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

Distribution systems: Western region

GWMWater also operates some 18 fully urban distribution systems, summarised in Table 8-40.

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 ground water	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	Total outflows		
Northern Mallee Pipeline	180	3,421	497	228	1,589	1,107	3,421	180	61%
Wimmera Mallee Pipeline Supply Systems 1	0	1,559	558	184	486	331	1,559	0	67%
Wimmera Mallee Pipeline Supply System 2	0	3,187	637	164	1,708	678	3,187	0	74%
Wimmera Mallee Pipeline Supply System 3	0	1,990	120	25	1,421	424	1,990	0	77%
Wimmera Mallee Pipeline Supply System 4	0	4,219	656	316	2,350	897	4,219	0	71%
Wimmera Mallee Pipeline Supply System 5	0	326	41	17	242	26	326	0	87%
Wimmera Mallee Pipeline Supply System 6	107	561	1	0	471	97	569	99	83%
Wimmera Mallee Pipeline Supply Systems 7	0	223	72	95	8	48	223	0	36%

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		Passed to other systems	Total outflows		
			To urban residential	To urban other	Reticulation(1)	Other system losses(2)				
Surface water systems										
Ararat system	232	1,349	714	586	0	19	0	1,319	262	99%
Buangor(3)	24	13	11	1	0	(1)	0	11	26	114%
East Grampians system (Willuara)	107	311	123	76	0	94	30	323	95	61%
Elmhurst(3)	23	17	15	3	0	(7)	0	11	29	154%
Horsham system	223	3,046	1,833	389	194	628	0	3,044	225	73%
Quambatook	110	121	33	30	0	68	0	131	100	48%
Stawell system	218	1,764	628	887	83	61	0	1,659	323	91%
Groundwater systems										
Apsley(3)		24	22	8	0	(6)	0	24		125%
Cowangie		9	1	1	0	7	0	9		20%
Edenhope	0	260	81	113	20	46	0	260	0	74%
Goroke		55	34	7	0	14	0	55		74%
Harrow		37	22	3	0	12	0	37		68%
Kaniva		230	136	65	0	29	0	230		87%
Kiata	0	5	3		0	2	0	5	0	54%
Lillimur		9	6	0	0	3	0	9		67%
Miram		1	1	0	0	0	0	1		105%
Murrayville		124	67	37	0	20	0	124		84%
Serviceton		8	4	1	0	3	0	8		67%
Streatham & Westmere	6	31	6	5	0	18	0	29	8	38%

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: 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 2014–15 was estimated to be 469 mm, which is about 14% less than the long-term average from 1961 to 1990. Modelled estimates of basin evapotranspiration are presented in Figures C-1, which shows that all basins, with the exception of a few basins in the south east, have evapotranspiration estimates for 2014–15 lower 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 2014–15 and the long-term averages varied between basins. The difference was greatest in the north-west, where evapotranspiration was up to 35% below the long-term average, whereas in the far south-east evapotranspiration estimates were similar to the long term average (Figure C-1). These differences broadly reflect rainfall over the year, with most areas of Victoria receiving below average rainfall.

Figure C-1 Modelled evapotranspiration per unit area (mm) in 2014–15

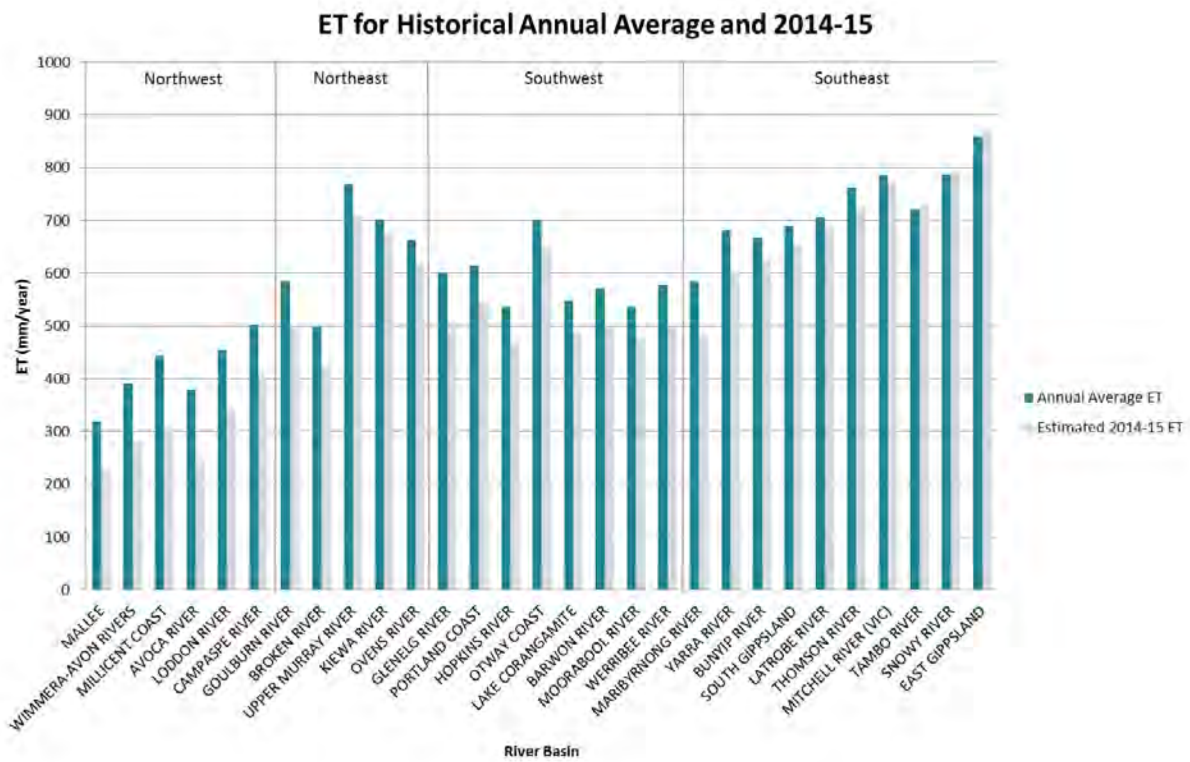
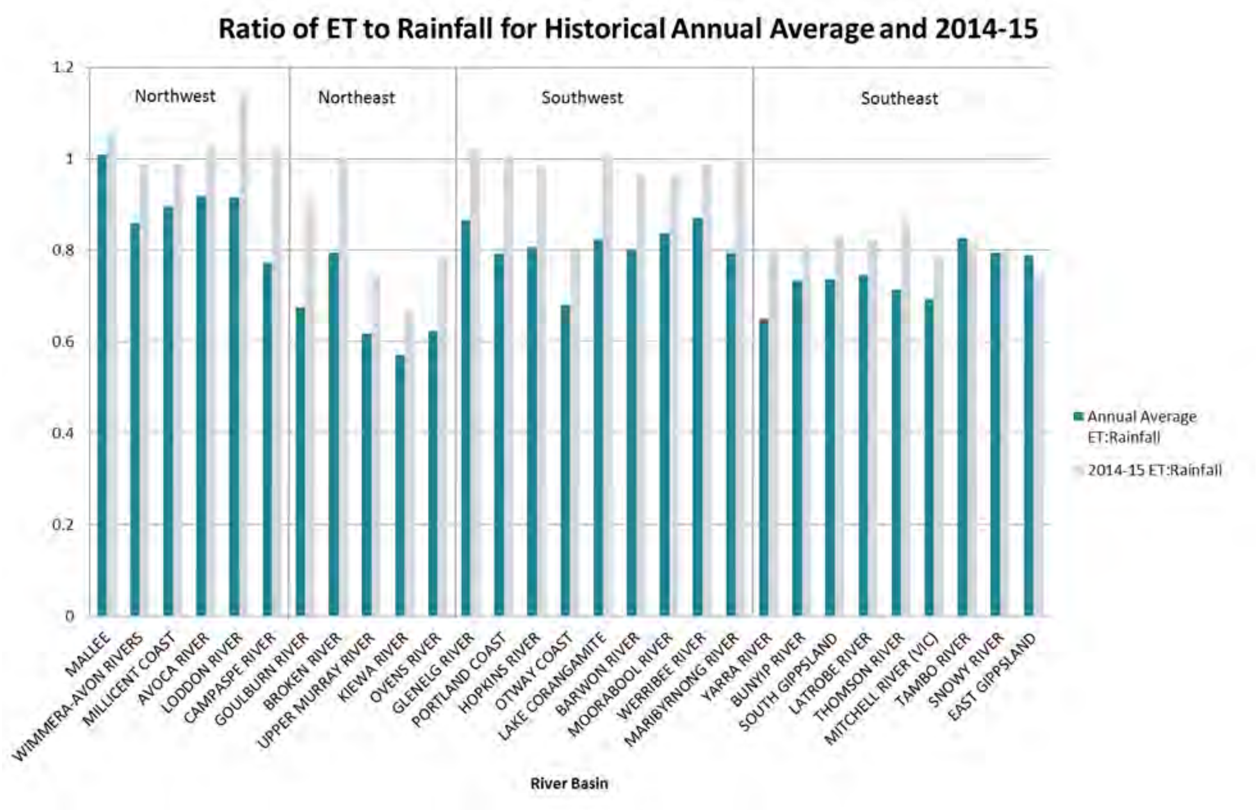


Figure C-2 illustrates evapotranspiration as a proportion of rainfall in Victoria's basins. In 2014–15, the proportion of evapotranspiration to rainfall was generally higher than the long term average in most basins except some areas in the south east. This is consistent with below average rainfall across most parts of the State for 2014–15, 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 2014–15 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)

Below average rainfall over north-eastern Victoria in 2014–15 resulted in estimates of evapotranspiration that were below average for the north-eastern basins. The estimated evapotranspiration ranged from 425 millimetres in the Broken basin to 709 millimetres in the Upper Murray basin, and comparisons with the long-term average ranged from 4% below average in the Kiewa basin to 15% below average in the Broken and Goulburn basins (Figure C-1).

In 2014–15, evapotranspiration as a proportion of rainfall in the north-eastern basins was higher than 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 (100%, compared to the long-term average of 79%), and the lowest was in the Kiewa basin (67% compared to the long-term average of 57%) (Figure C-2).

South-east Victoria (East Gippsland to Yarra basins)

Rainfall over south-eastern Victoria varied between slightly above average and below average, resulting in varying estimates of evapotranspiration for the south-eastern basins. In 2014–15, the estimated evapotranspiration ranged from 603 millimetres in the Yarra basin to 873 millimetres in the East Gippsland basin, and comparisons with the long-term average ranged from 11% below average in the Yarra basin to 2% above average in the East Gippsland basins (Figure C-1).

In 2014–15, evapotranspiration as a proportion of rainfall in the south-eastern basins varied between 16% below average to 4% above average. The Thomson River basin was estimated to have the south-east region's highest evapotranspiration as a proportion of the year's rainfall (86% compared to the long term average of 71%), and the lowest was in the East Gippsland basin (75%, compared to the long term average of 79%) (Figure C-2).

South-west Victoria (Maribyrnong to Glenelg basins)

Below average rainfall over south-western Victoria resulted in estimates of evapotranspiration that were below average for the south-western basins. In 2014–15, the estimated evapotranspiration ranged from 468 millimetres in the Hopkins basin to 649 millimetres in the Otway basin, and comparisons with the long-term average ranged from 18% below average in the Maribyrnong basin to 8% below average in the Otway basin (Figure C-1).

In 2014–15, evapotranspiration as a proportion of rainfall in the south-western basins was less than the long-term average. The Glenelg basin was estimated to have the south-west region's highest evapotranspiration as a proportion of rainfall in 2014–15, (102% compared to the long-term average of 87%) and the Otway basin the lowest (80% compared with the long-term average of 68%) (Figure C-2).

North-west Victoria (Mallee to Campaspe River basins)

Below average rainfall in north-western Victoria resulted in estimates of evapotranspiration that were below average for the north-western basins. In 2014–15, the estimated evapotranspiration ranged from 234 millimetres in the Mallee basin to 406 millimetres in the Campaspe basin, and comparisons with the long-term average ranged from 35% below average in the Avoca basin to 19% below in the Campaspe basin (Figure C-1).

In 2014–15, evapotranspiration was either similar, or greater than, the rainfall. This indicates that some land uses (such as native forests) may have been accessing groundwater. The Loddon basin was estimated as having the north-west region’s highest evapotranspiration as a proportion of rainfall (114% compared with the long term average of 91%) and the lowest was in the Wimmera-Avon Rivers and the Millicent Coast basins (99%, compared to the average of 86% and 90% respectively) (Figure C-2).

Key assumptions and data limitations

These 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 B: Storage levels

Basin	Reservoir	On-stream / Off-stream	Storage capacity (ML)	% full at 1 July 2014	% full at 30 June 2015
Murray	Lake Victoria (Victoria's share only)	On-stream	338,500	69%	75%
	Menindee Lakes (Victoria's share only)	On-stream	785,000	0%	0%
	Lake Hume (Victoria's share only)	On-stream	1,502,579	67%	32%
	Lake Dartmouth (Victoria's share only)	On-stream	1,928,116	100%	98%
	Lake Cullulleraine	On-stream	5,270	84%	82%
Kiewa	Rocky Valley	On-stream	28,294	38%	53%
	Lake Guy	On-stream	1,416	67%	31%
	Clover Pondage	Off-stream	255	75%	82%
	Pretty Valley Basin	Off-stream	355	100%	100%
Ovens	Lake William Hovell	On-stream	13,690	104%	98%
	Lake Buffalo	On-stream	23,900	68%	61%
Broken	Lake Nillahcootie	On-stream	40,400	82%	53%
	Loombah-McCall Say	On-stream	1,747	100%	93%
Goulburn	Lake Eildon	On-stream	3,334,158	72%	56%
	Goulburn Weir	On-stream	25,500	95%	99%
	Sunday Creek Reservoir	On-stream	1,650	89%	64%
	Greens' Lake	Off-stream	32,440	63%	69%
	Waranga Basin	Off-stream	432,362	60%	35%
Campaspe	Upper Coliban Reservoir	On-stream	37,770	68%	54%
	Lauriston Reservoir	On-stream	19,790	80%	88%
	Malmsbury Reservoir	On-stream	12,034	51%	37%
	Lake Eppalock	On-stream	304,651	74%	45%
	Campaspe Weir	Off-stream	2,624	100%	89%
Loddon	Newlyn Reservoir	On-stream	3,012	54%	45%
	Tullaroop Reservoir	On-stream	72,950	54%	38%
	Cairn Curran Reservoir	On-stream	147,130	57%	35%
	Laanecoorie Reservoir	On-stream	7,940	33%	32%
	Hepburn Lagoon	On-stream	2,457	59%	48%
	Evansford Reservoir	Off-stream	1,346	78%	84%
	Sandhurst Reservoir	Off-stream	2,590	58%	80%
	Spring Gully Reservoir	Off-stream	1,680	42%	50%
East Gippsland	None	-	-	-	
Snowy	None	-	-	-	
Tambo	None	-	-	-	
Mitchell	None	-	-	-	
Thomson	Lake Glenmaggie	On-stream	177,640	61%	58%
	Thomson Reservoir	On-stream	1,068,000	76%	72%
Latrobe	Blue Rock	On-stream	208,188	100%	100%
	Lake Narracan	On-stream	7,230	52%	85%
	Moondarra Reservoir	On-stream	30,458	96%	100%
South Gippsland	Lance Creek Reservoir	On-stream	4,200	72%	71%
	Hyland Reservoir	On-stream	671	75%	42%

	Western Reservoir	On-stream	1,137	70%	72%
	Candowie Reservoir	On-stream	4,463	77%	61%
Bunyip	Tarago Reservoir	On-stream	37,580	101%	100%
Yarra	Upper Yarra Reservoir	On-stream	200,579	52%	50%
	O'Shannassy Reservoir	On-stream	3,123	104%	60%
	Maroondah Reservoir	On-stream	22,179	44%	61%
	Yan Yean Reservoir	On-stream	30,266	89%	85%
	Cardinia Reservoir	Off-stream	286,911	64%	58%
	Greenvale Reservoir	Off-stream	26,839	65%	83%
	Silvan Reservoir	Off-stream	40,445	88%	84%
	Sugarloaf Reservoir	Off-stream	96,253	87%	68%
Maribyrnong	Rosslynne Reservoir	On-stream	25,368	75%	44%
Werribee	Melton Reservoir	On-stream	14,364	9%	9%
	Merrimu Reservoir	On-stream	32,516	62%	29%
	Pykes Creek Reservoir	On-stream	22,119	81%	58%
	Djerriwarrh Reservoir	On-stream	1,014	61%	55%
Moorabool	Korweinguboora Reservoir	On-stream	2,091	9%	21%
	Bostock Reservoir	On-stream	7,455	23%	2%
	Lal Lal Reservoir	On-stream	59,549	75%	68%
	Wilsons Reservoir	On-stream	1,010	13%	1%
	Moorabool Reservoir	On-stream	6,192	50%	27%
	Upper Stony Creek Reservoir	Off-stream	9,494	70%	57%
Barwon	West Barwon Dam	On-stream	21,504	86%	77%
	White Swan Reservoir	On-stream	14,107	61%	49%
	Gong Gong Reservoir	On-stream	1,902	27%	26%
	Wurdee Boluc Reservoir	Off-stream	40,431	71%	48%
Corangamite	None	-	-	-	
Otway Coast	West Gellibrand Reservoir	On-stream	1,856	100%	74%
Hopkins	None	-	-	-	
Portland Coast	None	-	-	-	
Glenelg	Rocklands Reservoir	On-stream	348,300	24%	17%
	Moora Moora Reservoir	On-stream	6,300	62%	19%
	Konongwootong Reservoir	On-stream	1,920	70%	86%
	Hamilton System Reservoirs	On-stream	2,654	90%	75%
Millicent Coast	None	-	-	-	
Wimmera	Taylors Lake	On-stream	27,060	36%	23%
	Lake Lonsdale	On-stream	65,480	11%	1%
	Wartook Reservoir	On-stream	29,300	56%	61%
	Lake Bellfield	On-stream	78,560	74%	65%
	Fyans Lake	On-stream	18,460	85%	67%
	Batyo Lake	On-stream	2,250	0%	0%
	Dock Lake	On-stream	4,420	0%	0%
	Green Lake	On-stream	5,350	56%	38%
	Pine Lake	On-stream	62,000	0%	0%
	Toolondo Reservoir	On-stream	92,430	17%	10%
Mallee	None	-	-	-	-
Avoca	None	-	-	-	-

Appendix C: Groundwater entitlement and use

GMU	PCV	Allocation limit at 30/06/15 (ML)	Licenses				Domestic and stock		Total use (licensed + domestic and stock)
			Licensed entitlements (ML)	No. of licences	No. of metered bores	Groundwater use(ML)	No. of domestic and stock bores[2]	Estimated use (ML)[3]	
Goulburn–Murray Water									
WSPA (approved plan)									
Katunga WSPA[3]	60,577	42,022	60,459	249	289	26,598	737	1,474	28,072
Upper Ovens WSPA	0	3,743	3,743	107	126	674.3	271	542	1,216
WSPA (draft plan)									
Loddon Highlands WSPA	20,697	19,948	20,691	181	296	6,904	620	1,240	8,144
Lower Campaspe Valley WSPA	55,875	55,875	55,875	138	169	36,057	514	1028	37,085
GMA									
Barnawartha GMA	2,100	2,100	375	4	7	0	22	44	44
Central Victorian Mineral Springs GMA	6,024	6,024	6,024	135	148	395	1,507	3,014	3,409
Kiewa GMA	3,852	3,852	2,807	98	113	74	288	576	650
Lower Ovens GMA	25,200	25,200	20,003	265	344	4,722	1,572	3,144	7,866
Mid Goulburn GMA	12,470	12,470	12,470	64	81	2,682	160	320	3,002
Mid Loddon GMA	34,037	34,037	33,831	105	130	17,165	326	652	17,817
Mullindolingong GMA	0	0	0	0	0	0	0	0	0
Shepparton Irrigation GMA[4]	n/a	194,785	194,785	1,108	1,098	72,056	1,345	2,690	3,056
Strathbogie GMA	1,660	1,660	1,487	63	72	169	267	534	703
Upper Goulburn GMA	8,568	8,568	6,076	112	138	424	512	1,024	1,448
Upper Murray GMA	7,674	3,347	3,347	70	88	449	208	416	865
Unincorporated areas									
Goulburn–Murray unincorporated areas	0	0	17,893	237	0	6,586	1,422	2,844	9,430
GWMWater									
WSPA (approved plan)									
Murrayville WSPA	10,883	10,883	9,634	32	46	4,961	107	214	5,175
West Wimmera GMA[5]	57,409	57,409	53,357	171	243	20,421	596	1,192	21,613
Unincorporated areas									
GWMWater unincorporated areas	0	0	12,954	48	54	6,952	420	840	7,792
Southern Rural Water									
WSPA (approved plan)									
Koo-Wee-Rup WSPA	12,915	12,915	12,598	364	247	3,693	1,061	1,592	5,285

Nullawarre WSPA[6]	22,741	22,741	22,733	229	163	13,285	0	0	13,285
Warrion WSPA	14,086	14,086	14,081	137	145	5,261	265	397.5	5,659
Yangery WSPA[6]	14,352	14,352	14,341	154	176	3,693	0	0	3,693
Yarram WSPA	25,690	25,690	25,689	87	90	11,309	321	527	11,835
WSPA (draft plan)									
Bungaree WSPA	5,334	5,334	5,333	104	147	2,262	188	282	2,544
Condah WSPA	7,475	7,475	7,475	37	44	3,208	54	81	3,289
Denison WSPA[7]	18,502	18,502	18,501	122	127	8,509	164	246	8,755
Deutgam WSPA	5,100	5,100	5,082	147	193	1,406	100	150	1,556
Glenelg WSPA	33,262	33,262	33,261	84	98	7,787	1,090	1,635	9,422
Sale WSPA	21,238	21,238	21,218	114	116	8,762	540	810	9,572
Wandin Yallock WSPA	3,008	3,008	2,995	193	210	509	59	88.5	597.5
Wy Yung WSPA	7,463	7,463	7,462	59	73	528	0	0	528
GMA									
Colongulac GMA	4,695	4,695	4,407	69	37	1,459	107	160.5	1,620
Cardigan GMA	3,967	3,967	3,878	22	23	784	90	135	919
Corinella GMA	2,550	2,550	662	14	9	49	60	90	139
Cut Paw Paw GMA	3,650	3,650	514	4	4	246	0	0	246
Frankston GMA	3,200	3,200	1,516	29	24	50	99	149	199
Gellibrand GMA	0	0	0	0	0	0	1	2	2
Gerangamete GMA[8]	20,000	20,000	8,000	1	6	0	3	5	5
Giffard GMA	5,689	5,689	5,689	17	18	877	53	80	957
Glenormiston GMA	2,698	2,698	2,636	42	28	1,459	74	111	1,570
Hawkesdale GMA	16,161	16,161	12,451	114	101	6,274	1,072	1,608	7,882
Heywood GMA	8,500	8,500	7,011	92	70	1,874	1,117	1,676	3,550
Jan Juc GMA[9]	39,250	39,250	11,250	3	7	3,877	4	6	3,883
Lancefield GMA	1,485	1,485	1,378	15	20	269	58	87	356
Leongatha GMA	6,500	6,500	1,803	33	13	128	74	111	239
Merrimu GMA	451	451	440	15	19	343	8	12	355
Moe GMA	8,200	8,200	3,889	96	33	446	122	183	629
Moorabbin GMA	2,700	2,700	2,612	57	71	1,171	202	303	1,474
Nepean GMA[5]	6,110	6,110	6,110	77	78	2,418	1,861	1,861	4,279
Newlingrook GMA[5]	1,977	1,977	1,958	6	6	738	2	3	741
Orbost GMA	1,217	1,217	1,217	4	5	150	6	9	159
Paaratte GMA	4,606	4,606	3,212	6	1	340	1	2	342
Portland GMA	7,795	7,795	7,794	8	7	2,514	1	2	2,516
Rosedale GMA[5][10]	22,372	22,372	23,217	69	49	10,303	206	309	10,612
Stratford GMA[5][10]	27,645	27,645	36,635	11	6	21,524	45	68	21,592
Tarwin GMA	1,300	1,300	38	3	1	8	593	890	898
Wa De Lock GMA[5][7]	30,795	30,795	29,286	250	193	6,098	312	468	6,566
Unincorporated areas									
Southern Rural Water unincorporated areas	0	0	73,142	1,550	871	14,378	9,183	13,774	28,152
Total	**731,705**	**906,602**	**957,323**	**7,625**	**6,971**	**355,278**	**30,090**	**49,696**	**404,974**

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) The Minister for Water has abolished the Shepparton Irrigation WSPA and revoked the Groundwater Management Plan in February 2014. The new Groundwater Management plan was approved on 3 June 2015. There is no permissible consumptive volume for the Shepparton Irrigation GMA as there is no limit on the total volume of shallow groundwater entitlement available.
(5) West Wimmera 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.
(6) The Nullaware and Yangery WSPAs and the Hawkesdale and Heywood GMAs were revoked during the 2014–15 year. The South West Limestone GMA was approved in their place. Because the changes were not in place until very late in the year, the new arrangements were not used for accounting in the *Victorian Water Accounts 2014–15*.
(7) The volume of use in Denison WSPA and Wa De Lock GMA includes metered extractions for salinity control (Denison WSPA 3,207 ML and Wa De Lock GMA 735 ML).
(8) 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.
(9) 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.
(10) The use volume reported in Rosedale and Stratford GMA includes metered extractions from Latrobe Valley mines (Rosedale GMA 4,351 ML and Stratford GMA 21,521 ML).

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	GWMWater
	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 Hyrdro 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 (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
Goulburn	*Bulk Entitlement (Broadford, Kilmore and Wallan) Conversion and Augmentation Order 2003*	Goulburn Valley Water

River basin	Entitlements	Holder
	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
Goulburn	*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 Hyrdro Ltd) Conversion Order 1997	AGL Hydro Ltd
	Silver and Wallaby Creeks Environmental Entitlement 2006	Victorian Environmental Water Holder
	Bulk Entitlement (Silver & Wallaby Creeks – Melbourne) Melbourne Retailers Order 2014	City West Water, South East Water and 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 Higlands 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
	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

Appendix D: Bulk entitlement holders

River basin	Entitlements	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
	Bulk Entitlement (Thomson River – Melbourne Water) Order 2014	City West Water, South East Water and Yarra Valley 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
	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

River basin	Entitlements	Holder
	Bulk Entitlement (Meeniyan) Conversion Order 1997	South Gippsland Water
	Bulk Entitlement (Desalinated Water – City West Water Limited) Order 2014	Melbourne Water
	Bulk Entitlement (Desalinated Water – South East Water Limited) Order 2014	Melbourne Water
	Bulk Entitlement (Desalinated Water – Yarra Valley Water Limited) Order 2014	Melbourne Water
South Gippsland	*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) Conversion Order 2014	Melbourne Water
Yarra	*Bulk Entitlement (Yarra River – Melbourne Water) 2014*	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
	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

Appendix D: Bulk entitlement holders

River basin	Entitlements	Holder
	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
Glenelg	*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.