Australian Government

Murray–Darling Basin Authority

Annual Water Take Report 2021–22

Report on water availability and take under Sustainable Diversion Limits in the Murray–Darling Basin

Including findings from the Cap on diversions

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Acknowledgement of the Traditional Owners of the Murray–Darling Basin

We acknowledge the Traditional Owners and Custodians of Country throughout the Murray–Darling Basin and their continuing connection to land, waters and community. We offer our respects to the people, the cultures and the Elders past, present and emerging.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

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Executive summary

The Annual Water Take Report 2021–2022 documents the Murray–Darling Basin Authority's (MDBA) assessment of water use (referred to as 'take') across the Murray–Darling Basin for the 2021–22 water year. This report provides insight on water availability, consumptive and environmental water held and used and is generated from the Sustainable Diversion Limit (SDL) accounting data the MDBA collects in undertaking its responsibilities.

This report also provides commentary and compliance assessment outcomes of the Cap on diversions as a requirement of Schedule E to the Murray–Darling Basin Agreement.

Key findings:

Consumptive water use

1. Most parts of the Basin received average to above average rainfall in 2021–22, particularly in NSW and Queensland, with areas such as the Border Rivers subjected to flooding. It was generally wetter than in 2020–21. Temperatures in the Basin remained average to above average.
2. Driven by the wetter conditions, the amount of water lawfully available to users under state frameworks was generally higher than the previous year, 2020–21, increasing from ~14,400 GL/y to ~15,700 GL/y Basin-wide. The predominant increase occurred in NSW and Queensland, where most of the above average rainfall fell.
3. The increase in water availability resulted in high annual consumptive take across the Basin, in the order of 11,000 GL, which was the highest use post 2013–14. However, this was only a minor increase compared to 2020–21 (~4%, or 454 GL) which was also wetter than average. In NSW use in 2021–22 was virtually the same as in the previous year. Heavy rainfalls and flooding may have reduced the need for additional irrigation in some parts of the Basin.
4. At the Basin scale, the proportion (%) of water actually taken decreased from 77% of the volume that was lawfully accessible in 2019–20, to 70% in 2021–22.
5. Compared to 2020–21, the slight increase in surface water take was coupled with a continuing decrease in groundwater annual actual take (by 329 GL). This is consistent with an observed trend where groundwater take increases in dry years and decreases in wet years, as it is often utilised as an alternative or supplementary water source to surface water in dry years. The groundwater take for 2021–22, at 895 GL, was the lowest since 2011–12, during which significant rainfall events occurred in both the southern and northern Basins.

Surface water trends in use relative to SDLs

6. The IGWC published an assessment of SDL compliance[1] for 2021–22 in September 2023. This report further considers some of the trends in use relative to the SDLs.
7. The 18 surface water SDL resource units with accredited WRPs accumulated credits of ~1,160 GL in 2021–22. Among the 10 NSW SDL resource units reporting under the Bilateral Agreement in place between the MDBA and NSW, there was an overall debit of 107.4 GL – driven by annual debits in four SDL resource units.

[1] Sustainable Diversion Limit Compliance Statement for 2021–22 (igwc.gov.au)

8. The NSW Murray, Victorian Murray and Goulburn SDL resource units continue to accumulate credits, though the extent of this has varied significantly over the three years.
9. The trend in use relative to the limits in the Murrumbidgee SDL resource unit has changed substantially over the last three years, and demonstrates the need for multiple years of data to be acquired to enable trends to emerge and be understood.

Trade

10. The recent trend in temporary surface water trade continues, with the majority of temporary water trading in 2021–22 occurring within the respective pools of entitlements (i.e. consumptive to consumptive, or environment to environment). The net trade between the two pools was from environment to consumptive entitlements.

Held environmental water

11. The amount of held environmental water (HEW) used increased in 2021–22. This increase reflects increased opportunities to use HEW, driven by the increased availability of HEW entitlements, particularly in the northern Basin. The use of HEW in 2021–22 has assisted environmental water managers to achieve significant positive outcomes for flora and fauna. However, the proportion of HEW used relative to HEW available between 2020–21 and 2021– 22 remained consistent.
12. At a Basin-scale, the proportion of HEW carried over compared to the amount lawfully available for use (~28%), is about the same as that for consumptive users (~30%). The volume of HEW carried over averages about 6% of the total volume of water lawfully available to be used, whereas that carried over by consumptive users averages about 24%.

Cap

13. All Cap valleys remained compliant with the Murray–Darling Basin Cap on diversions in 2021–22.
14. There are two Cap valleys where annual diversions exceed annual cap target. They are the Murrumbidgee (-280.6 GL) and Gwydir (-12.9 GL). Other Cap valleys recorded annual credits in 2021–22, resulting in an overall increase in the cumulative Cap balance of ~1860 GL/y.

The MDBA would like to acknowledge and thank each of the Basin states, the Department of Climate Change, Energy, the Environment and Water (DCCEEW), the Commonwealth Environmental Water Holder (CEWH), and the Bureau of Meteorology (Bureau) for their contribution and ongoing support in the preparation of this report.

1 Introduction

Water accounting in the Murray–Darling Basin occurs at different scales; each with a different purpose. The sustainable diversion limit (SDL) accounting arrangements are established under the *Water Act 2007* (Cth) (the Water Act) and the *Basin Plan 2012* (the Basin Plan). The MDBA prepares two annual reports relating to water accounting at the Basin-scale, this report and the *Sustainable Diversion Limit Accounts*[2] report.

This report uses the best available data and information submitted by Basin States, the Bureau of Meteorology (the Bureau) and the Commonwealth Environmental Water Holder (CEWH) to:

1. Provide an analysis of water availability, take, allocations and trade (Part 1).
2. Identify and account for held environmental water for each financial year in accordance with Section 32 of the Water Act and Schedule 12 Matter 9 of the Basin Plan (Part 1).
3. Meet the MDBA's ongoing commitment to report on annual Basin State compliance with the Cap in accordance with Schedule E to the Murray–Darling Basin Agreement (Part 2).
4. Document progress made to date by the MDBA and the Basin States towards progressive improvement of the accounts (Part 3).

All examinations and interpretations made in this report are solely those of the MDBA unless stated otherwise.

The MDBA is responsible for developing and maintaining annual 'registers of take' across 29 surface water Sustainable Diversion Limit (SDL) 'resource units' and 80 groundwater SDL resource units across the Murray Darling Basin. These registers are used to track water usage relative to SDLs in accordance with the *Basin Plan 2012*; and are provided to the Inspector-General of Water Compliance (IGWC), to inform regulatory actions.

The Basin States, MDBA and the IGWC have completed the annual assessment of water take for 2021–22, with the MDBA publishing registers of take in the *2021–22 Sustainable Diversion Limit Accounts* report[3], and the IGWC publishing an assessment of SDL compliance[4] in September 2023.

Prior to the Basin Plan and SDLs, surface water usage across the Basin was managed via the *Murray Darling Basin Agreement's* Cap on diversions, often referred to as 'the Cap'. The summary assessment of formal Cap compliance is given in the Cap Register[5] and summarised in Part 2 of this report.

Additional information regarding water take in the Basin, including relevant legislation and a glossary is available in Appendix 7. Maps of surface water and groundwater SDL resource units are available in the MDBA maps and spatial data repository[6].

[2] The *Sustainable Diversion Limit Accounts report is also referred to as the 'registers of take' report.*
[3] 2021–22 Sustainable Diversion Limit Accounts (mdba.gov.au)
[4] Sustainable Diversion Limit Compliance Statement for 2021–22 (igwc.gov.au)
[5] Cap compliance reports | Murray–Darling Basin Authority (mdba.gov.au)
[6] Spatial data | Murray–Darling Basin Authority (mdba.gov.au)

Key terms used in this report:

Sustainable Diversion Limit (SDL) is the long-term average annual take of water that can be taken for consumptive use while leaving sufficient water for the environment, and is set by the Basin Plan. An SDL is set for each *SDL Resource Unit;* there are 109 SDL resource units across the Basin for surface and groundwater.

Water Resource Plans (WRP) are prepared by Basin States, reviewed by MDBA, and accredited by the Commonwealth Minister for Water. The WRPs detail the methods used for determining the annual actual take and annual permitted take for each SDL resource unit, for the purposes of assessing SDL compliance.

Cap on diversions (the Cap) was agreed by the Murray–Darling Basin Ministerial Council in 1995 and introduced the first long-term limits on how much water could be taken from rivers in the Basin. The Cap continues in parallel with SDL accounting until Schedule E of the Murray–Darling Basin Agreement is amended or repealed.

Baseline Diversion Limit (BDL) reflects how much could be used, or was being used, in the Basin, prior to the Basin Plan (June 2009). The BDL establishes a baseline from which to determine required reductions in diversions to "bridge the gap" to the SDL.

Water for the environment means held environmental water (HEW) or planned environmental water (PEW).

Part 1: Water availability and take

2 Water availability

This section discusses climate, streamflow, and storage conditions to provide context on how wet or dry the Basin was in the 2021–22 period and how these factors influence water availability for consumptive use and environmental needs.

Water availability is a function of many components including:

- water held in storages (and groundwater in aquifers)
- precipitation on rivers and storages
- water flowing in rivers (upstream inflows)
- rainfall runoff
- evaporation and evapotranspiration.

As the Basin covers a considerable geographical range, climate zones and hydrology shift when moving from the most northern parts of the Basin to the most southerly. Information is therefore often reported with respect to the two broad regions 'northern Basin' and 'southern Basin'.

2.1 Climate, streamflow and storages

2.1.1 Rainfall, temperature and streamflow

Rainfall

Annual rainfall in 2021–22 was much higher than the nine previous years, continuing on from the drought-breaking rainfall relief that fell in 2020–21. The total area-averaged rainfall across the Basin during 2021–22 was 638 mm; 37% higher than the average value of 466 mm. However, an area around the Victorian-South Australian border in the Southern Basin only received average to below average falls.

The above-average rainfall that tended more easterly across the Basin was largely driven by a La Niña event that established in November 2021 and continued into December 2021. The Basin received an area-averaged 124 mm of rainfall during this time (Figure 2-2). This was well above the 90th percentile, leading to wide scale flooding across the Northern Basin.

The wider Basin also received another month of rainfall above the 90th percentile in May 2022 (Figure 2-3); however, by June the oceanic indicators of El Niño Southern Oscillation returned to neutral[7]. Despite some atmospheric indicators showing a La Niña-like signal, rainfall in June 2022 was mostly average to lower than average for most of the Basin.

[7] El Niño Southern Oscillation (ENSO) signals a transition period between La Niña and El Niño

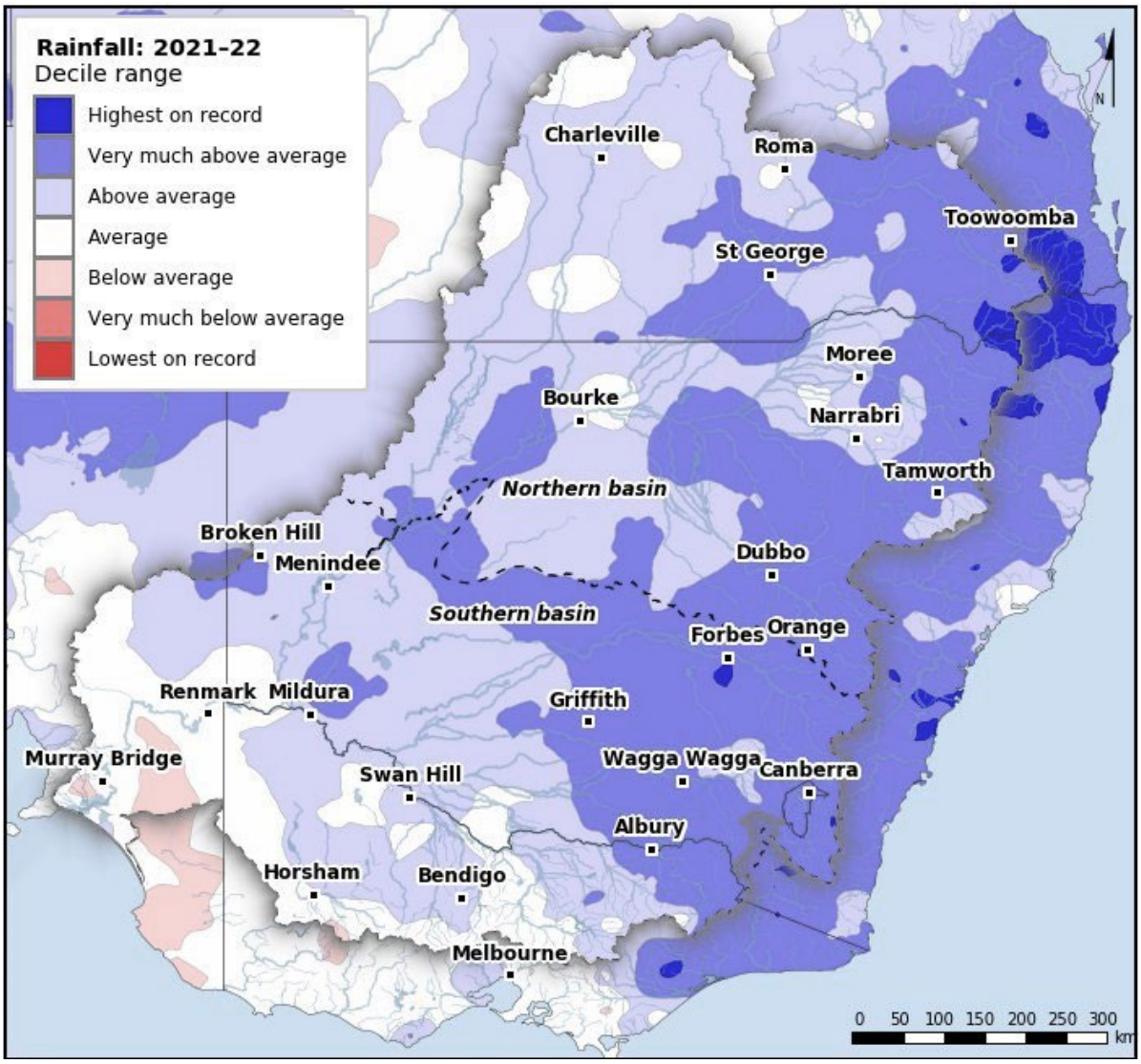


Figure 2-1 Basin rainfall deciles 1 July 2021 to 30 June 2022

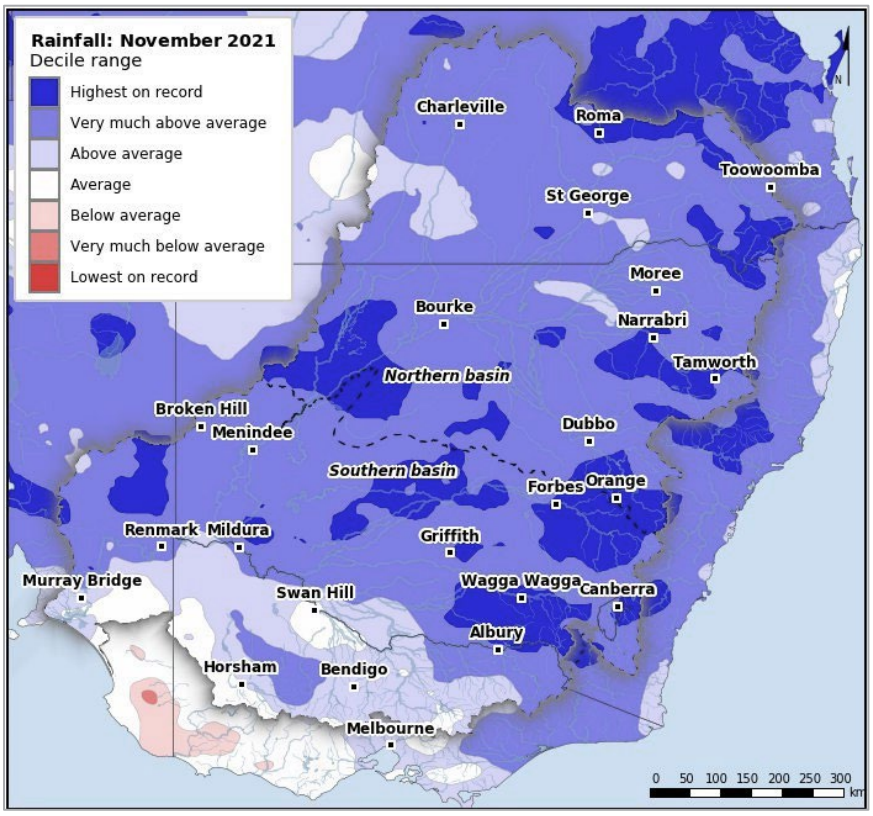


Figure 2-2 Basin rainfall decile for November 2021

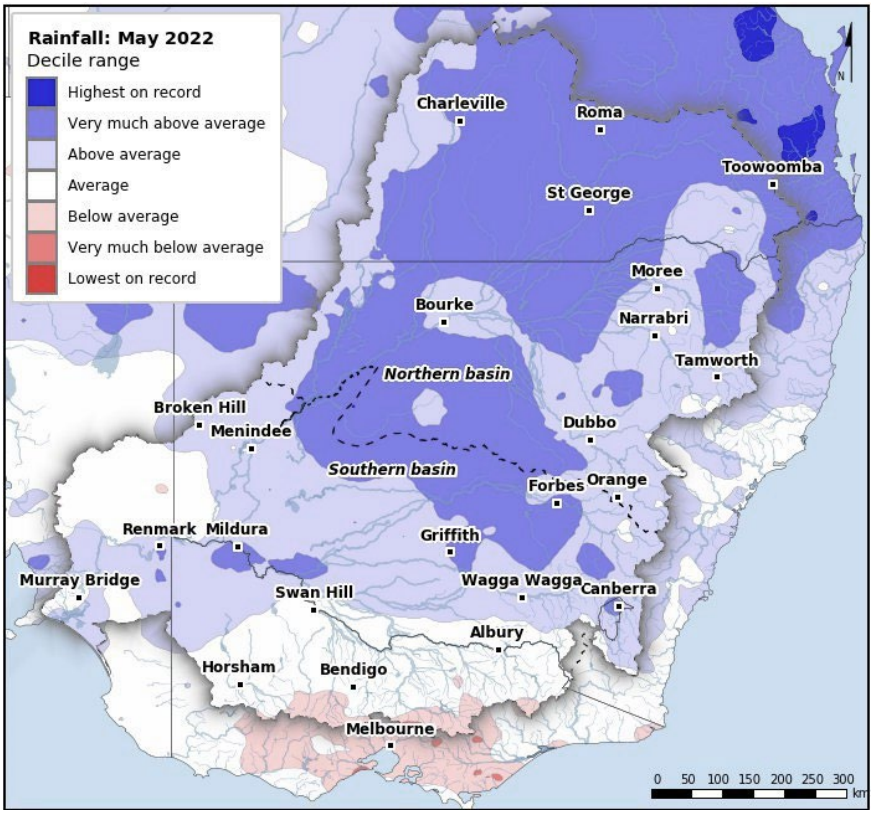


Figure 2-3 Basin rainfall decile for May 2022

Temperature

Mean daily temperatures across most of the Basin were average to above average for the 2021–22 water year (Figure 2-4). Above average temperatures were experienced across most of Queensland, South Australia and Victoria within the Basin area. Inland western areas of New South Wales also experienced higher than average temperatures, with eastern New South Wales experiencing cooler than average mean temperatures.

Temperatures were warm for most of the areas in the mid-winter (July-August), autumn (March-May) and January 2022. In contrast, mid-spring (October-November), summer (December and February) and June 2022 saw average to below average mean temperatures across the Basin, reflecting the increased cloud cover and rainfall during this period.

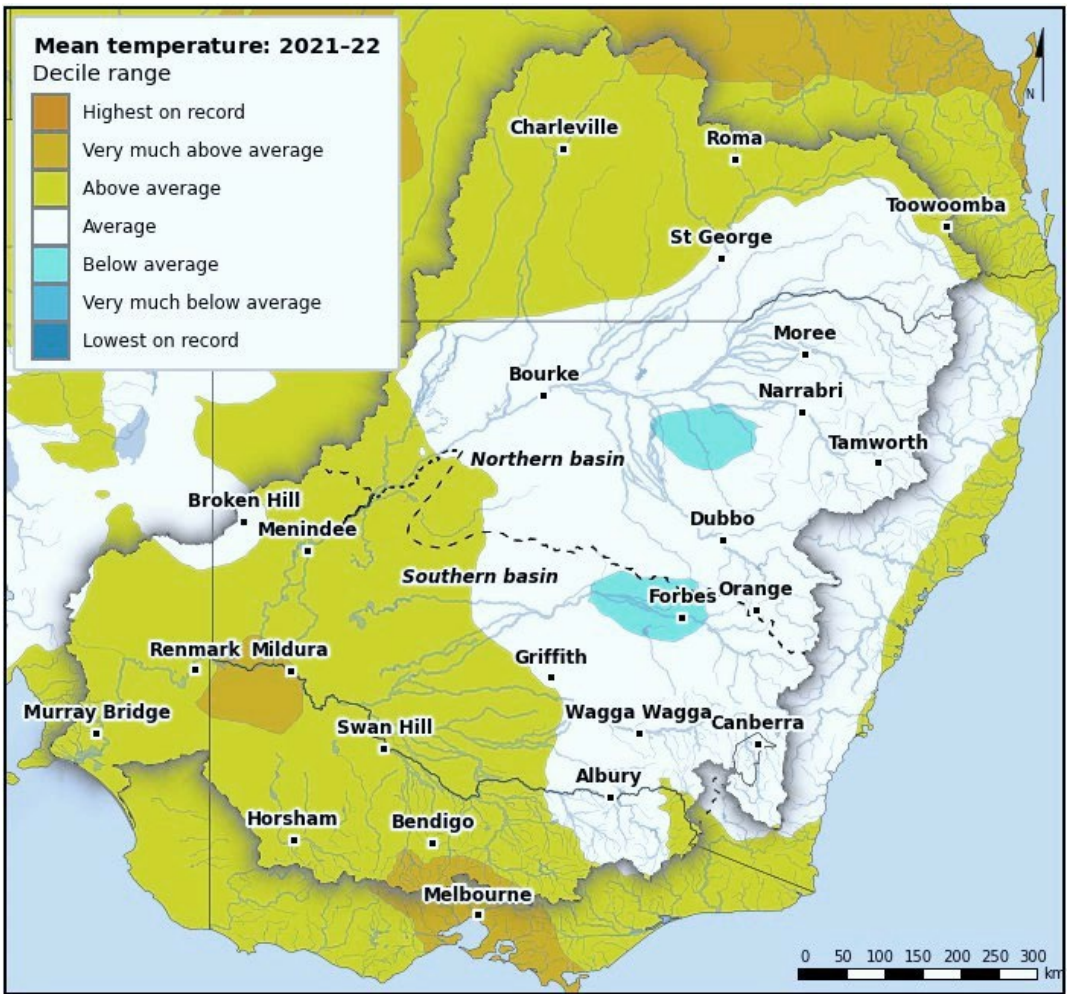


Figure 2-4 Mean temprature deciles 1 July 2021 to 30 June 2022

Streamflow

November's heavy rainfall contributed to widespread flooding across parts of inland New South Wales and Queensland within the Basin, such that by the end of 2021, soil moisture in the eastern Murray–Darling Basin was above average to highest on record. The saturated soil conditions,

combined with ongoing heavy rainfall drove average to higher-than-average streamflow. More than 60% of gauging stations across the Basin recorded flows that were above average.

Total annual flow recorded at Lock 1 (Station A4260903) on the River Murray was 8,374 GL. Lock 1, being close to the river mouth, is extremely influenced by regulation. As such, using streamflow readings at this site as an indicator of flow conditions across the wider Basin should be treated with caution. However, it is noted that this flow is considerably higher than the average (1961–2021) value of 5,546 GL, and was a 236% increase on the previous water year (2020–21) when only 2,492 GL was recorded.

2.1.2 Water in storages

The Murray Darling Basin has a storage capacity of 4,708 GL in the northern Basin and 16,296 GL in the southern Basin. With a storage capacity of 1,253 GL, the Lachlan catchment is also situated in the southern area but is reported on separately to the south as it is a closed system.

In the northern Basin (Figure 2-5) water use is largely influenced by sporadic river flows. In the southern Basin region including Lachlan in Figure 2-6, there is greater storage infrastructure and capacity to capture and re-regulate river flows.

Record rain across large areas of the Basin substantially increased storage levels, particularly in the northern Basin where many storages spilt. Total storage levels in the northern Basin were almost at capacity by the end of November 2021 (compared with just 24.5% at the end of November the year prior) and remained at 96% by the end of the water year (June 2022). Similarly, southern Basin storage reached 90.4% by the end of Spring, up from 68.8% at the same time the year prior, and were still sitting at 89% by June 2022 (Table 2-1).

In the River Murray System (Figure 2-7) combined active storage volume in Dartmouth, Hume, Lake Victoria and Menindee Lakes rose above 8,000 GL by the end of May 2022. Combined active storage in Dartmouth and Hume reservoirs was 6,391 GL, the highest volume since 1993.

The Murray–Darling Basin (MDB) ended the year with a total surface storage volume of 91%, a significant increase from the same time the previous year (63%).

Table 2-1 Accessible storage from 1 July 2021 – 30 June 2022 for Southern, Northern Basin and total Basin scale

	Northern Basin	Southern Basin	Total
1 July 2021	55%	65%	63%
30 June 2022	96%	89%	91%

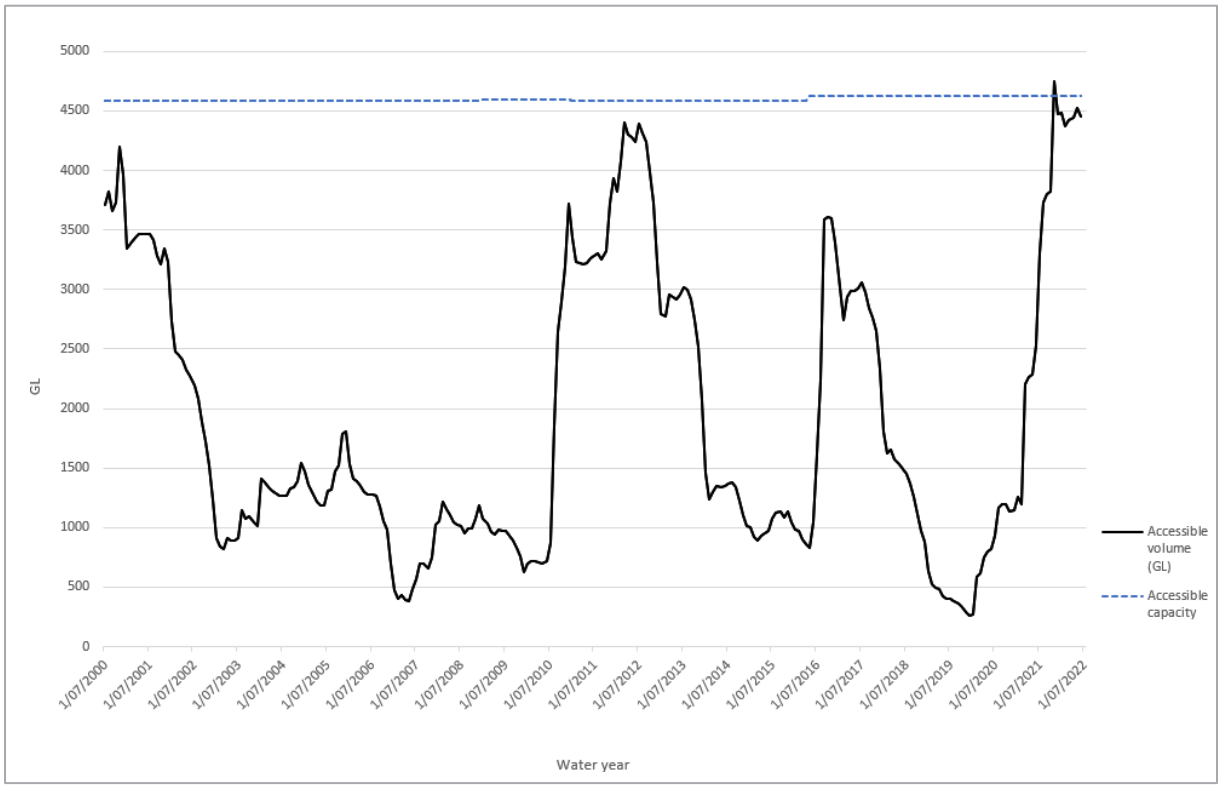


Figure 2-5 Northern Basin (aggregated) accessible[8] storage volumes for the period June 2000 to June 2022

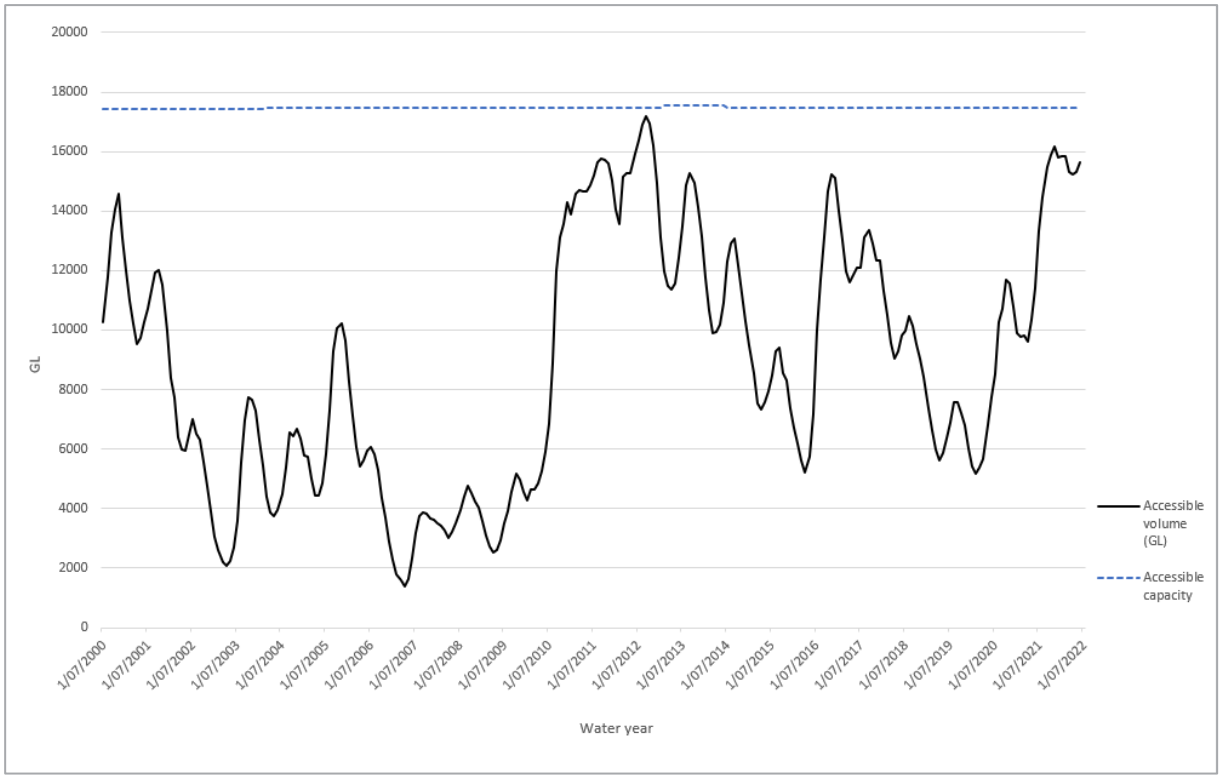


Figure 2-6 Southern Basin (aggregated) accessible[9] storage volumes for the period June 2000 to June 2022

[8] Increase in Northern Basin total capacity at 2016 is Chaffey Dam upgrade and capacity improvement works
[9] This also includes Lachlan. Increase in Southern Basin total capacity is Cotter Dam upgrade in 2013 and Pine Lake coming offline in 2014

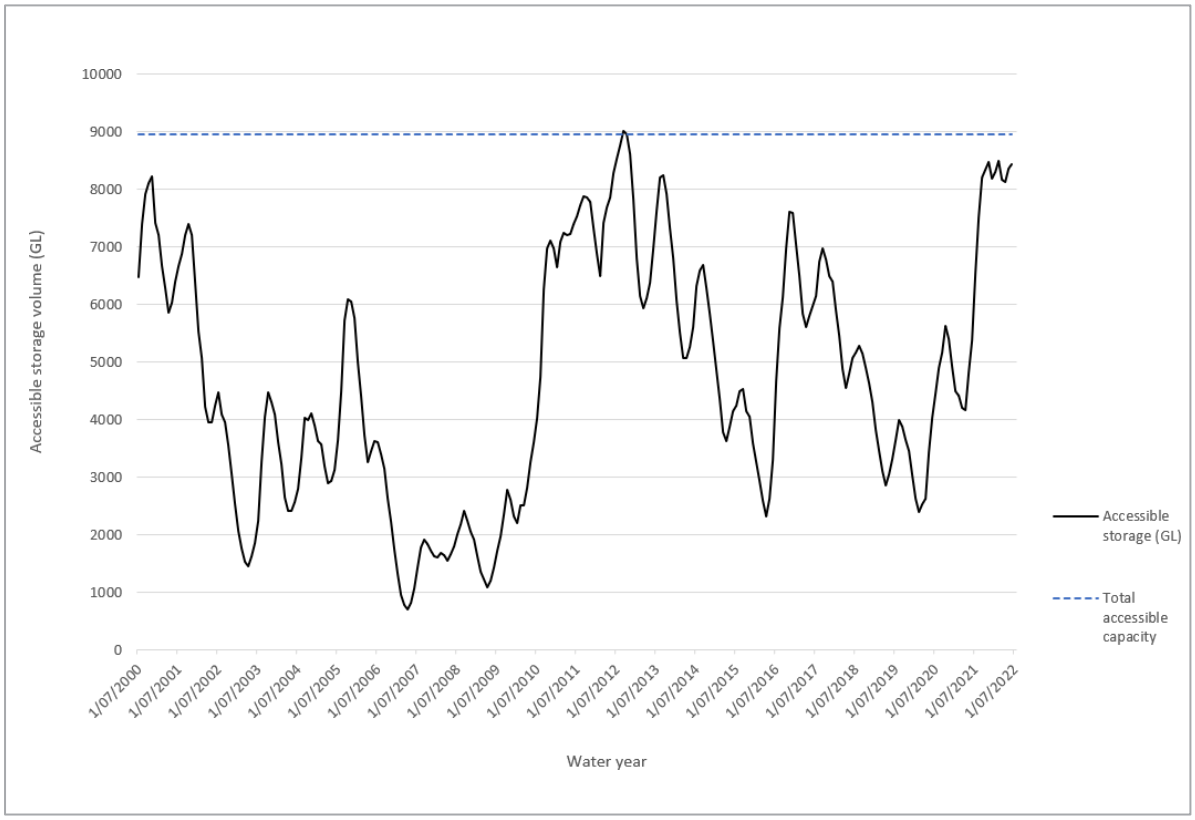


Figure 2-7 River Murray System accessible storage volumes for the period June 2000 to June 2022

3 Water take

In undertaking its responsibilities under the Water Act and Basin Plan, the MDBA collects water take data provided by the Basin States. This data allows the MDBA to develop an assessment of water availability and take across different contexts and scales as discussed further in this section including:

- actual surface water and groundwater take aggregated to Basin and state scale
- assessment of actual take relative to the annual permitted take
- comparison with water lawfully accessible for take and
- the proportion of metering and measurement of actual take.

While it is anticipated that water availability and take will fluctuate from year to year based on climatic variation and storage capacity as discussed in Section 2, a range of other factors also affect take, including:

- water planning/use decisions taken by water entitlement holders
- commodity and water prices and opportunities to trade water
- annual allocations to entitlements and the timing of such allocations
- conditions on entitlements/rights such as annual use limits or commence-to-pump triggers and
- access to carryover.

These factors also influence **Annual Permitted Take** and **Annual Actual Take** which are used to determine SDL compliance assessment, which is reported separately.

'ANNUAL PERMITTED TAKE' (or permitted take) is the volume of water that was expected to be used in a water year (July to June) given the climate and water availability of that year. It is modelled or assessed at the end of the water year based on the management rules and assumptions about water user behaviour.

'ANNUAL ACTUAL TAKE' (or actual take) is how much water was actually used in the SDL resource unit in a water year. It is metered or estimated.

Methods for both permitted and actual take are required to be specified for each SDL resource unit in water resource plans developed by Basin states.

3.1 Water take across the Basin

On a Basin scale (Figure 3-1), surface water take for consumptive purposes steadily declined between 2012–13 and 2016–17, due to a combination of continuing dry conditions within the Basin and the increase in held environmental water (HEW) as a result of water recovery progress (refer to Section 5). An increase in use can be seen in the wetter periods that occurred in the southern Basin in 2016 through to 2018 and, most recently, in 2020 through to 2022.

During the 2021–22 water year, groundwater take represented 7.5% of total annual take in the Basin. Where there is surface water available, irrigators will generally use surface water first as groundwater can be expensive to extract. Within the Murray–Darling Basin, groundwater is often used as an alternative or supplementary water source when surface water availability is low.

This can be observed in Figure 3-1, for example during the drier years of 2018–19 to 2019–20 there was an increase in groundwater take. This trend has reversed since the 2020–21 water year due to increased rainfall and subsequent increase in surface water availability.

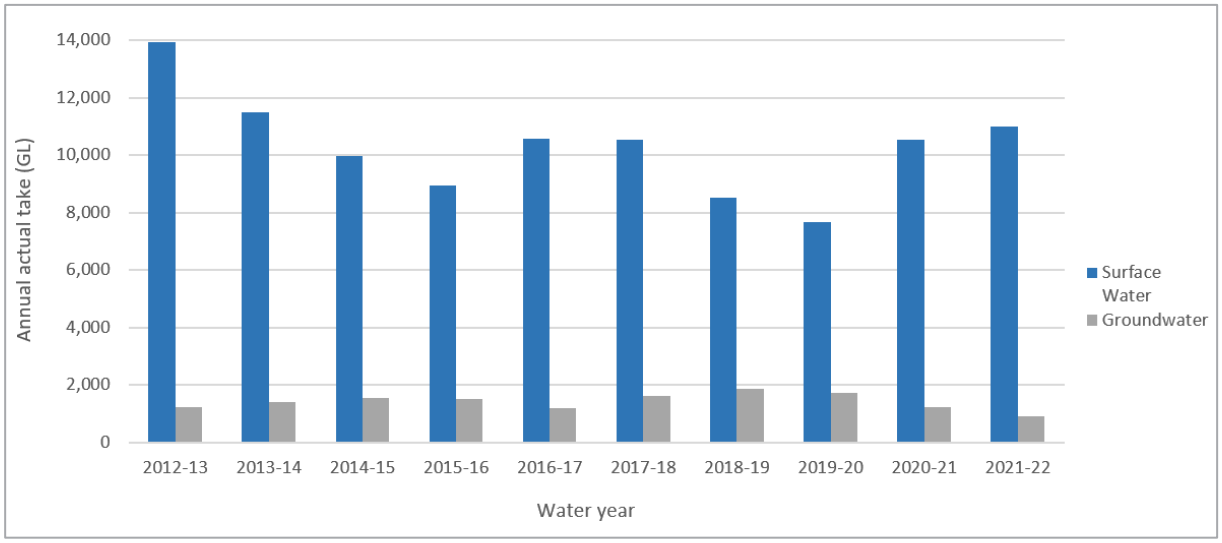


Figure 3-1 Surface water and groundwater annual actual take across the Basin, from 2012–13 to 2021–22

Figure 3-2 is split into three periods: pre-cap conditions, Cap compliance period and since the implementation of the Basin Plan and is based on the historical annual actual surface water take data that has been formally reported. From 2012–13 when the Basin Plan started, through to 2018–19 is the transition period to SDLs. The 2019–20 water year was the first year from which SDLs came into effect. The spike in take in 2012–13 occurred just after the Millennium drought broke in 2010–11. Since that time annual actual surface water take has been lower, driven by a range of reasons such as annual climatic variation, water licence holder/irrigator planning decisions, acquisition of environmental water entitlements and Basin State policies varying across SDL resource units.

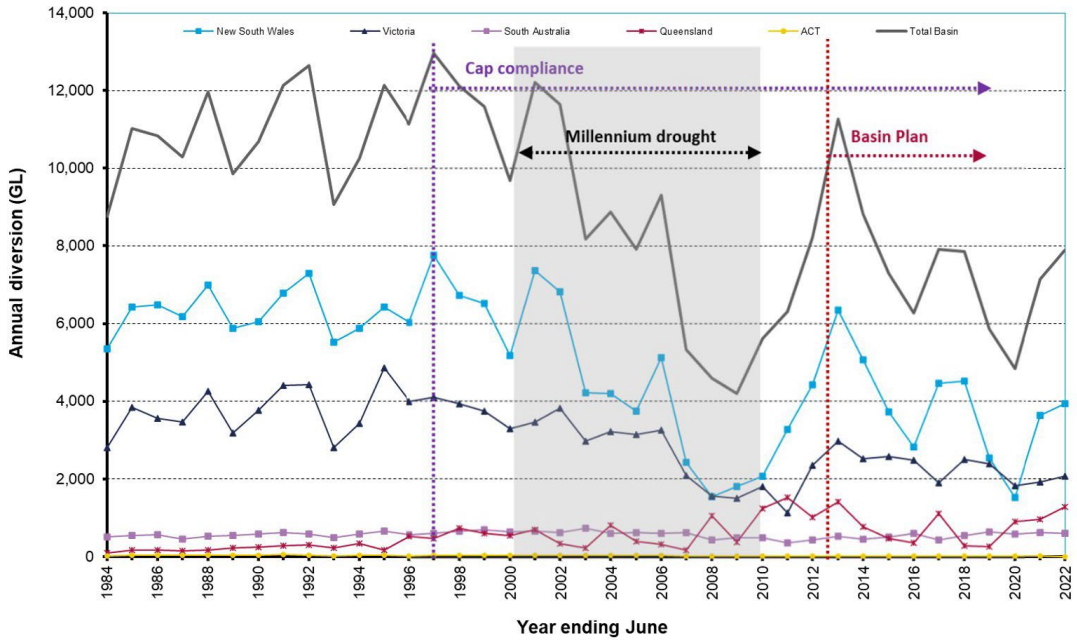


Figure 3-2 Surface water annual actual take from regulated rivers, watercourses and Queensland floodplain harvesting from 1983–84 to 2021–22

3.2 Surface water take

3.2.1 Annual actual take: surface water

Across much of the Basin, the 2021–22 water year saw continuing recovery from severe drought conditions, following some rainfall relief in 2020–21. Supported by the marked recovery of water storages, there was a modest increase in surface water take, as shown in Table 3-1 in Queensland, New South Wales and Victoria. Conversely, a slight reduction in take occurred in both the Australian Capital Territory (ACT) and South Australia. Like other Basin States, the ACT experienced climatic conditions driving high rainfall and increased soil moisture. This contributed to a decrease in gross diversions, and an increase in return flows which resulted in very low annual actual take.

Table 3-1 Surface water annual actual take (GL) by State from 2012–13 to 2021–22

State	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
QLD	1,859.2	1,210.2	907.7	799.4	1,555.2	713.7	699.1	1339.6	1403.4	1,720.2
NSW	8,177.6	6,891.3	5,560.4	4,649.0	6,286.4	6,349.6	4,370.9	3479.7	6193.1	6,205.9
ACT	27.5	27.6	25.8	28.9	25.1	30.4	31.8	31.4	19.8	14.8
Vic	3,304.9	2,852.3	2,914.0	2,816.3	2,239.5	2,848.7	2,731.2	2177.8	2262.5	2,414.7
SA	571.5	493.5	546.6	634.9	469.2	579.3	683.8	618.7	672.5	649.4
Basin total	13,940.6	11,474.8	9,954.5	8,928.6	10,575.4	10,521.7	8,516.8	7,647.1	10,551.2	11,004.9

Figure 3-3 shows annual actual take by the form of take since the introduction of the SDL accounting and compliance framework in 2019. At that time, take from regulated rivers in the 2019–20 water year was limited by extreme drought conditions across the entire Basin. The increase in both regulated river and floodplain take in the following 2020–21 water year may be explained by the rainfall relief increasing availability and access in the northern Basin.

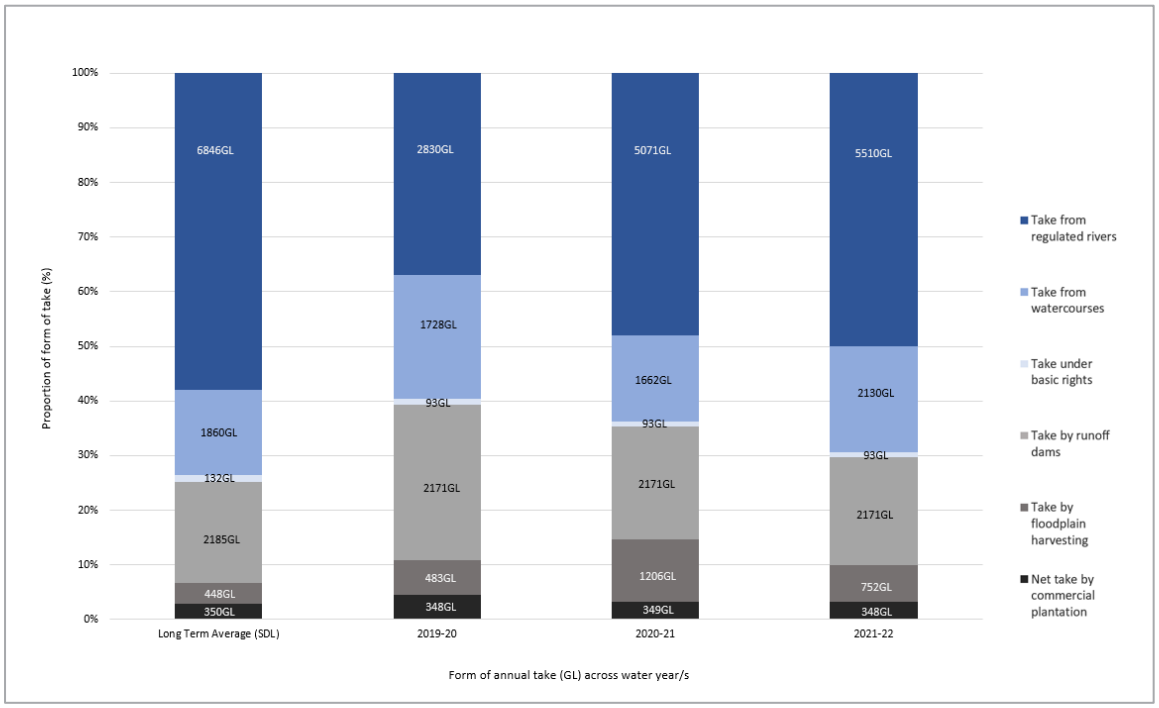


Figure 3-3 Proportion of annual actual take (surface water) by each form of take (GL) 2019–20 to 2021–22 against long-term average (SDL)

Annual actual take for the water year (2021–22) is further expanded on by Basin State and forms of take in Table 3-2. In Queensland, the increase in take was largely attributed to take from watercourses in the Condamine Balonne SDL resource unit where record rain was recorded. Similarly, New South Wales' section of Border Rivers SDL resource unit experienced an increase in actual take, along with Gwydir and Macquarie–Castlereagh.

Table 3-2 Surface water annual actual take (GL) by Basin State and forms of take in 2021–22

State	SDL resource unit	Take from regulated rivers	Take by floodplain harvesting	Take from water-courses	Take under basic rights	Net take by commercial plantation	Take by runoff dams	Total	Proportion of annually variable take (% of total)
Queensland	Paroo	-	0.0	0.0	0.3	0.0	10.6	10.9	0%
	Warrego	-	0.0	27.3	0.3	0.0	13.5	41.1	67%
	Nebine	-	0.0	4.6	0.1	0.0	11.0	15.8	29%
	Condamine–Balonne	-	211.0	832.7	6.0	1.0	264.0	1,314.7	79%
	Moonie	-	5.2	1.5	0.4	0.0	51.0	58.1	12%
	Queensland Border Rivers	-	57.1	141.1	3.6	1.0	77.0	279.8	71%
Total Queensland		**0.0**	**273.3**	**1,007.2**	**10.6**	**2.0**	**427.1**	**1,720.2**	**74%**
New South Wales	NSW Border Rivers	241.9		16.0	8.5	0.0	95.0	361.4	67%
	Intersecting Streams	-		5.8	2.5	-	111.0	119.3	0%
	Gwydir	389.5		11.0	8.0	1.0	124.0	533.5	73%
	Namoi[10]	172.8		78.0	4.7	5.0	160.0	420.5	38%
	Macquarie–Castlereagh	343.2		44.0	7.1	44.0	266.0	704.3	49%
	Lachlan	145.9		16.0	6.0	29.0	287.0	483.8	30%
	Murrumbidgee	1,515.0		42.0	6.1	116.0	385.0	2,064.0	73%
	Barwon–Darling Watercourse[11]	-		254.5	0.8	-	-	255.3	100%
	Lower Darling	3.2		-	0.5	0.0	5.5	9.1	35%
	NSW Murray	1,117.4		28.0	5.1	24.0	80.0	1,254.6	89%
Total New South Wales			**3,928.8**	**495.3**	**49.3**	**219.0**	**1,513.5**	**6,205.9**	**67%**
ACT	Australian Capital Territory	-	-	2.8	-	7.4	4.6	14.8	19%
Australian Capital Territory		**0.0**	**-**	**2.8**	**0.0**	**7.4**	**4.6**	**14.8**	**19%**
Victoria	Victorian Murray	1,121.6	-	5.5	8.2	24.2	12.4	1,171.9	96%
	Kiewa	-	-	4.6	1.0	7.3	8.2	21.1	0%
	Ovens	5.8	-	5.0	2.9	32.5	25.0	71.2	8%
	Broken	3.2	-	2.9	1.6	14.9	16.7	39.3	8%
	Goulburn	826.1	-	18.3	6.3	24.9	51.5	927.1	89%
	Campaspe	32.5	-	0.9	1.6	1.8	20.5	57.3	57%
	Loddon	25.0	-	8.9	4.8	5.5	34.7	78.9	32%
	Wimmera–Mallee	16.2	-	0.8	1.1	5.7	24.1	47.9	34%
Total Victoria[12]		**2,030.4**	**0.0**	**46.9**	**27.5**	**116.8**	**193.1**	**2,414.7**	**84%**
South Australia	South Australian Murray	-	-	603.0	6.1	-	-	609.0	99%
	South Australian Non-Prescribed Areas	-	-	0.0	-	-	23.3	23.3	0%
	Marne Saunders	-	-	0.0	-	0.1	1.4	1.6	94%
	Eastern Mount Lofty Ranges	-	-	4.7	-	3.2	7.6	15.5	79%
Total South Australia		0.0	0.0	607.7	6.1	3.3	32.4	649.4	99%
Total Basin			6,232.5	2,159.8	93.4	348.5	2,170.7	11,004.9	74%
Form of take % of total			57%	20%	1%	3%	20%	100%	
Annual variable take %			100%	87%	0%	2%	1%		
Long-term average take (non-variable) %			0%	13%	100%	98%	98%		

*Blue shaded cells represent long-term average estimates set by methods under accredited WRPs or by bilateral agreement, otherwise actual take is annually variable through metering, measurement or estimation

Table 3-2 includes both measured volumes (i.e. metered take) and estimated take that is determined from long-term average estimates. Indicated by blue shaded cells in Table 3-2, the forms of take that

[10] Namoi take from regulated rivers include a long term average estimate of take by floodplain harvesting.
[11] Barwon Darling take from water courses includes take by floodplain harvesting.
[12] Victoria provides metered data for take from watercourses but this method is not currently used for SDL accounting. For SDL accounting purposes this take is recorded as being based on long term averages (long-term averages are excluded in considering unmetered take.

most commonly use long term averages to estimate actual take are 'basic rights', 'commercial plantations' and 'runoff dams'. Since the 2019–20 water year, the percent of take that is annually variable has increased from 62% in 2019–20 to 73% in 2020–21, and 74% in 2021–22, primarily driven by wetter conditions driving an increase in take from regulated rivers.

3.2.2 Metering of surface water take

Provided as part of s71 data in Basin State's submissions, Table 3-3 and Table 3-4 show the trend in metering of surface water actual take from 2012–13 to 2021–22. This analysis draws on the measurement performance of the meters/devices used to generate the data. For example, actual take data have been collected from meter readings or developed from estimations with reference to long term take records, where metered data not available. In this analysis, it is assumed that:

- the unmetered take from watercourses was reported under similar conditions as in the previous years
- all watercourse diversions are metered in the Australian Capital Territory and the South Australian Eastern Mount Lofty Ranges and Marne-Saunders SDL resource units.

Water taken for environmental benefits is not included in these estimates.

There continues to be a marked difference of metered actual take between the northern and southern Basin (Table 3-4). Across all forms of surface water take in the northern Basin, over the 10 year period of record, between 27% and 60% is metered, and between 70% and 84% in the southern Basin. However, while there is a difference in proportions, the volume of unmetered water take in the northern Basin is similar to that in the southern Basin due to the larger volumes used in the southern Basin.

While an increase in metered actual take may be expected (owing to Basin States' commitments to improving water take measurement) a reduction in the *proportion* of metered actual take may occur due to a change in the proportion of metered take relative to measured take. For example, in the ACT there is reported to be a considerable reduction in the proportion of actual take that is metered (Table 3-4). This is because the use in the city (watercourse take) is reported net of any flow returned to the river, and is significantly reduced in wet years due to high return flows. Whereas other forms of take (i.e., by runoff dams and commercial plantations) remain static as long-term average estimates and are therefore a relatively greater proportion compared with take from the watercourse in wet years.

Table 3-3 Surface water annual actual take that is metered take from watercourses and regulated rivers

State / Basin	Metered actual take from watercourses and regulated rivers (%)									
	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
Queensland	58%	31%	61%	81%	79%	73%	83%	93%	77%	79%
New South Wales	94%	92%	89%	86%	91%	91%	88%	86%	95%	95%
Australian Capital Territory	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Victoria	99%	98%	98%	98%	99%	99%	99%	99%	99%	98%
South Australia	98%	98%	98%	98%	98%	100%	100%	100%	100%	100%
Total Basin	**91%**	**89%**	**91%**	**92%**	**92%**	**94%**	**94%**	**94%**	**94%**	**94%**
Northern Basin	**73%**	**64%**	**57%**	**65%**	**80%**	**76%**	**72%**	**87%**	**86%**	**85%**
Southern Basin	**98%**	**98%**	**98%**	**97%**	**98%**	**98%**	**98%**	**97%**	**98%**	**98%**

Table 3-4 Surface water annual actual take that is metered for all forms of take

State / Basin	Metered actual take for all forms of take (%)									
	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
Queensland	45%	20%	32%	37%	57%	28%	31%	63%	53%	59%
New South Wales	73%	68%	60%	52%	65%	65%	51%	37%	55%	60%
Australian Capital Territory	54%	55%	52%	56%	51%	58%	60%	59%	41%	15%
Victoria	90%	88%	88%	88%	85%	89%	88%	85%	85%	85%
South Australia	87%	85%	86%	88%	85%	88%	90%	89%	90%	90%
Total Basin	**74%**	**69%**	**68%**	**66%**	**70%**	**71%**	**66%**	**62%**	**71%**	**72%**
Northern Basin	**53%**	**42%**	**27%**	**30%**	**55%**	**43%**	**32%**	**49%**	**58%**	**60%**
Southern Basin	**84%**	**81%**	**81%**	**78%**	**78%**	**81%**	**77%**	**70%**	**79%**	**79%**

3.2.3 Surface water entitlements

A water entitlement or licence is a permanent right to receive up to a certain volume of water in a year, whereas water 'allocation' is the percentage of a water entitlement that can be taken in a given water year, depending on availability. For example, in a wet year the water allocations may be close to 100% of the entitlement volume – but the irrigator's actual take might be only 60% of the allocation because the irrigation water requirements are partially met by rain, resulting in a lower demand. In a hot, dry year when the stored water volumes are lower, the allocations will be lower relative to entitlement, but the irrigator's actual take might be above 90% of the allocation to meet the higher demand for water.

See Appendix 2 for Basin States surface water entitlements.

3.2.4 Surface water lawfully accessible for take

This section provides information on the MDBA estimated total volume of water that was lawfully accessible for take throughout the Basin in a given water year at the SDL resource unit level, based on data submitted by Basin States under s.71(1)(d) and (e) of the Water Act. The formal arrangements under which water is made lawfully accessible for take are often different for each form of take within a Basin state and are also different between Basin States.

This includes the terminology used to describe how access to water is granted, which may have specific and different meanings depending on the relevant Basin State framework. This report adopts the following definition of 'water lawfully accessible for take'.

WATER LAWFULLY ACCESSIBLE FOR TAKE (WLAT): The granting of permission, either annually or on a long-term basis, to take water from a water source under a form of take in a Basin state in accordance with that state's legal frameworks.

It is important to recognise that annual permitted take and water lawfully accessible for take are different concepts. Annual permitted take is how much water was expected to be used under the SDL, based on the climate and water patterns of that water year. It is used to assess compliance with the SDLs; SDL compliance is determined based on the cumulative differences between annual permitted take and annual actual take. In contrast, water lawfully accessible for take has no impact on SDL compliance.

In general terms[13], water lawfully accessible for take is estimated based on:

- volumetric allocations against water entitlements, including for conveyance
- actual use of unregulated entitlements and supplementary water[14]
- net allocation volumes carried over from previous water years[15]
- net trade of annual allocations between SDL resource units
- rights to take surface or groundwater or capture flows in runoff dams
- rights to take surface or groundwater under basic rights
- rights to intercept surface water for commercial plantations
- rights to harvest overland flows (i.e. floodplain harvesting).

Reporting on water lawfully accessible for take is an important part of the overall water take accounting 'story'. Particularly, it supports the fundamental concept that in the case where annual actual take exceeds annual permitted take in a given year, the annual actual take is likely to be within the amount lawfully accessible in that year. For clarity, it is expected that annual actual take should be within the amount lawfully accessible, since that actual take is governed and limited by the allocations, rights, and net trade that make up water lawfully accessible for take.

[13] Note that some of these components may not be applicable to all SDL resource units
[14] Excluding the Barwon Darling Watercourse and basic rights.
[15] Limit applies to carryover under state management laws

In unregulated systems where there are flow conditions and rules applied to individual water access licences, extraction is subject to river flow thresholds and individual daily limits (such as in Queensland and in the New South Wales Barwon–Darling system). For example, in the Barwon–Darling system, despite water being allocated to accounts, the opportunity to use water depends on the 'commence to pump' thresholds in the relevant management zones of the river. In dry years, the 'commence to pump' thresholds have been a limiting factor in take from the river.

Table 3-5 summarises surface water lawfully accessible for take by Basin States from 2019–20 to the current water year. Across the last three water years in all States the volume lawfully accessible has increased, however the actual take has become a smaller proportion of the volume lawfully accessible. At a Basin scale it has decreased from 77% to 70%. The volumes and the proportions taken are influenced by a multitude of factors, including cropped area, land use and climatic conditions, with substantial differences across regions.

Table 3-5 Surface water including interceptions lawfully accessible for take, and actual take as a proportion of water lawfully accessible for take in 2019–20, 2020–21 and 2021–22 by Basin State

Basin State	2019–20			2020–21			2021–22		
	Water lawfully accessible for take (GL)	Annual actual take (GL)	ANNUAL ACTUAL TAKE as a proportion of WLAT (%)	Water lawfully accessible for take (GL)	Annual actual take (GL)	ANNUAL ACTUAL TAKE as a proportion of WLAT (%)	Water lawfully accessible for take (GL)	Annual actual take (GL)	ANNUAL ACTUAL TAKE as a proportion of WLAT (%)
Queensland	1,391.4	1,339.6	96%	1,453.6	1,403.4	97%	1,845.8	1,720.2	93%
New South Wales	4,439.0	3,336.7	75%	8,689.1	6,193.1	71%	9,380.7	6,205.9	66%
Australian Capital Territory	91.5	31.4	34%	92.8[1]	23.1	25%	92.3	14.8	16%
Victoria	3,036.0	2,177.8	72%	3,455.4	2,262.5	65%	3,676.3	2,414.7	66%
South Australia	725.9	618.7	85%	734.4	669.3	91%	751.0	649.4	86%
Basin total	9,683.9	7,504.2	77%	14,425.2	10,551.4	73%	15,746.1	11,004.9	70%

1 Corrected value that varies from that published in Annual Water Take Report 2020–2021

In some unregulated surface water systems (e.g. the Barwon–Darling) water allocated is only available to be taken under certain conditions such as when the flow in a river reaches a designated flow rate at the key river gauging stations. The water lawfully accessible for take volumes reported in Table 3-5 are the sums of the announced allocations plus carryover, trade, basic rights and unregulated use, but access to this water is subject to the relevant licence conditions and/or management rules being met. This means that the water lawfully accessible for take in these systems may include volumes that are not physically available to the user (e.g. if flows are below levels required for extraction).

As opposed to other Basin States, the ACT experienced a reduction in WLAT since the previous (2020–21) water year, as discussed in 3.2.2. The proportion of urban use compared to non-urban use in the Campaspe and Wimmera–Mallee (surface water) increased due to the wet conditions. The full break-down of water lawfully accessible for take by SDL resource unit is available in Appendix 1.

3.3 Surface water use relative to the sustainable diversion limit

The Basin Plan allows for water use up to the SDLs, with the Basin states responsible for managing and setting the rules for sharing water among their users. Within the SDL accounting framework, credits and debits can be accumulated. A 'credit' is recorded for a given year if water use is less than the annual permitted take (or annual use limit). A 'debit' is recorded for a given year if water use was more than the annual permitted take. Each year the credits and debits are added to those from the previous year and so can build up over time, forming the 'cumulative balance'.

Trends in surface water use and the accumulation of surface water accounting 'credits' have been reviewed by the MDBA and Basin States in recent years, including during the transition period to SDL[16]. 2021–22 represents the third year of reporting relative to SDLs, and the third year that WRP models and methods are being used for the assessment (with assessment of NSW SDL resource units occurring under the bilateral agreements in place with the NSW government). This allows for comparisons in surface water use relative to the SDL since 2019–20[17].

During the transition period (2012–13 to 2018–19) when the accredited SDL accounting methods were not available, 'proxy' methods[18] were used to trial SDL compliance. This means that the data from the transition period (particularly the permitted take data) cannot be directly compared with the data for 2019–20 onwards.

3.3.1 Basin credits

Among the 18 surface water SDL resource units with accredited WRPs, namely those in Queensland, ACT, Victoria and South Australia, all generated annual credits in 2021–22, which totalled 1162.2 GL. This is more than the annual surface water credit in 2020–21, which was 738.5 GL. Similar to previous years, this credit was driven by the larger SDL resource units in Victoria, which are the Goulburn and Victorian Murray, which in aggregate generated 341.6 GL in credits. However, in 2021–22, the large SDL resource units in Queensland (namely the QLD Border Rivers and Condamine-Balonne) also generated large annual credits, 537.4 GL in aggregate, which was far larger than the 61.3 GL generated in 2020–21.

Among the 10 NSW SDL resource units still currently operating under the Bilateral Agreement, five recorded zero balance or annual credits, 254.5 GL in aggregate, offset by four SDL resource units recording annual debits totalling 361.9 GL, which gives a state-wide net of 107.4 GL in annual debit. The credits generated in NSW were largely driven by NSW Murray (180.3 GL) and NSW Border Rivers, whereas the debits were driven by the Murrumbidgee (-272.1 GL).

Following discussions with Basin States regarding SDL credits in previous water years, the following were identified as possible drivers of the SDL credits, particularly in the large SDL resource units:

- Basin State methods for determining the permitted take (including adjustments associated with environmental water recovery and inter-valley trade)

[16] Transitional sustainable diversion limits water take reports | Murray–Darling Basin Authority (mdba.gov.au)
[17] Sustainable diversion limit reporting 2021–22 | Murray–Darling Basin Authority (mdba.gov.au)
[18] Method utilised the output of the Cap models with some adjustments to reflect Basin Plan water recovery progress

- changes to crop types and utilisation patterns both within a year and over time, since the Millennium drought and the way these changes are (or aren't) modelled and
- changes to river operations, including improved efficiencies.

The drivers of SDL credits identified above are still valid for 2021–22. Additionally, the likely reason for the SDL credits in Queensland is the heavy rainfalls and flows occurring that year, which increased the amount of water that is permitted to be taken, while the resulting flooding in the region (particularly in the QLD Border Rivers), reduced the amount actually taken. On the other hand, in accordance with the annual permitted take methods described in Queensland Water Resource Plans (WRP), permitted take is based on full entitlement modelling without making any assumptions about irrigator behaviour (i.e. assumes that water is taken if there is opportunity to take it under WRP rules).

In 2020–21, a large annual credit (101.2 GL) was observed in Macquarie–Castlereagh. At the time, this credit was thought to be driven by water recovery in excess of the SDL. However, in 2021–22, the annual credit reduced substantially (to 3.39 GL) indicating user behaviour and water availability are also key factors.

An annual debit was again recorded in the Murrumbidgee following from 2020–21. In 2020–21 the debit and the corresponding large credit in 2019–20, was understood to be due to a discrepancy in when the Snowy river releases (from the Snowy Hydro Scheme) were modelled to when it had occurred in reality. However, the debit in 2021–22 cannot be explained by this behaviour. Cumulatively, the Murrumbidgee has recorded a debit of -407 GL or -18% of SDL. This is not in exceedance of the SDL compliance trigger but is of concern due to its closeness to the threshold.

For the Gwydir, the debit was driven by floodplain harvesting estimates. In the absence of measured data for actual take, the "current conditions" model recently developed by NSW as part of its Healthy Floodplains Program was used to determine an estimate for actual take from floodplain harvesting in last three reporting years. Based on the findings of its Healthy Floodplains Program, NSW reduced supplementary water access allocations in the Gwydir River in 2021–22 to offset the known excess floodplain harvesting take, with the aim of keeping overall take within the compliance limits. While this is expected to have reduced actual take by regulated rivers, the combined regulated river and modelled estimate of floodplain harvesting actual take resulted in an estimate of water use that was higher than the permitted take.

A similar method and approach was also used in NSW Border Rivers, however for 2021–22, the overall level of actual take led to an annual credit in that SDL resource unit.

In 2020, at the request of the Commonwealth Water Minister, the MDBA undertook analysis[19] to better understand trends in water use relative to the limits in the Murrumbidgee, NSW and Victorian Murray and the Goulburn SDL resource units; the four largest water using SDL resource units in the Basin. A continuation of this analysis is available in the following section.

[19] Analysing trends in water use relative to the sustainable diversion limits in the southern Basin | Murray–Darling Basin Authority (mdba.gov.au)

3.3.2 Analysis on four Southern SDL resource units

This analysis uses WRP models (accredited/proposed) for all four SDL resource units (Figure 3-4). The 2020 trends in use analysis[19] was a hybrid of the transition period and the sustainable diversion limit compliance methods for determining annual use limits, which entailed using WRP models for NSW and Vic Murray and Goulburn and Cap model for Murrumbidgee.

In the absence of accredited surface water WRPs, NSW is currently reporting in accordance with the methods/models agreed under a Bilateral Agreement. The annual credits/debits may change once the methods/models are finalised under the WRPs accreditation process. Further, as more reporting years water use data becomes available, these trends may shift. For example, in the 2020–21 water year, a significant annual debit was reported in the Murrumbidgee.

The annual permitted take in this analysis is calculated as the modelled permitted take volume (that is take from regulated river only), adjusted for trade and environmental water, plus the model refresh adjustments and acquisition/disposal of held environmental water. This considers the annual balance or the difference between annual permitted take and annual actual take, these credits/debits as displayed in Figure 3-4 are determined specifically for the purposes of this analysis, are slightly different to the methods used in the registers of take.

These four SDL resource units in aggregate produce a credit of 410 GL for 2021–22, and an average over the three years of 496 GL. However, this credit/debit varies considerably each year from 1151 GL in 2019–20, -72 GL in 2020–21 to 410 GL in 2021–22.

Figure 3-4 Credits/debits of surface water take in four Southern SDL resouce units at 30 June from 2019 to 2022

In the NSW Murray, the annual balance has remained in credit since 2019–20, while in the Murrumbidgee a debit has occurred in both 2020–21 and 2021–22. Based on the limited data available to date, it is difficult to determine if this pattern of use will continue into the future,

however the average permitted take in this analysis over the three years presented is less than the actual take which puts the average account balance as a debit for the three years.

There may be some interactions between carryover rules and late season trade that is occurring between states and has evolved over time. While trade is taken into account in the SDL accounts, the nuances of such interactions may not be fully captured and may result in anomalies in the accrual of annual credits and debits. Further work is required to better understand the materiality of this issue.

In Victoria, both the Victorian Murray and Goulburn have both maintained a credit in the annual accounts since 2019–20. With only three years of data to analyse no clear patterns of use are obvious, however in the Victorian Murray even though the resource unit has remained in credit, the annual permitted take has decreased over time, while use has increased, such that credits have decreased from 351 GL in 2019–20 to 62 GL in 2021–22.

3.3.3 Summary of state analysis

NSW Murray and Murrumbidgee regional water strategies

NSW is progressively developing long-term regional water strategies to guide how the NSW Government can best address the water-related challenges to support liveable and prosperous regions. This involves undertaking scientific modelling to bolster knowledge and understanding of water resources, as well as potential climate challenges for the regions.

As part of the development of the NSW regional water strategies program, NSW are combining climate evidence, economic and ecological analysis with input from water service providers, local councils, communities, Aboriginal people and other stakeholders to improve knowledge and understanding of water resources, and potential climate challenges of the regions. As part of this process NSW seeks to explore options that will enable further investigation into the trends impacting the reliability of water licences as well as to better understand people's behaviour around water use and assumptions of water availability.

SDL credits in the Goulburn system and the Victorian Murray

Victoria has undertaken analysis of data from the 2019–20 and 2020–21 water years to understand the SDL credits in the Goulburn system, including the difference between the actual and modelled data for storage volumes and end of system flows, and links to carryover.

Victoria requested that the MDBA undertake similar modelling analysis for the River Murray system. The MDBA analysed data from the 2019–20 and 2020–21 water years to understand where in the southern-connected system the SDL credits being generated by the Victorian Murray SDL resource unit are residing. This analysis is complicated by the number of storages involved, the impact of water being held in tributary inter-valley trade accounts prior to delivery (i.e. it may be delivered in a different year to that in which its use is recorded in the SDL accounts) and the delivery of environmental water.

These analyses indicated that more carryover was being stored by both consumptive and environmental owners compared to what was modelled. Or, expressed differently, that when there are no physical spills from the systems, a larger portion of the SDL accounting credits for these SDL

resource units were (at the time) held in storage for use in a subsequent water year. Some of the SDL credits remaining in the systems were lost as result of physical spills. Notably the analysis did not include data for the 2021–22 water year.

3.4 Groundwater take

Under the Basin Plan there are two forms of take for groundwater. These include take from groundwater and take under basic rights. Groundwater is used for town water supply, irrigation, and extraction to manage water table and salinity levels. Take under basic rights is water used for stock and domestic purposes in all Basin States, as well as for native title rights in some Basin States. While the licencing requirements vary across Basin States, a licence or approval is generally required to construct a bore for basic right purposes, but a license to extract water may not be required.

This section discusses the annual actual take and annual permitted take, water lawfully accessible for take, metering and managed aquifer recharge (MAR), for groundwater in the Basin during the 2021–22 water year.

3.4.1 Groundwater annual actual take

The following total volumes of annual actual take were recorded for groundwater in 2021–22:

- Take from groundwater: 654.6 GL or 73% of total groundwater take
- Take under basic rights: 240.4 GL or 27% of total groundwater take.

To put this in context the average annual groundwater take over the past 19 years is 1,414 GL[20], so 2021–22 take was about 63% of the average annual actual take.

Groundwater represented 7.5% of the total water take in the Basin over the 2021–22 reporting period, with the remainder attributed to surface water take. This is a 6% reduction in take from the 2020–21 water year and reflects the wetter conditions and increased access to surface water.

Table 3-6 Groundwater annual actual take (GL) by State from 2012–13 to 2021–22

State	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
QLD	162.4	193.9	177.7	187.2	191.5	187	190	162	152.1	130.5
NSW	834.7	988.9	1,095.7	1,031.1	735.2	1,182.7	1,349.6	1,213.7	788.1	558.3
ACT	0.6	0.5	0.8	1	0.8	0.7	1.1	0.3	0.6	0.3
Vic	163.9	149.2	213.1	241.9	214	194.5	272.4	262.7	216.6	141.4
SA	61.7	54.6	55.3	60.8	49.7	60.7	69.4	67.0	66.4	64.6
Basin total	1,223.2	1,387.1	1,542.6	1,521.9	1,191.3	1,625.6	1,882.4	1,705.7	1,223.8	895.0

Changes in groundwater take can be driven by rainfall variability. This is suggested by the data in Figure 3-5 which shows the volume of take over the past 19 years at a Basin-scale and for the individual states. Figure 3-5 also shows the pattern of increased groundwater consumption during dry periods and reduced usage when there is higher surface water availability. The overall

[20] Based on MDBA held data supplied by the states for the water years between 2003–04 and 2021–22.

groundwater take for 2021–22 of 895 GL was the lowest since 2011–12, during which significant rainfall events occurred in both the southern and northern Basins.

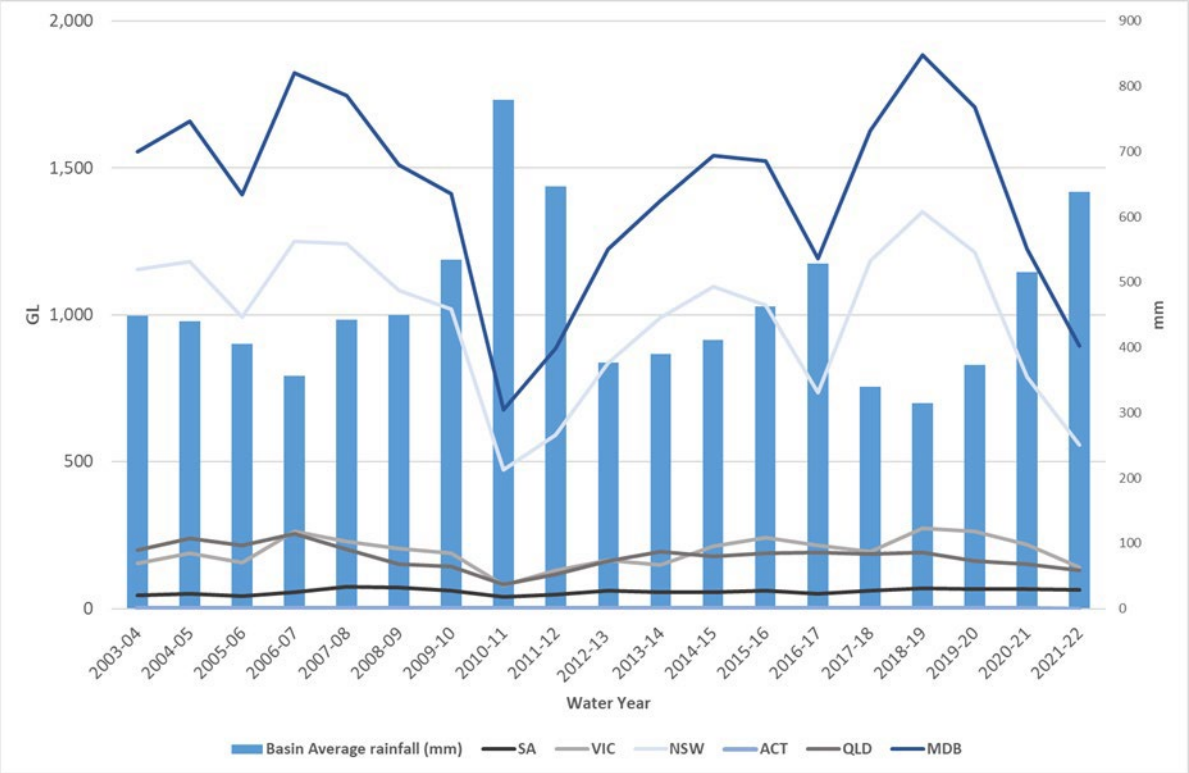


Figure 3-5 Groundwater annual actual take from 2003–04 to 2021–22

The overall volume of groundwater take in the Basin does not reflect its accessibility, quality, and importance in areas across the Basin. There are MDB communities in northern New South Wales and southern Queensland that have a high reliance on groundwater, as surface water inflows tend to be more sporadic than in the southern Basin. During drier periods, the relative importance of groundwater becomes greater and can be especially critical for irrigators and town water supply during these times.

Most of the groundwater annual actual take is concentrated in a small number of large groundwater systems in New South Wales, Queensland, and Victoria. During the 2021–22 water year, 14 of the 80 groundwater SDL resource units accounted for 74% of all groundwater take across the Basin, with just five units accounting for 42% of the take. Table 3-7 presents the 2021–22 actual take and percentages of the total take for the 14 SDL units with the most take.

Table 3-7 Groundwater SDLs with highest proportion of actual take (GL) for 2021–22

SDL resource unit	Total Actual Take (GL)	% of Total Basin Groundwater Take
Lower Murrumbidgee Deep Alluvium	100.3	11.2
Lower Lachlan Alluvium	77.6	8.7
Lachlan Fold Belt MDB	77.6	8.7
Goulburn–Murray: Sedimentary Plain	75.4	8.4
Upper Condamine Basalts	46.9	5.2
Goulburn–Murray: Shepparton Irrigation Region	41.4	4.6
Lower Murray Deep Alluvium	35.4	4.0
Western Porous Rock	34.8	3.9
Mallee (Murray Group Limestone)	34.7	3.9
Upper Namoi Alluvium	32.7	3.6
Upper Lachlan Alluvium	31.1	3.5
Mid-Murrumbidgee Alluvium	25.2	2.8
Upper Condamine Alluvium (Tributaries)	25.2	2.8
Upper Condamine Alluvium (Central Condamine Alluvium)	25.2	2.8

The majority of the groundwater take in these 14 SDL resource units was accounted for as take from groundwater, which encompasses all types of groundwater use except for take under basic rights. The exceptions to this trend can be seen in Figure 3-6, for the Lachlan Fold Belt MDB (GS20) and Western Porous Rock (GS50) SDL units. Groundwater take in these two units is predominantly for basic rights use.

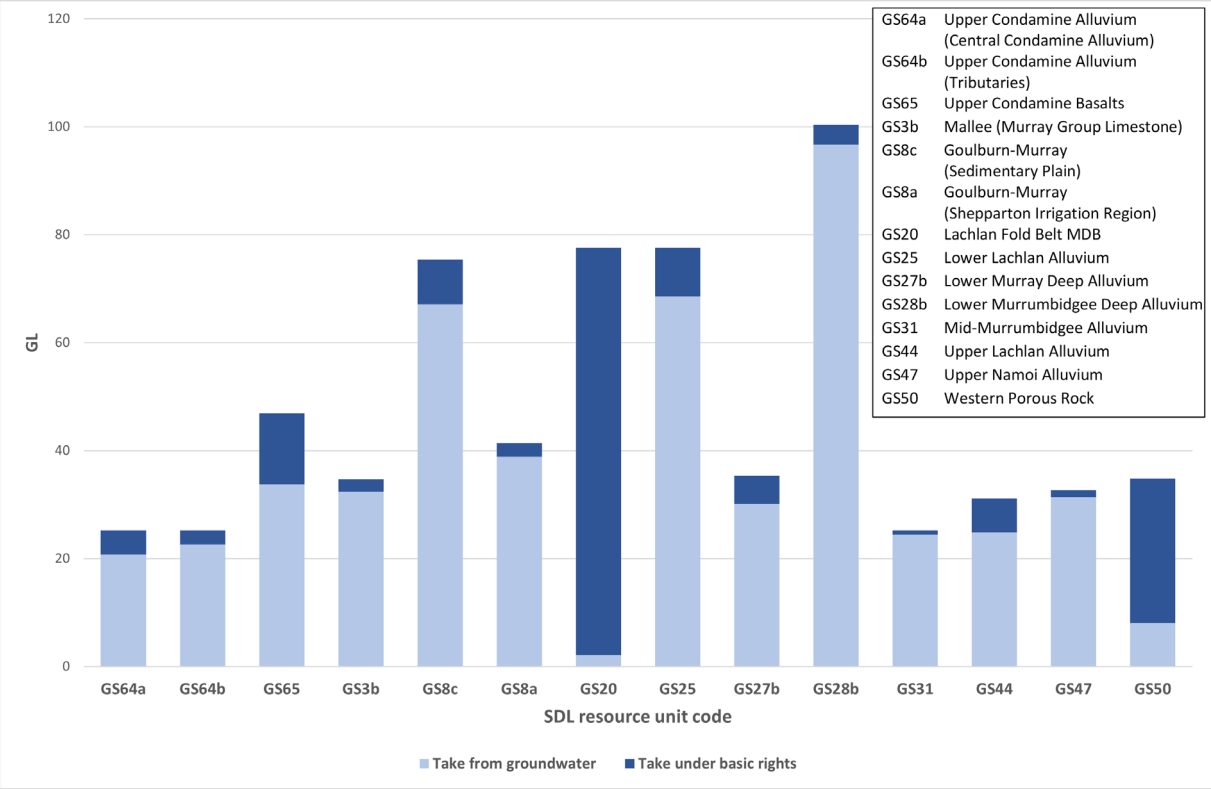


Figure 3-6 Groundwater actual take by form of take for SDLs with highest levels of actual take (GL) for 2021–22

Across the Basin, there are five groundwater SDL resource units where the actual take for basic rights is greater than 10 GL. The three SDL resource units with the largest take under basic rights are all in NSW and are the Lachlan Fold Belt with a volume of 75 GL (97% of groundwater take in this SDL), Western Porous Rock with 27 GL (77% of groundwater take in this SDL), and the New England Fold Belt MDB with 19 GL (89% of groundwater take in this SDL).

3.4.2 Groundwater annual permitted take and water lawfully accessible for take

Typically, groundwater annual permitted take methods are fixed volumes equal to the SDL for the resource unit. However, there are exceptions to this, where the permitted take is less than SDL, or where the permitted take uses a method that reflects climatic conditions and thus the annual permitted take is variable from year to year. These include:

1. SDL resource units in the Warrego–Paroo–Nebine water resource plan area where the annual permitted take is equal to the volume of entitlements plus take under basic rights.
2. eleven SDL resource units across New South Wales where a variable permitted take method based on total rainfall is used.

Water lawfully accessible for take refers to the volume of water that can be accessed for take under an entitlement or rights by holders each year under a Basin States water sharing arrangements. The volume of groundwater available for use in a SDL unit can be influenced by the announcement of volumetric allocations, carryover of unused entitlement from the previous water year, and trading of entitlements.

All Basin States have the ability to make groundwater allocation announcements (or restrictions to the use of a licensed right to access) based on rules within the Basin state water management plans. For groundwater systems, reduced allocation announcements are made, if necessary, to:

- maintain compliance with the state's extraction limits or SDLs or to maintain or protect water levels in an aquifer,
- maintain pressure, or to ensure pressure recovery, in an aquifer,
- protect groundwater-dependent ecosystems,
- maintain, protect, or improve the quality of water in an aquifer,
- prevent land subsidence or compaction in an aquifer, and/or
- manage for climatic variability within a water source.

Victoria maintained announced allocations at 100%, with the exception of the Goulburn–Murray: Sedimentary Plain SDL resource unit which had a reduction of 8%. While ACT, NSW and SA users received full access to groundwater allocation assignments for the 2021–22 water year.

Due to good rainfall in the northern Basin that resulted in good groundwater recharge and associated water level rises in a majority of aquifers, Queensland was able to either maintain or increase announced allocations in most groundwater management areas[21]. Announced allocations were 100% for the 2021–22 water year with the exception of the Upper Condamine Alluvium (Tributaries) and the Upper Condamine Basalts SDL units. Management units within the Upper Condamine Alluvium (Tributaries) unit had a range of 50–100% with an average allocation of 82%, while the Upper Condamine Basalts units had a range of 60–100% with an average allocation of 71%.

In a number of groundwater management areas a proportion of the unused water is able to be added to the total amount of water able to be taken in the following water year. This is referred to as carryover. Carryover is subject to the conditions and rules that the relevant Basin State has in place for a groundwater SDL resource unit. The rules affecting access to carryover volumes vary from Basin state to Basin state due to different licence categories and varied hydrogeology across the SDL resources units. In most groundwater systems, town water supply and domestic and stock licence categories cannot carryover unused water allocations.

Table 3-8 shows Basin scale groundwater lawfully accessible for take (allocation, carryover, and basic rights) as reported by Basin States for the 2019–20, 2020–21 and 2021–22 reporting years. At the Basin scale, 29% of groundwater lawfully accessible for take was used in the 2021–22 reporting year, a 12% reduction from the previous water accounting year.

[21] 2021–22 section 71 state narrative submitted by Queensland.

Table 3-8 Groundwater lawfully accessible for take, and actual take as a proportion of water lawfully accessible for take in 2019–20, 2020–21 and 2021–22 by Basin state

Basin State	2019–20			2020–21			2021–22		
	Water lawfully accessible for take[1] (GL)	Annual actual take (GL)	Annual Actual Take as a proportion of WLAT (%)	Water lawfully accessible for take[1] (GL)	Annual actual take (GL)	Annual Actual Take as a proportion of WLAT (%)	Water lawfully accessible for take[1] (GL)	Annual actual take (GL)	Annual Actual Take as a proportion of WLAT (%)
Queensland	182.7	162.0	89%	276.9	152.1	55%	194.8	130.5	67%
New South Wales	2,227.0	1,210.4	54%	2,148.1	788.1	37%	2,295.7	558.3	24%
Australian Capital Territory	2.2	0.3	15%	2.1	0.6	30%	2.3	0.3	14%
Victoria	490.1	262.7	54%	464.5	216.6	47%	452.1	141.4	31%
South Australia	113.4	65.2	57%	113.8	64.7	57%	133.7	64.6	48%
Basin Total	3,015.4	1,700.6	56%	3,005.4	1,222.1	41%	3,078.60	895	29%

[1] Sum of allocation, carryover and take under basic rights

3.4.3 Metering of groundwater take

Groundwater actual take data is provided to the MDBA by the states as either an estimate, or from data collected by approved meters. The methodology for determining estimates of groundwater taken are outlined in the relevant WRPs. Generally, take under basic rights is unmetered and estimated and is typically small volumes of water extracted per bore (usually up to 2 ML). As these volumes are estimates, they will not change between water years, unless an updated WRP with improved estimates is submitted by a basin state and accredited by the Commonwealth Water Minister. Despite basic rights only representing a small percentage of the total take for groundwater in the Basin, it is relied on by many users.

The breakdown of metering and estimate groundwater take is as follows:

- Take from groundwater – in 2021–22 Basin States reported that 78% of this form of take was metered
- Take under basic rights – no metering, 100% estimated.

The proportion of groundwater take (excluding basic rights) that is metered varies between the different Basin States. By volume in the 2021–22 reporting year, the Australian Capital Territory reported 100% of take from groundwater as metered. This value is 98% in New South Wales, 95% in South Australia, 68% in Victoria and 29% in Queensland. It should be noted that these percentages relate to the total volume of water taken and does not show the proportion of the infrastructure used for taking groundwater that is currently metered.

3.5 Managed aquifer recharge

Managed aquifer recharge (MAR) is the intentional recharge of an aquifer, either by injection or infiltration of treated or untreated surface water into a groundwater system for subsequent recovery by planned extraction or for environmental benefit. One of the inherent benefits of MAR is the ability to use the groundwater system as a storage system to 'bank' injected waters for use at another time (e.g. recharge water during wet years for extraction during drier years). The Basin Plan provides for the accounting of MAR.[22] MAR volumes are accounted for in a way that avoids double accounting the extraction of water against an SDL in both the source (e.g. surface water) and receiving SDL resource units (e.g. groundwater).

The Basin Plan provides for the accounting of water use for managed aquifer recharge. Surface water diverted for the purpose of managed aquifer recharge is accounted for within the relevant surface water SDL resource unit from which the diversion occurs. The net extraction of the water from the groundwater system is then separately accounted for.

There is ongoing interest in the potential for managed aquifer recharge schemes to store excess water within the Basin. However, it is currently only practiced in two groundwater SDL resource units: one in South Australia and the other in the ACT.

In South Australia, water from the River Murray SDL resource unit and from selected tributaries of the River Murray in the Eastern Mount Lofty Ranges surface water SDL resource unit is recharged into the Angas Bremer (Murray Group Limestone) SDL resource unit. There are no licences specifically for MAR in South Australia, and the water used for recharge is generally attached to irrigation allocations. As can be seen in Figure 3-7, in the 2021–22 reporting year, 1.02 GL was added to this groundwater system via managed aquifer recharge with 0.089 GL extracted over the same period. This resulted in a net MAR volume of 0.93 GL for the Angas Bremer (Murray Group Limestone) SDL resource unit.

[22] Basin Plan 2012, s.10.12(1)(i)

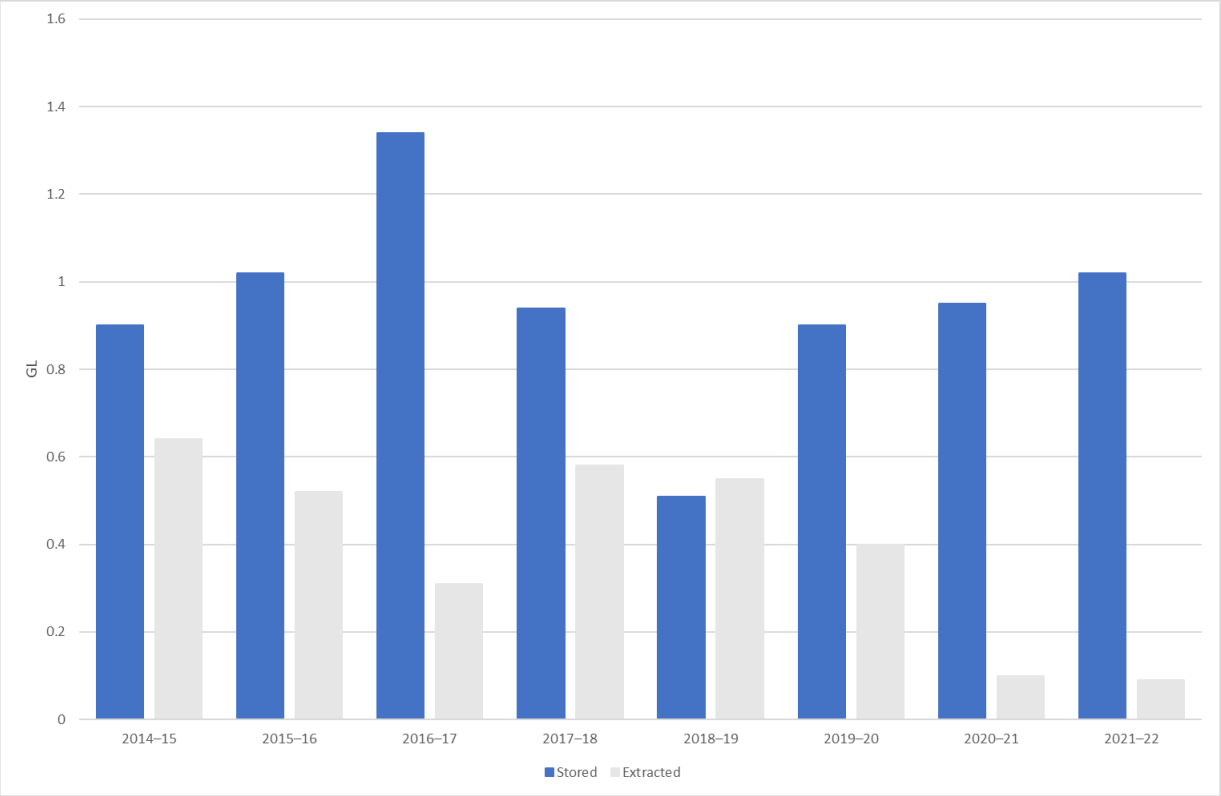


Figure 3-7 Managed aquifer recharge in SA volumes from 2014–15 to 2021–22

Managed aquifer recharge was first used in the ACT in 2014–15 to test and evaluate the suitability of an aquifer within the ACT groundwater SDL resource unit. This forms part of a program by the ACT government to use managed aquifer recharge to store stormwater harvested and filtered via a constructed wetland before it is injected into an aquifer for future irrigation of urban green spaces. Over the 2021–22 reporting year, 0.11 GL was added to this groundwater system with 0.01 GL extracted for use over the same period (Figure 3-8). The relative disparity between the amount of water recharged and then extracted under the MAR accounting in the ACT is likely to be a direct result of the 2021–22 climatic conditions.

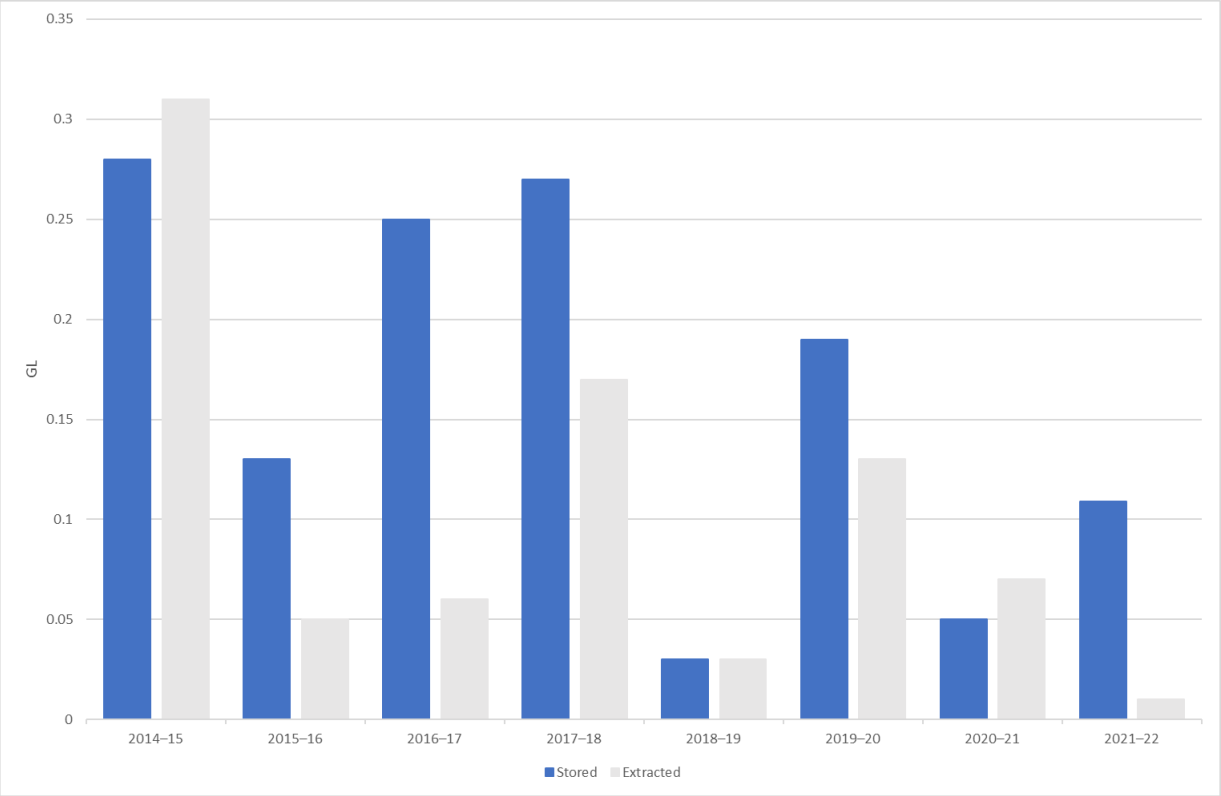


Figure 3-8 Managed aquifer recharge in ACT volumes from 2014–15 to 2021–22

Table 3-9 presents the volumes of water stored and extracted via managed aquifer recharge from 2014–15 to 2021–22. During the 2021–22 water year 1.13 GL was recharged to groundwater and 0.10 GL was extracted for use. Compared to 2020–21, this is a slight increase in the volume recharged, and similar volume in the volume of the stored MAR water extracted.

Cumulatively, since the 2014–15 water year, 8.89 GL has been recharged with 4.02 GL extracted, resulting in a net volume of 4.87 GL added to groundwater systems across the Basin via managed aquifer recharge. The majority of the MAR is occurring in South Australia, with 90% of the change in net volumes in groundwater occurring in this state.

Table 3-9 Managed aquifer recharge volumes (GL) from 2014–15 to 2021–22

	2014–15		2015–16		2016–17		2017–18		2018–19		2019–20		2020–21		2021–22	
SDL Resource unit	**Stored**	**Extracted**	**Stored**	**Extracted**	**Stored**	**Extracted**	**Stored**	**Extracted**	**Stored**	**Extracted**	**Stored**	**Extracted**	**Stored**	**Extracted**	**Stored**	**Extracted**
Australian Capital Territory																
Australian Capital Territory (groundwater) (GS52)	0.28	0.31	0.13	0.05	0.25	0.06	0.27	0.17	0.03	0.03	0.19	0.13	0.05	0.07	0.11	0.01
South Australia																
Angas Bremer (Murray Group Limestone) (GS1)	0.90	0.64	1.02	0.52	1.34	0.31	0.94	0.58	0.51	0.55	0.90	0.40	0.95	0.10	1.02	0.09
Basin total	**1.19**	**0.94**	**1.15**	**0.57**	**1.59**	**0.37**	**1.21**	**0.75**	**0.54**	**0.58**	**1.09**	**0.53**	**1.00**	**0.17**	**1.13**	**0.10**

4 Movement of water within the Basin

4.1 Water trade within the Basin

Allocations and entitlements across the Basin that are traded must be consistent with states' water management laws and the Basin Plan chapter 12 water trading rules. Water is traded within and between Basin States, and within and between holders of consumptive water entitlements and environmental water entitlements (consumptive entitlements being for irrigation of crops and town water supplies etc.). Water trade has enabled water entitlement holders to maximise the value of their entitlement through the opportunity to buy and sell water.

Trade also provides an important risk management tool. When individual allocations are not enough to meet crop or environmental watering needs, entitlement holders can purchase additional allocations to make up part or all of the shortfall.

This section provides information on the annual volume of water allocation traded at the Basin-wide and state scales. Data on trade at the SDL resource unit scale can be provided on request.

Data on water trade in the Basin is recorded by governments and agencies for a range of purposes. In the context of SDL accounting, data on trade is required for two purposes:

- The first purpose is in the determination of the adjustment to annual permitted take.
    - As all actual use for consumptive purposes is recorded at the point of use (regardless of whether it has been traded to that location or not), it is necessary to adjust the annual permitted take to reflect the net trade of consumptive entitlements and/or allocation into or out of an SDL resource unit, to ensure that like is compared with like. Under SDL accounting, volumes of net consumptive trade between SDL resource units must be accounted for as part of the process to calculate the annual permitted take.
- The second purpose is in the determination of the cumulative balance for an SDL resource unit.
    - In accordance with requirements of s. 10.12(3), set out in the relevant water resource plan, and s. 6.12(1)(a) of the Basin Plan, the cumulative balance is adjusted for any acquisition or disposal of held environmental water in the SDL resource unit, i.e., trade of consumptive allocation to an environmental water entitlement holder (C to E) or trade of environmental allocation to a consumptive water entitlement holder (E to C).

Accounting adjustments for both of these purposes occurs using a simple 1:1 ratio. That is, 20 GL of environmental allocation traded to the consumptive pool will increase the cumulative balance by 20 GL. This ensures that compliance is tested against a cumulative balance that accounts for any movement of allocation between the consumptive and environmental pools and vice versa.

Most trade within the Basin is of surface water. Due to the very small volumes of trade and use of environmental water in groundwater systems, adjustments for trade and environmental water availability are not applied in groundwater SDL resource units.

4.1.1 Surface water trade

The volumes of water traded throughout the Basin since 2019–20 is set out in Table 4-1. It shows the total allocations traded within SDL resource units (i.e., in valley) and to other SDL resource units (i.e. across or 'inter-valley'). It includes trades for both consumptive and environmental holdings, to provide an indication of trade activity in the Basin. Note, the data considers allocation as traded every time there was a transaction. Therefore, if a volume of allocation was traded a number of times between buyers and sellers, it will be accounted for multiple times as well.

Table 4-1 Surface water allocation trades between consumptive and environmental users by State since 2019–20

Year	State	Total allocation traded (GL)	Consumptive to consumptive	Environmental to environmental	Consumptive to environmental	Environmental to consumptive	Net Environmental to Consumptive
2019–20	QLD	36.2	36.2	0.0	0.0	0.0	0.0
	NSW	2,113.6	1,445.7	637.4	10.1	20.4	10.4
	ACT	0.0	0.0	0.0	0.0	0.0	0.0
	VIC	3,799.3	1,659.7	2,139.3	0.3	0.0	-0.3
	SA	477.5	269.4	207.1	1.0	0.0	-1.0
	TOTAL	**6,426.7**	**3,411.1**	**2,983.8**	**11.4**	**20.4**	**9.0**
	% of total	**100%**	**53%**	**46%**	**0%**	**0%**	
2020–21	QLD	46.8	46.8	0.0	0.0	0.0	0.0
	NSW	3,266.4	1,980.4	1,241.7	3.5	40.8	37.2
	ACT	0.0	0.0	0.0	0.0	0.0	0.0
	VIC	3,353.0	1,767.8	1,585.2	0.0	0.0	0.0
	SA	432.6	211.3	207.7	13.6	0.0	-13.6
	TOTAL	**7,098.8**	**4,006.2**	**3,034.6**	**17.2**	**40.8**	**23.6**
	% of total	**100%**	**56%**	**43%**	**0%**	**1%**	
2021–22	QLD	13.4	13.4	0.0	0.0	0.0	0.0
	NSW	2,824.9	1,512.5	1,259.0	7.2	46.2	39.0
	ACT	0.0	0.0	0.0	0.0	0.0	0.0
	VIC	3,312.9	1,806.5	1,493.5	0.9	12.0	11.1
	SA	396.9	173.9	209.4	13.6	0.0	-13.6
	TOTAL	**6,548.1**	**3,506.3**	**2,961.8**	**21.7**	**58.2**	**36.5**
	% of total	**100%**	**54%**	**45%**	**0%**	**1%**	

Volumes of entitlement (or permanent) trade across the Basin are published separately by the Bureau of Meteorology[23]. Water allocations traded in each Basin State are partitioned into source (i.e., origin), from where the water is traded and its destination (consumptive or environmental). The

[23] http://www.bom.gov.au/water/dashboards/#/water-markets/mdb/et

trade activity data suggests that most trade occurs in the southern Basin States, aligning with the majority of water use and regulation in the Basin.

In the southern Basin, allocation trade remains dominant driven by continued demand from irrigators looking to meet their ongoing water requirements for high value crops. With improved water availability, the volume of allocation traded during 2020–21 was a record high (7098.8 GL). With relative wet conditions during 2021–22 particularly in the southern Basin, trade was slightly less than that of 2020–21.

4.1.2 Groundwater trade

Groundwater trade is divided into three categories in the Basin Plan:

- between locations within an SDL resource unit s.12.24
- between two SDL resource units s.12.25
- between a groundwater SDL resource and a surface water SDL resource unit s.12.26

Rules governing groundwater trade vary between SDL resource units. There are a number of SDL resource units where trade is not currently enabled. Basin States may choose to enable trade in these SDL resource units in the future subject to Basin States' administrative processes and legislative requirements, and as long as the Basin Plan trade conditions are met in the water resource plan.

The Basin States have rules in place which prevent groundwater trades exceeding a state's extraction limit or SDL. Where trade is permitted between SDL resource units, it is only permitted where the trade will not exceed the extraction limit for the corresponding SDL resource unit.

Across the Basin, the majority of groundwater trade within the 2021–22 reporting period was trade within the same SDL resource unit. The only trade between units for the 2021–22 water year occurred in Victoria, where there was a total volume of trade 0.08 GL between SDL resource units. Trade between SDL resource units is permitted in two SDL units in New South Wales and eight SDL units in Victoria. This is dependent on certain conditions being met as set out in sections 12.24, 12.25 and 12.26 of the Basin Plan.

A small amount of trade occurs between groundwater and surface water SDL units. For this water year this trade was comprised of 0.38 GL temporary trade and 0.03 GL of permanent trade between the Goulburn–Murray: Sedimentary Plain (GS8c) and the Goulburn–Murray: Highlands (GS8b) SDL units into the Ovens River Unregulated surface water unit. This trade was small and only accounted for 0.41 GL of water being traded.

As can be seen in Table 4-2, most groundwater trade consistently occurs in New South Wales (90.7% in the 2021–22 reporting period). In NSW 93.6 GL was comprised of permanent trades, and temporary trades accounted for 144.5 GL. Most of the NSW trade occurred within the Gwydir Alluvium, Namoi Alluvium, Macquarie–Castlereagh Alluvium, Lachlan Alluvium, Murrumbidgee Alluvium and Murray Alluvium WRP areas. The Lower Murrumbidgee Alluvium (deep) (GS28) SDL resource unit alone accounted for approximately 36% of total groundwater trade in the Basin, and the Lower Lachlan Alluvium (GS25) a further 19.5%.

The total groundwater allocation volume traded in the Basin was 262.6 GL in 2021–22, which is a 54.6 GL increase from the 208.03 GL traded in the 2020–21 reporting period (Table 4-2). Detailed trade volumes at SDL resource unit scale are available from MDBA upon request. This includes a list of SDL resource units where trade was not enabled.

Table 4-2 Total groundwater allocation trade volumes in 2019–20, 2020–21 and 2021–22. Total includes permanent and temporary trade for both within and net trade between SDL resource units

State	2019–20	% of total	2020–21	% of total	2021–22	% of total
Queensland	8.33	3%	5.08	2%	3.48	1%
New South Wales	296.6	90%	180.4	87%	238.1	91%
Australian Capital Territory	0	0%	0	0%	0	0%
Victoria	15.6	5%	13.6	7%	12.2	5%
South Australia	7.45	2%	8.93	4%	8.79	3%
Basin Total	328	100%	208	100%	262.6	100%

4.2 Trends in water trade

Water market reforms were a key component of the 1994 national reform agenda agreed by Council of Australian Governments (COAG). Further, National Water Initiative reform has facilitated the movement of water within consumptive and environmental pools and between the pools depending upon a range of factors such as weather, water needs, market incentives, and users' decisions. The main market of water trade is within the consumptive pool for crops, industries and regions to achieve the 'highest value use'. This has seen the development of almond and olive plantations in semi-arid regions in the southern connected Basin. Water can be traded hundreds of kilometres, with state water authorities and river operators then charged with the responsibility of delivering water orders.

Environmental allocation trade (i.e. environment to environment trade) is generally used to deliver and account for the movement of environmental water from one SDL resource unit to another as part of environmental watering actions, and to facilitate carryover of environmental water to meet priority needs in the following water year. Another dominant driver is likely administrative trades within SDL resource units to facilitate delivery. For example, trading from a The Living Murray (TLM) licence onto a relevant state licence (e.g. SA) within the same SDL resource unit.

The water markets and their prices are mainly driven by the surface water available. The shift in water demand following the millennium drought, the floods in 2011, 2012, 2016, and 2022, and other market forces, have resulted in a volatility in water prices and changes in water market patterns.

Figure 4-1 shows trends in allocation trade from 2012–13 to 2021–22. Consumptive water trade plays a vital role in meeting water demands for agriculture, industry and other productive use. The consumptive-to-consumptive allocation trade remained dominant in seven out of ten water years, with its proportion to the total allocation trade trending slightly up from 49% in 2012–13 to 54% in 2021–22. As shown in Figure 4-1, trade between pools are orders of magnitude smaller than trade within pools; to the extent that they are barely visible in the Figure.

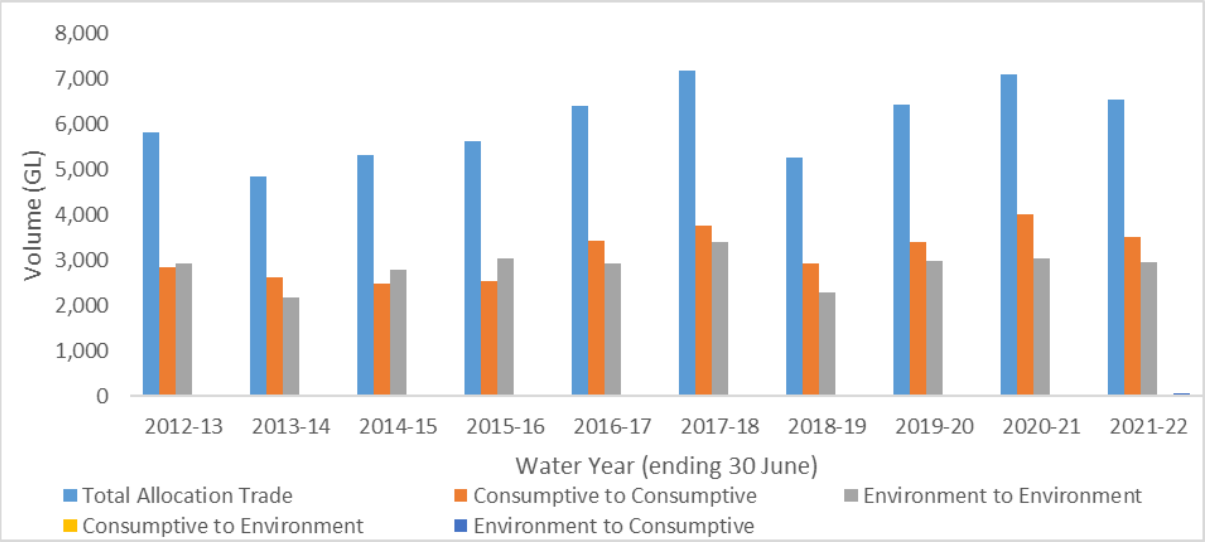


Figure 4-1 Trends of surface water allocation trade during 2012–13 to 2021–22

Figure 4-2 shows trends in surface water allocation trade between consumptive and environmental pools and vice versa. Since 2017–18, the dominant trade was from environment to consumptive. Increased rainfall and wetter conditions have seen more trade from environment to consumptive pool (E to C) due to sufficient water available in the environmental pool for the environmental benefits. Volume of net environment to consumptive trade was about 37 GL in 2021–22, primarily occurring in New South Wales, although this volume remains small compared to the overall volumes of trade in the Basin[24].

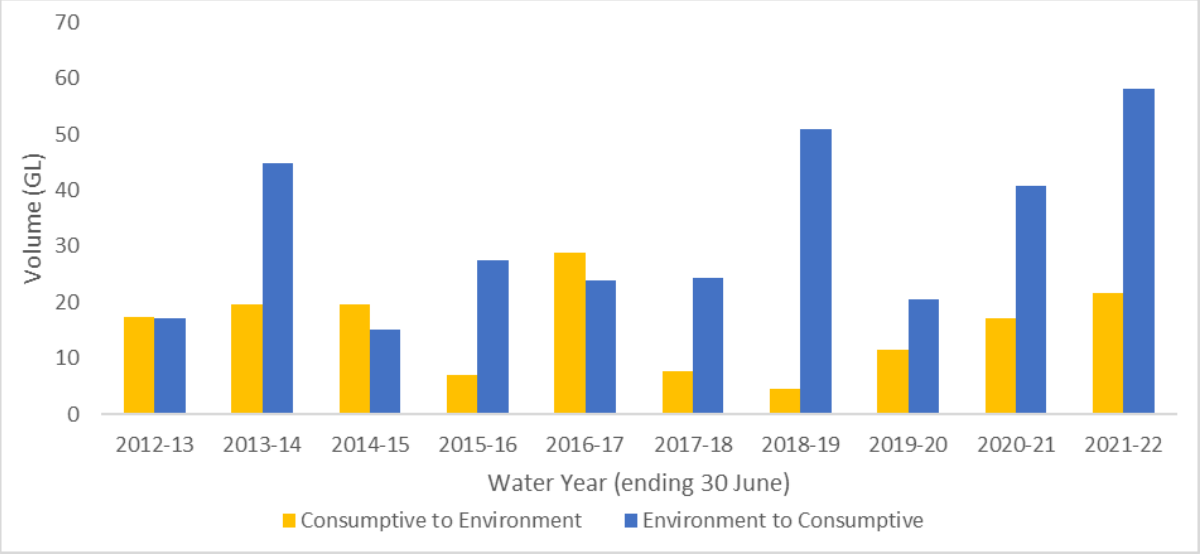


Figure 4-2 Trends of surface water allocation trade between the two pools of water use during 2012–13 to 2021–22

[24] Detailed water market information, including trends and analysis, are also available at Bureau of Meteorology website at http://www.bom.gov.au/water/market/index.shtml

5 Water for the environment

This section of the report sets out information about environmental water as reported to the MDBA in accordance with s.32 of the Water Act and Matter 9 of Schedule 12 of the Basin Plan. Reporting requirements for Matter 9 include Matters 9.1, 9.2 and 9.3, all which fulfil different purposes.

- Matter 9.1 accounts for the volume of water available for the identification and accounting of held environmental water (HEW) for each surface water and groundwater SDL resource unit.
- Matter 9.2 refers to the volume of planned environmental water (PEW) available in the water year and the proportion of PEW used for each surface water and groundwater SDL resource unit.
- Matter 9.3 reports on the volume of environmental water delivered to specific locations in the Basin (e.g. environmental assets) and for what purposes (e.g. longitudinal connectivity, improve flow regimes to support native fish populations). The volumes of environmental water reported in Matter 9.3 include HEW and PEW.

This report includes data from Matter 9.1 and 9.2 reporting. Matter 9.3 reports are prepared separately by Basin States, the CEWH and the MDBA each year and published in the publications section of the MDBA website.

By distinction from held environmental water, planned environmental water is environmental water that is generally not callable or associated with any water access rights. There are some exceptions in New South Wales where planned environmental water exists in the form of environmental water allowances in particular valleys. These exist as volumes in storage that may be called on in certain circumstances. Planned environmental water is discussed in more detail in section 5.6.

Detailed reporting of annual data on the availability and use of held environmental water under the requirements of the *Water Act 2007* and the Basin Plan was first provided for the 2013–14 water year. The held environmental water accounts presented herein represent progress to date in assembling this data in a useful and accurate way. All held environmental water volumes quoted in this report are the long-term average volumes estimated using *long-term diversion limit equivalent* - or LTDLE - factors, which are explained in section 5.2.

It is important to note that registered held environmental water entitlements retain the same characteristics as the consumptive entitlements from which they are sourced. For example, a New South Wales Murray general security entitlement registered as held environmental water will have the same characteristics in terms of access rules, fees, charges, and tradability as the original New South Wales Murray general security entitlement previously registered as a consumptive entitlement.

Like consumptive water, held environmental water represents the water allocated to water entitlements that are owned by the various environmental water holders. Like irrigation water, this held environmental water generally remains in storage until called upon to meet orders submitted by its owners for use at environmental sites. This water is subject to the same storage rules, storage losses, carryover and forfeit rules as consumptive water held in the storage.

This section identifies and accounts for HEW in the Murray–Darling Basin with reference to the following terms.

Held environmental water that contributes to bridging the gap

The component of held environmental water that represents entitlements that have been recovered to bridge the gap between the BDL and the SDL under the Basin Plan. Noting that this is a subset of the total held environmental water entitlements.

Held environmental water lawfully accessible for use

The volume calculated after the end of the water year that could have been used in the water year as a result of all allocations, announced periods of access, net carryover available from the previous year etc.

Held environment water actual use

The component of held environmental water that was used during the year in question.

5.1 Water recovery targets

At the time of its commencement in 2012, the Basin Plan required a reduction in long-term average consumptive surface water diversions (as they were understood at the time) to achieve the Basin-wide SDL estimate of 10,873 GL/y. At the time this required a reduction in the long-term average diversions of 2,750 GL/y, which was in addition to the HEW that had been recovered for environmental use prior to 30 June 2009. The water acquired was to be made available to achieve the environmental objectives of the Basin Plan.

Basin Plan amendments in 2018 impacted both the SDL and the surface water recovery target. Together, the SDL adjustment mechanism and the Northern Basin review reduced the Basin-scale surface water recovery target from 2,750 GL/y to 2,075 GL/y[25]. In addition, the Basin Plan includes a target of 450 GL/y of additional environmental water (efficiency measures) for delivery by 30 June 2024. Efficiency projects are activities that change water use practises and save water for the environment. The water saved from these projects is registered as efficiency entitlements set aside as water for the environment and the SDL is reduced as a result.

The Australian Government has committed to secure the reduction target to achieve the SDL through the recovery of water entitlements that will be registered as HEW and managed by the CEWH, and Basin state environmental water holders[26]. This commitment has been made to avoid any impacts on remaining consumptive entitlement holders associated with the reduction in the size of the consumptive pool.

[25] The determination to adjust sustainable diversion limits | Murray–Darling Basin Authority (mdba.gov.au)
[26] More information about water recovery projects is available from the Department of Climate Change, Energy, the Environment and Water.

On 5 September 2023 the Australian Government *introduced* legislation to extend Basin Plan delivery time frames; SDL adjustment mechanism supply and constraint projects to 31 December 2026, and 450 GL efficiency measures to 31 December 2027.

Prior to the Basin Plan, water for the environment was recovered through programs such as The Living Murray and Water for Rivers[27]. The water recovery commitments in the period 2004–09 were taken into account when determining the BDLs and SDLs for each SDL resource unit area. The water recovery target builds upon these historical efforts to improve environmental outcomes.

The Basin Plan also requires groundwater diversions to be reduced to meet the SDL in two SDL resource units in Queensland, within the Condamine–Balonne water resource plan area. The Australian Government has committed to recovering the 38.5 GL/y target required to bridge the gap to the SDL in this water resource plan area. The required reduction is 35.4 GL/y in the Upper Condamine Alluvium (Central Condamine Alluvium) SDL resource unit and 3.05 GL/y in the Upper Condamine Alluvium (Tributaries) SDL resource unit. Progress has been made against each of these recovery targets. At 30 June 2022 a total of 3.2 GL/y recovery remains in this water resource plan area[28].

The MDBA, with Queensland and the Australian Government Department of Climate Change, Energy, the Environment and Water, has worked to improve the BDL estimate in the Upper Condamine Alluvium (Tributaries) SDL resource unit. At the time of setting the BDL, the volume used included licences which were authorised to take water from three groundwater resources, namely the Tributaries, the Upper Condamine Basalts, and the Great Artesian Basin. Queensland has since amended these licences so they may take water from one resource only. As a result, the maximum allowable take in the Tributaries decreased by 1.95 GL/y in 2018. Queensland has proposed that the BDL be decreased accordingly. To give effect to this BDL change, a Basin Plan amendment would be required. This matter will be considered during the 2026 Basin Plan review. Nevertheless, the required reduction amount or target recovery volume in the Upper Condamine Alluvium (Tributaries) SDL resource unit is estimated to be 3.05 GL/y.

5.2 The long-term average annual volume of HEW

For reporting of held environmental water entitlements, both the water share volume (or number of entitlements) and a long-term annual average use volume are considered. The long-term annual average use volume is derived using long-term diversion limit equivalence (LTDLE) factors (also known as 'Cap factors'). To derive the long-term annual average volume of an entitlement, the water share value is multiplied by the relevant LTDLE factor to give the long-term annual average volume. For example, if an entitlement has a 50 ML water share value and a LTDLE factor of 0.9, the long-term annual average volume of the entitlement is 50 x 0.9 = 45 ML/y.

LTDLE factors enable differing entitlements across the Basin to be converted into a common currency to allow for direct comparison between products with differing reliability and expected usage under

[27] Pre-2009 water recovery table 2017 | Murray–Darling Basin Authority (mdba.gov.au)
[28] Progress on water recovery | Murray–Darling Basin Authority (mdba.gov.au)

the rules of the relevant water sharing arrangements. LTDLE factors are used to estimate the volume of water recovered to bridge the gap between the BDL and the SDL.

In surface water, there is a unique LTDLE factor for each class of entitlement in each SDL resource unit. In groundwater, most entitlements associated with held environmental water are determined to have an LTDLE factor of 1.00. Therefore, the entitlement volume equals the LTDLE volume. In the Upper Condamine Alluvium (Central Condamine Alluvium) SDL resource unit, the LTDLE factor was determined to be 0.876.

A set of LTDLE factors across the Basin was initially adopted by the Murray–Darling Basin Ministerial Council in 2011, however these did not provide a consistent basis for water accounting across the Basin. In 2015, all Basin Government Water Ministers agreed to update the 2011 LTDLE factors, ahead of WRP accreditation. To date, updated LTDLE factors have been developed for Victoria, South Australia and Queensland based on the information used for WRP accreditation. New South Wales factors were also updated in 2019, based on modelling used for the 2012 Basin Plan, and will be finalised when the New South Wales WRPs are accredited.

The 'planning assumptions' process agreed by Ministerial Council allowed each Basin State to identify and provide to the MDBA relevant 'planning assumptions' that would support each Basin state's proposed water resource plans. The assumptions include proposed methods that would be used to inform the demonstration of SDL compliance in each SDL resource unit. The planning assumptions enable the calculation of a set of LTDLE factors for the period that the water resource plan operates, and this in turn informs the Australian Government's water recovery strategy.

Updated LTDLE factors used to estimate the volume of water recovery to bridge the gap from BDLs to SDLs for both surface water and groundwater, and the methodology behind them are outlined in the following independent reviews:

- The July 2018 independent review of the updated New South Wales LTDLE factors
- The March 2019 independent review of the updated Victorian LTDLE factors
- The November 2019 independent review of the updated South Australian LTDLE
- The August 2020 independent review of the updated Queensland LTDLE factors for both surface water and groundwater entitlements

Endorsed by Basin States, these reviews are available at State water recovery – independent review reports.

The New South Wales LTDLE factors may be further updated and finalised through the accreditation of the New South Wales water resource plans.

Where water recovery occurred prior to the setting of the baseline conditions (generally at 30 June 2009), the LTDLE factors that were used in settling the recovery volumes from those programs are continued in this report. The Living Murray and Water for Rivers continue to be reported at the agreed volumes of recovery previously recognised.

5.3 Held environmental water entitlements

Total available held environmental water is made up of four components, with the primary purpose of achieving an environmental benefit:

1. Entitlements recovered prior to the Basin Plan and/or entitlements recognised as being for the purpose of environmental benefits when the BDL was set (i.e. pre-Basin Plan water recovery programs or pre-existing environmental water)
2. Entitlements recovered after the BDL was established that are not gap-bridging because they were not previously part of consumptive water (e.g. evaporation savings) (i.e. post Basin Plan recoveries that are not gap-bridging)
3. Entitlements recovered to bridge the gap from the BDL to the SDL (a long-term average annual target of 2,075 GL/y plus at least 62 GL/y of efficiency measures as at 3 July 2018)
4. Entitlements that contribute to the SDL adjustment mechanism's 450 GL/y of efficiency measures, targeted for delivery by 30 June 2024

Bridging the gap is the primary water recovery target in the Basin Plan, with the investment in water for the environment only able to occur where there are opportunities to generate water savings for conversion to HEW entitlements or where there have been water acquisitions.

Due to the nature of water recovery projects, especially those incorporating significant infrastructure upgrades or renewals, progress in water recovery does not proceed in a regular pattern. From investment to realisation of the savings takes time, sometimes in the order of five or more years. Many of these projects were completed by 30 June 2022 and long-term savings in the form of entitlements were transferred to environmental water holders. At 30 June 2022 a number of efficiency measure projects were still underway which are expected to deliver held environmental water entitlements in the near future. Efficiency projects aim to provide 450 GL more water for the environment.

In terms of describing total held environmental water recovery and progress towards achieving the required Basin Plan reduction amount of 2,075 GL/y, the following terms are used:

HEW 'contracted'

Refers to entitlements secured under contracts that are not yet transferred from the current owner to the relevant environmental water holder.

HEW 'available'

Refers to entitlements that have been transferred to the ownership of the relevant environmental water holder and are available for use.

For efficiency measures under the SDL adjustment mechanism, the efficiency entitlement must be registered on the Basin Plan s.7.13 Register of Measures[29]. For the purpose of this report, an efficiency entitlement included on the Register has the same meaning as HEW 'available'.

[29] Sustainable diversion limit adjustment mechanism–register of measures | Murray–Darling Basin Authority (mdba.gov.au)

Contracted and available HEW is reported by the MDBA in conjunction with the Australian Government Department of Climate Change, Energy, the Environment and Water on a quarterly basis[30]. Any 'contracted' HEW entitlements are listed in the HEW register maintained by the MDBA when the entitlement becomes 'available'.

This part of the report discusses HEW available and not HEW contracted.

The Water Act s.32 requires the MDBA to identify and account for all HEW in the Murray–Darling Basin. Basin States, as per s.10.09 of the Basin Plan, must also provide for the establishment and maintenance of a register of HEW. Therefore, Basin States and the CEWH report annually on existing and newly obtained HEW entitlements. The MDBA register is a formal database that records all HEW entitlements registered in the Basin and is the source of all volumes presented in this report. This accounting includes the volumes of groundwater HEW available, and those that contribute to bridging the gap.

5.3.1 Surface Water

Over the reporting period, total surface water HEW available has increased by 0.2 GL/y in long-term diversion limit equivalence (LTDLE) terms from 3,053.2 GL/y at 30 June 2021 to 3,053.5 GL/y at 30 June 2022. The total volume of surface water HEW entitlements held at 30 June for 2021 and 2022 is shown in Table 8-3, Appendix 4. This table shows all surface water HEW entitlements in the Basin including those entitlements that were HEW before the Basin Plan commenced and those that have been acquired since it commenced.

HEW entitlements are largely generated from water recovery programs funded by the Australian Government and/or Basin state governments. In some Basin States, environmental water has existed for many years prior to the Basin Plan. Water recovery programs commenced in the late 1990s and the composition of HEW at 30 June 2022 includes:

- Pre-Basin Plan water recovery programs or pre-existing surface water environmental water
    - Water for Rivers – 249.7 GL/y. On a long-term average, this returns 179.7 GL/y to the Snowy River and 70 GL/y for the River Murray
    - The Living Murray initiative – 488.1 GL/y for the River Murray
    - Victorian government initiatives – 76.7 GL/y (39.2 GL/y for Wimmera–Mallee, 34.9 GL/y for the Victorian Murray and 2.5 GL/y for the Loddon)
    - South Australian class 9 wetlands entitlement – 39.0 GL/y.
    - New South Wales initiatives – 75.3 GL/y (44.1 GL/y for the Murrumbidgee, 29.3 GL/y for the NSW Murray, 1.9 GL/y for the Macquarie–Castlereagh)
    - Establishing consumptive limits lower than Cap, in some New South Wales water sharing plans – contributing 241 GL/y for a lower consumptive limit rather than creating HEW
- Bridging the gap programs under the Basin Plan – to achieve the 2,075 GL/y target
    - Australian Government led Sustainable Rural Water Use and Infrastructure Program (SRWIUP) 1,924 GL/y

[30] Progress on water recovery | Murray–Darling Basin Authority (mdba.gov.au)

        - Queensland “Gifted” Water 15.4 GL/y
        - Other initiatives including Basin state-based recovery programs 168.3 GL/y
- Note: The total volume of bridging the gap programs is 2,108 GL/y, which is greater than the target water recovery of 2,075 GL/y, refer to Section 5.5.2 for further explanation.
    - Efficiency measure projects for the SDLAM
        - As at 30 June 2022, five efficiency measure entitlements are registered for 2.0 GL/y in the South Australian Murray.
    - Post Basin Plan recoveries that do not contribute to bridging the gap as the water was not previously available for consumptive use under the BDL such as water recovered as a result of projects that reduce evaporation that were not part of the BDL (14.4 GL/y). These post Basin Plan recoveries include:
        - South Australian River Murray Class 9 wetland entitlements of 7.2 GL/y
        - New South Wales Gwydir 2.4 GL/y and Lachlan 4.8 GL/y
    - Post Basin Plan recoveries that do not contribute to bridging the gap, however were previously available for consumptive use under the BDL (0. 6 GL/y). These post Basin Plan recoveries include:
        - South Australian Adelaide desalination plant 0.5 GL/y
        - Victoria, Goulburn NVIRP Stage 1 program 0.1 GL/y

Figure 5-1 shows the progressive increase in HEW entitlements since 2004. These entitlements meet both Basin state water recovery programs and the Basin Plan recovery target. This reporting incorporates all Basin HEW entitlements, including those that existed before the Basin Plan commenced. The rate of increase in HEW entitlements has slowed in recent years as the remaining gap to achieving the water recovery target draws closer.

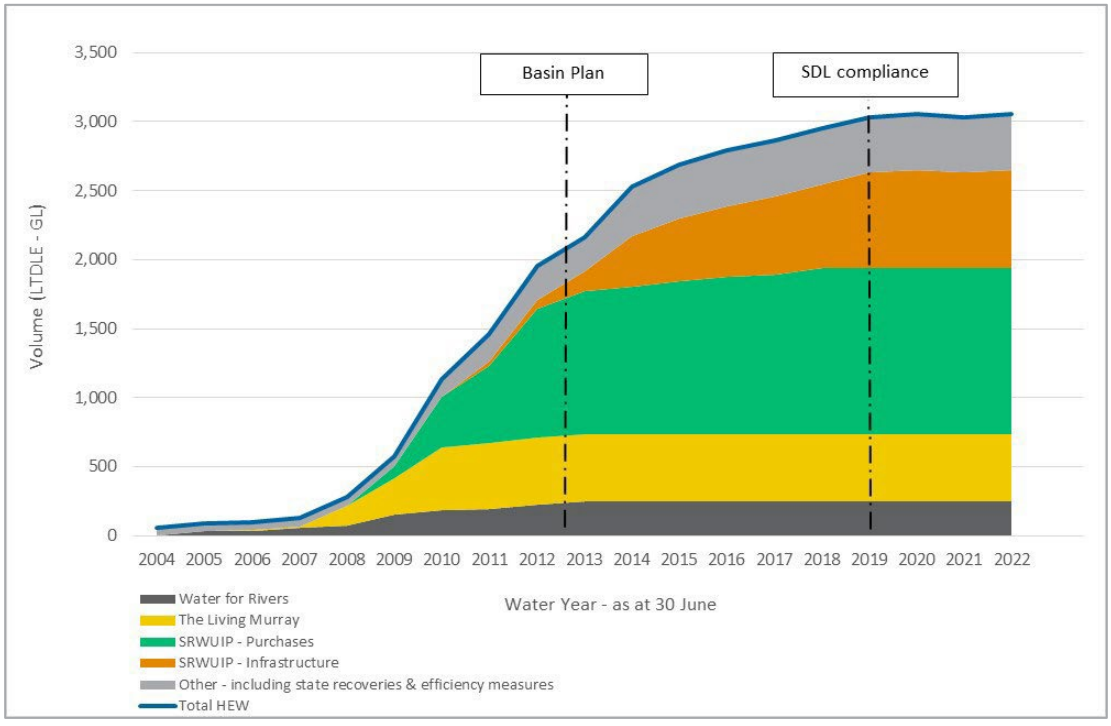


Figure 5-1 Total available surface water held environmental (HEW) entitlements as at 30 June by recovery program for the period 2004 to 2022

SRWUIP refers to the Australian Government Sustainable Rural Water Use and Infrastructure Program. Basin state recoveries include programs such as New South Wales Riverbank and other small recoveries.

HEW entitlements are typically transferred or recognised once the program or stages of the program are finished, the water savings or purchases are confirmed and the HEW entitlement is owned by an environmental water holder. There are a range of owners of HEW entitlements, reflecting the investment history in water for the environment (Figure 5-2). HEW entitlement holders in the Basin include the CEWH, state governments (the Victorian Environmental Water Holder - or VEWH, various New South Wales state government agencies and the South Australian Minister for Water and the River Murray) and a number of other private organisations.

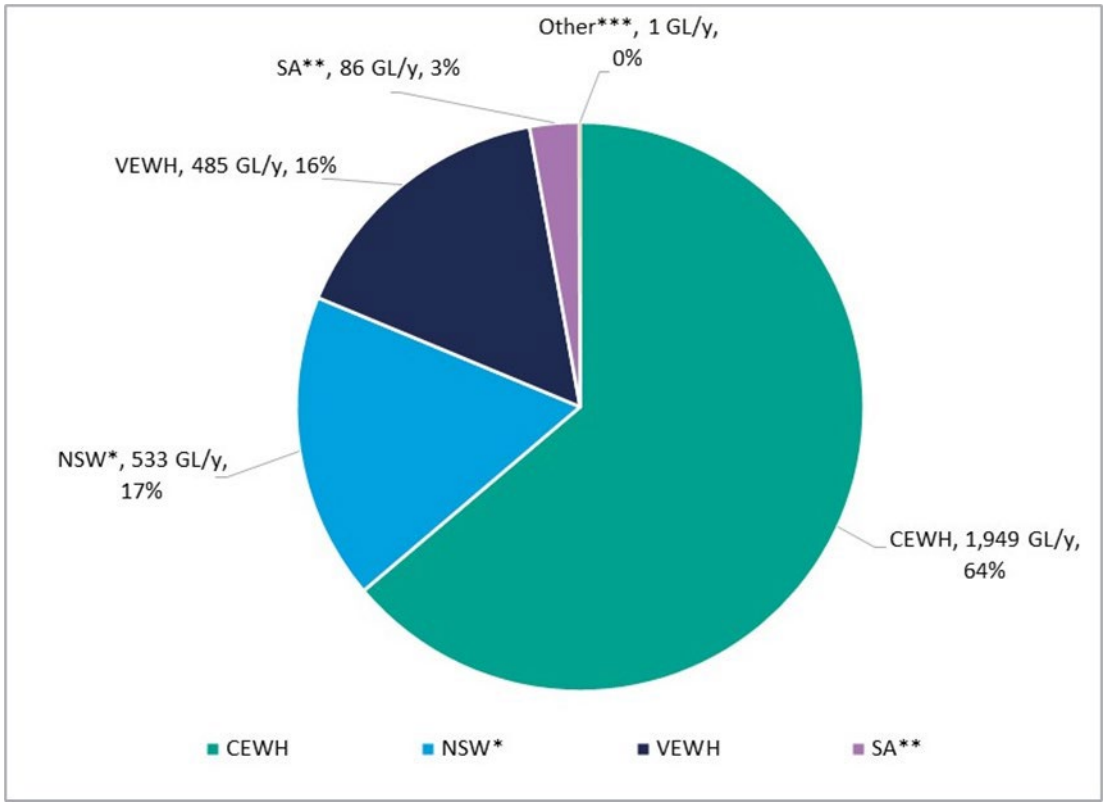


Figure 5-2 Proportions of total surface water HEW available as owned by different environmnetal holders at 30 June 2022 (volumes in GL/y LTDLE)

* various NSW State Government agencies
** Entitlements held by SA Minister for Water and the River Murray
*** HEW volume held by other private organisations is 1 GL/y LTDLE and thus too small to appear in this chart

As shown in Figure 5-2 the CEWH holds the largest volume of HEW entitlements in the Basin (64%). This reflects the significant Australian Government investment in water recovery. The CEWH holds HEW entitlements in all Basin States except the Australian Capital Territory. The Queensland government does not own any HEW entitlements, instead all HEW in Queensland is owned and managed by the CEWH.

Previously, some HEW entitlements were owned by MDBA and managed jointly under The Living Murray (TLM) program. As at 30 June 2020, the MDBA completed the process of TLM licence divestment, transferring ownership of MDBA held TLM water entitlements to the appropriate holder in the respective state of issue/origin. South Australian entitlements were divested in 2017, Victorian

entitlements in 2018, and New South Wales entitlements were finalised in 2020. Divestment included making sure there were clear use conditions attached to reflect the joint venture nature of TLM e.g. for NSW water access licences (or WALs) – "This access licence is part of the Living Murray portfolio and must only be used as agreed by joint Governments to deliver Basin Plan outcomes".

The divestment process helped to remove a potential conflict of interest between MDBA's former role as a regulator under the Basin Plan and MDBA's service delivery role as program manager of TLM under the MDB Agreement. After divestment, the use of TLM water entitlements for joint government and Basin Plan outcomes continues to be directed by consensus decision making of the Southern Connected Basin Environmental Watering Committee (SCBEWC) (i.e. portfolio management and water use decisions continue to be made collectively by NSW, VIC, SA, and the Commonwealth, including MDBA and CEWH). The MDBA continues to manage the TLM water portfolio to give effect to joint government decisions, as well as the coordinated management of other TLM program elements, such as monitoring, site management, modelling and the Indigenous Partnerships program.

Stakeholders and partners including government agencies, advisory groups and community and First Nation groups contribute to many environmental watering decisions. In the southern Basin, SCBEWC supports decisions for providing water for the environment, while, in the northern Basin, the Northern Basin Environmental Water group (NBEWG) provides advice and guidance for planning and providing water for the environment between valleys and across borders. The NBWEG consists of representatives from NSW, Queensland and the Commonwealth (including MDBA and the CEWH).

Figure 5-3 is a function of several things:

- Firstly, investment in HEW can only occur where there are opportunities to generate water savings for conversion to HEW entitlements or where there have been water acquisitions.
- Secondly, the water recovered is aimed at meeting the local reduction target and then, once that has been met, the shared reduction target. New South Wales and Victoria have the highest volumes of HEW entitlements, which reflect the larger volumes of the consumptive pool that occur in these states (Table 8-2) and hence the larger water recovery targets for these states set out in the Basin Plan. In addition, the water must be available within a system that is able to facilitate the delivery of this water to the agreed environmental sites.

Figure 5-3 Location of surface water HEW entitlements by Basin States as at 30 June for each year 2013 to 2022

5.3.2 Groundwater

The total amount of available groundwater HEW throughout the Basin, is shown in Table 5-1. There was no increase in groundwater HEW LTDLE volumes across the Basin from 2021 to 2022.

Table 5-1 Total groundwater held environmental water (HEW) entitlements available as at 30 June for 2021 and 30 June 2022

Groundwater SDL resource unit	30 June 2021		30 June 2022	
	HEW entitlements (GL)[1]	long-term HEW (GL/y - LTDLE)	HEW entitlements (GL)[1]	long-term HEW (GL/y - LTDLE)
Queensland				
Upper Condamine Alluvium (Central Condamine Alluvium)	40.13	35.15	40.13	35.15
Upper Condamine Alluvium (Tributaries)	0.10	0.10	0.10	0.10
Queensland total	**40.22**	**35.25**	**40.22**	**35.25**
New South Wales				
Billabong Creek Alluvium	0.03	0.03	0.03	0.03
Lachlan Fold Belt MDB	0.03	0.03	0.03	0.03
Lower Murray Shallow Alluvium	0.03	0.03	0.03	0.03
Lower Murray Deep Alluvium	1.32	1.32	1.32	1.32
Lower Murrumbidgee Deep Alluvium	6.91	6.91	6.91	6.91
Upper Murray Alluvium	0.14	0.14	0.14	0.14
New South Wales total	**8.46**	**8.46**	**8.46**	**8.46**
Total	**48.68**	**43.70**	**48.68**	**43.70**

[1] Entitlement data are based on differing classes of entitlements and are provided for comparison against the corresponding LTDLE totals (e.g. as a rough indication of aggregate security of entitlements).

Groundwater HEW in New South Wales is the result of HEW entitlements acquired in six groundwater SDL resource units under the New South Wales metering project, a New South Wales led state priority project under the Australian Government Sustainable Rural Water Use and Infrastructure Program. These water savings were offered in return for funding and are not part of bridging the gap under the Basin Plan.

5.3.3 HEW that contributes to bridging the gap

As of 30 June 2022:

- 2,107.7 GL/y of surface water HEW is estimated to be available and under contract to environmental water holders for bridging the gap purposes, with the application of the updated New South Wales, Victorian, South Australian and Queensland LTDLE factors (Section 5.2).
- While the total water recovery is greater than the target water recovery of 2,075 GL/y (plus at least 62 GL/y of efficiency measures), in some SDL resource units there is still a local or shared reduction amount to recover. As NSW water resource plans are finalised and accredited, the NSW LTDLE factors will be finalised, and the estimate of the volume of water recovered to bridge the gap updated.
- Groundwater HEW is estimated to be 35.3 GL/y in the Queensland Condamine-Balonne water resource plan area.

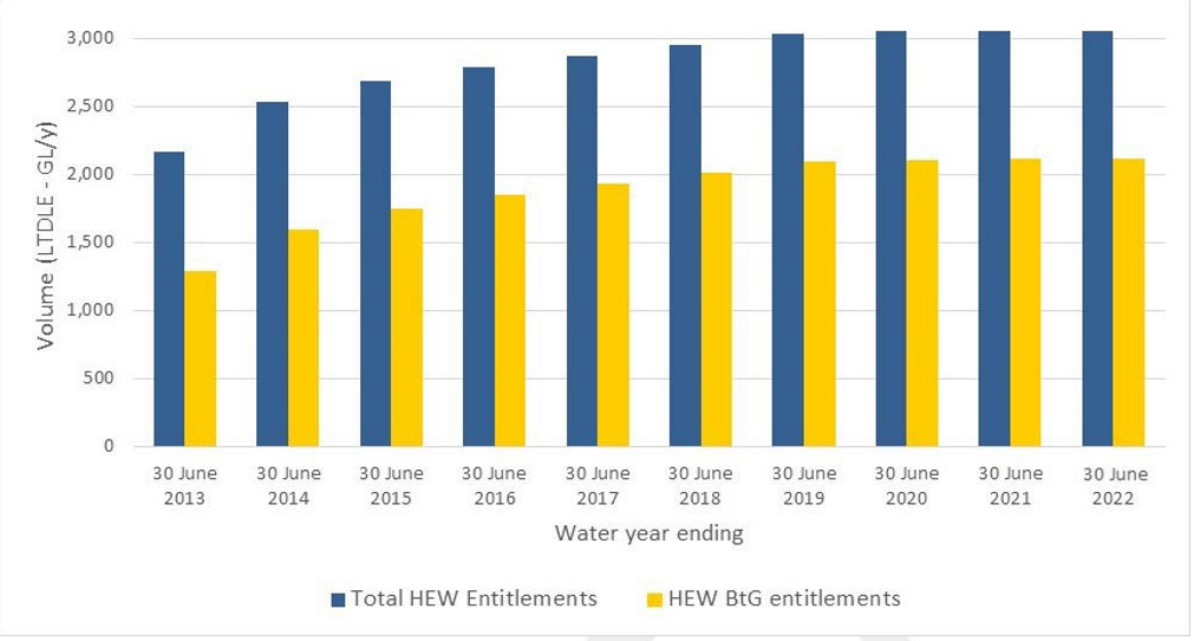


Figure 5-4 Bridging the gap (BtG) 'available' surface water HEW as compared to the total 'available' surface water HEW as at 30 June 2013 to 30 June 2022, excluding efficiency measure contributions

Table 5-2 shows the total available volumes of surface water HEW that contributes to bridging the gap (excluding efficiency measure contributions) at the SDL resource unit level. There has been no increase in volumes from 2021 to 2022.

Table 5-2 Total surface water HEW that contributes to bridging the gap as at 30 June 2021 and 30 June 2022, excluding efficiency measure contributions.

	2021		2022	
Surface water SDL resource unit	**HEW entitlements (GL)[1]**	**HEW (GL/y - LTDLE)**	**HEW entitlements (GL)[1]**	**HEW (GL/y - LTDLE)**
Queensland				
Paroo	-	-	-	-
Warrego	19.0	20.1	19.0	20.1
Nebine	1.0	3.8	1.0	3.8
Condamine–Balonne	90.1	86.0	90.1	86.0
Moonie	2.6	2.8	2.6	2.8
Queensland Border Rivers	23.6	14.4	23.6	14.4
Queensland total	**136.3**	**127.2**	**136.3**	**127.2**
New South Wales				
NSW Border Rivers	4.2	2.0	4.2	2.0
Intersecting Streams	17.8	13.8	17.8	13.8
Gwydir	132.0	54.6	132.0	54.6
Namoi	14.9	10.5	14.9	10.5
Macquarie–Castlereagh	184.4	95.9	184.4	95.9
Lachlan	115.3	47.1	115.3	47.1
Murrumbidgee	827.8	442.4	827.8	442.4
Barwon–Darling Watercourse	30.4	30.4	30.4	30.4
Lower Darling	24.6	22.3	25.8	23.2
NSW Murray	408.3	293.0	408.3	293.0
New South Wales total	**1,760.8**	**1,012.7**	**1,760.8**	**1,012.7**
Australian Capital Territory				
Australian Capital Territory (Surface Water)	-	-	-	-
Australian Capital Territory total	**-**	**-**	**-**	**-**
Victoria				
Victorian Murray	424.0	394.0	424.0	394.0
Kiewa	-	-	-	-
Ovens	0.1	0.1	0.1	0.1
Broken	0.7	0.4	0.7	0.4
Goulburn	401.1	369.0	401.1	369.0
Campaspe	30.6	27.9	30.6	27.9
Loddon	14.2	12.3	14.2	12.3
Wimmera–Mallee (Surface Water)	28.0	23.2	28.0	23.2
Victoria total	**898.6**	**826.8**	**898.6**	**826.8**
South Australia				
SA Murray	159.9	141.0	159.9	141.0
SA Non-Prescribed Areas	-	-	-	-
Marne Saunders	-	-	-	-
Eastern Mount Lofty Ranges	-	-	-	-
South Australia total	**159.9**	**141.0**	**159.9**	**141.0**
Basin total[2]	**2,955.5**	**2,107.7**	**2,955.5**	**2,107.7**

Note allow for minor rounding in total values

1 Entitlement data are based on differing classes of entitlements and are provided for comparison against the corresponding LTDLE totals (e.g. as a rough indication of aggregate security of entitlements)

2 Reversal of over reported Adelaide desalination plant recovery volume of 0.5 GL/y from 2019–20

As previously noted, the Basin Plan only requires groundwater extractions to be reduced to meet the SDL in two SDL resource units in the Queensland Condamine–Balonne water resource plan area (GW21). The required reduction is 35.4 GL/y in the Upper Condamine Alluvium (Central Condamine Alluvium) SDL resource unit and 3.05 GL/y in the Upper Condamine Alluvium (Tributaries) SDL resource unit.

Since February 2014, a number of tenders for entitlement purchase have been held in the Upper Condamine Alluvium. These have recovered 35.2 GL/y as at 30 June 2022, or 91% of the required 38.5 GL/y target that was to be reached by 2019. This leaves 0.2 GL/y remaining to be recovered in the Central Condamine Alluvium, and 2.95 GL/y remaining to be recovered in the Tributaries.

5.4 Held environmental water use

As with consumptive entitlements (refer to section 3.2.3), the amount of HEW lawfully accessible for use each year varies depending on the climatic conditions and allocations, carryover from previous years, trade of allocations and allocation adjustments reflecting applicable rules in Basin state water resource plans. The net volume of allocations that may be used in an SDL resource unit after accounting for these variables is presented in this report as the HEW lawfully accessible for use.

Basin States, the Commonwealth Environmental Water Office and The Living Murray (TLM) commenced reporting HEW available for use, volumes used and HEW lawfully accessible for use against Matter 9.1.2 and Matter 9.1.3 in the 2013–14 water year. Water accounting for HEW usage is continually improving.

5.4.1 HEW lawfully accessible for use

The volume of HEW lawfully accessible for use is a combination of the following (noting different Basin States develop methods as appropriate to their existing water sharing arrangements, and not all of these apply to all Basin States):

- allocations made to HEW entitlements in the year,
- HEW allocation carryover from the previous year,
- trade of HEW allocations between SDL resource units,
- net trade of HEW allocations for consumptive use,
- net transfer out of the Murray–Darling Basin (i.e. Snowy Hydro) applicable to NSW and Victoria only
- any unregulated or supplementary HEW use,
- return flows from HEW watering activities (applicable to Victoria only), and
- any adjustments reflecting applicable Basin state water sharing rules.

The total volume of HEW lawfully accessible for use may not be finalised until the end of the water year, as trades may influence whether the allocation is available in one SDL resource unit or another.

The difference between the long-term average value of HEW entitlements and the HEW lawfully accessible for use in any year is attributable to the climatic conditions in that year and in some cases trade from other SDL resource units and carryover provisions. For example, Table 8-3 shows Queensland with long-term average surface water HEW for 2021–22 at 127.2 GL/y, whilst Table 8-4

shows HEW lawfully accessible for use as 379.8 GL for 2021–22, in this case the difference is attributed to supplementary access and unregulated entitlement used.

In unregulated surface water systems, HEW lawfully accessible for use reflects HEW actually recorded as used, not the volume that may be allocated to an account. For instance, unregulated licence categories may receive 100% allocations, however the opportunity to take water is dependent on gauged flows in the river reaching licensed commence to pump/cease to pump (CTP) triggers. Therefore, if CTP triggers are not met the HEW lawfully accessible for use would be zero. For a more detailed breakdown of surface water HEW lawfully accessible for use see Table 8-4 in Appendix 4.

Under Basin Plan arrangements, it has also been agreed that HEW may be left in-stream to provide environmental benefits. Where this occurs, it is also accounted for as environmental use. For example, in Queensland the sum of diversions and agreed in-stream use is reported as both HEW lawfully accessible for use and HEW used. This is consistent with reporting of Queensland unregulated consumptive use. Therefore, HEW lawfully accessible for use in unregulated systems and for supplementary access water rights reflects the actual HEW use that has occurred. For example, HEW lawfully accessible for use in the Barwon–Darling was zero for 2019–20 as drought conditions prevailed and as an unregulated system CTP trigger may not have been met, therefore no HEW was used in this period. Compared to 2020–21 and 2021–22 (two wet years) where 100% of HEW was used each year, as these volumes are for use of supplementary access and unregulated entitlements. It is acknowledged that this practice may result in under-reporting of HEW lawfully accessible for use as some environmental managers may choose not to use the supplementary access allocation to improve base flows, which would normally trigger a recording of supplementary access being extracted or ‘used’.

At a Basin scale, HEW lawfully accessible for use increased from 3,357 GL in 2020–21 to 4,844 GL in 2021–22. All Basin States (excluding ACT where there is no HEW) experienced improved access to water under allocations as a result of ongoing rainfall across the Basin and minor flooding in the northern Basin. In the SA Murray, HEW allocation has remained at 252 GL since 2019–20, however the HEW lawfully accessible for use has fluctuated attributed to the volume of water traded into the accounts (Table 8-4).

The volume of surface water HEW lawfully accessible for use each year influences the timing and location of environmental watering activities for that year. Each year, the HEW lawfully accessible can be used for the following purposes:

- undertaking environmental watering actions—such as delivering environmental flows to specific river reaches, wetlands, floodplains, and other important ecological sites, including in-stream use
- be traded on a temporary basis to the consumptive pool.

In groundwater systems, the allocation provided for groundwater HEW entitlements does not need to be extracted to be considered used. Environmental outcomes can be achieved from groundwater HEW when it remains in the groundwater system.

5.4.2 Surface water HEW account use

The use of HEW to deliver environmental watering actions is typically co-ordinated among the different managers of the entitlements. Further information about the use of HEW (reported as Matter 9.1.3 in s71 reporting) under the Basin Plan is available from the MDBA website[31] and from the websites of the environmental water holders.

If HEW is not used or extracted and remains in storage, it may be:

- carried over to the next water year (if carryover provisions apply) or
- forfeited or deducted from the account if there are no carryover provisions or carryover limits are reached or there is a spill from the storage.

HEW use, as a share of all water used, varies between years and between valleys. This is to be expected in a large and complex river system and is necessary for the best environmental outcome to be achieved from the available HEW. Annual averages are therefore useful to provide an overall level of usage of HEW.

Figure 5-5 and Figure 5-6 shows an increase in the volume of HEW account use from 2020–21 to 2021–22 across all Basin States. At a Basin scale this was an increase from 2,287 GL to 3,258 GL. The 971 GL increase in HEW used was due to increased carryovers and allocations in the systems. There was no difference between the proportion of HEW used to HEW lawfully accessible to be used, suggesting the use remained consistent to HEW available to be used. For more detailed accounts see Appendix 4.

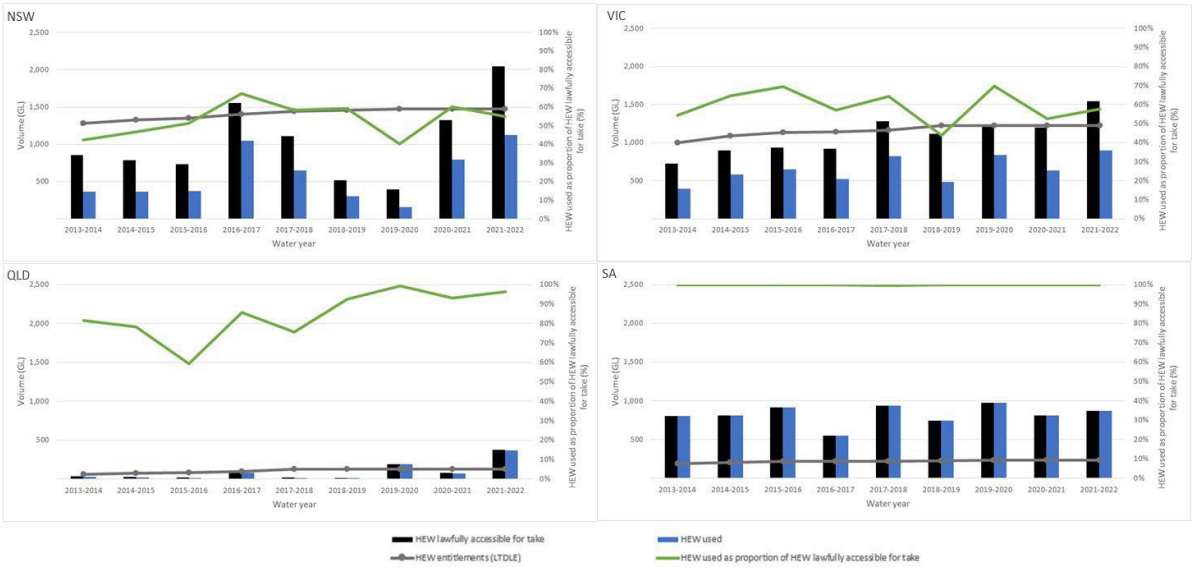


Figure 5-5 Surface water HEW lawfully accessible, HEW used and the percentage of HEW lawfully accessible used by Basin State (noting ACT has no HEW) 2013–14 to 2021–22

HEW allocations, HEW carryover, and HEW lawfully accessible for use across the Basin were greater in 2021–22 than 2020–21. At a State level, the NSW proportion of HEW used decreased, while in Victoria and Queensland HEW use as a proportion of HEW lawfully accessible for use show minor increases (Figure 5-5). This may in part be due to the increasing volume of water available, or

[31] Water for the environment | Murray–Darling Basin Authority (mdba.gov.au)

management decisions by environmental water holders to carry supply over for the next year, driven by the increased level of water available as discussed in Section 2. For a more detailed breakdown of HEW account use see section 5.5.

Figure 5-5 shows the surface water HEW lawfully accessible for use since the Basin Plan and reporting of HEW commenced and how much was utilised each year. Overall, the volume of HEW lawfully accessible and use has increased over time. This large increase in water available is a reflection on the increased flows occurring throughout the Basin, providing increased opportunities to use HEW, including increased availability of HEW entitlements, changing management of HEW accounts and the improvement in the quality of reporting of HEW use over several years.

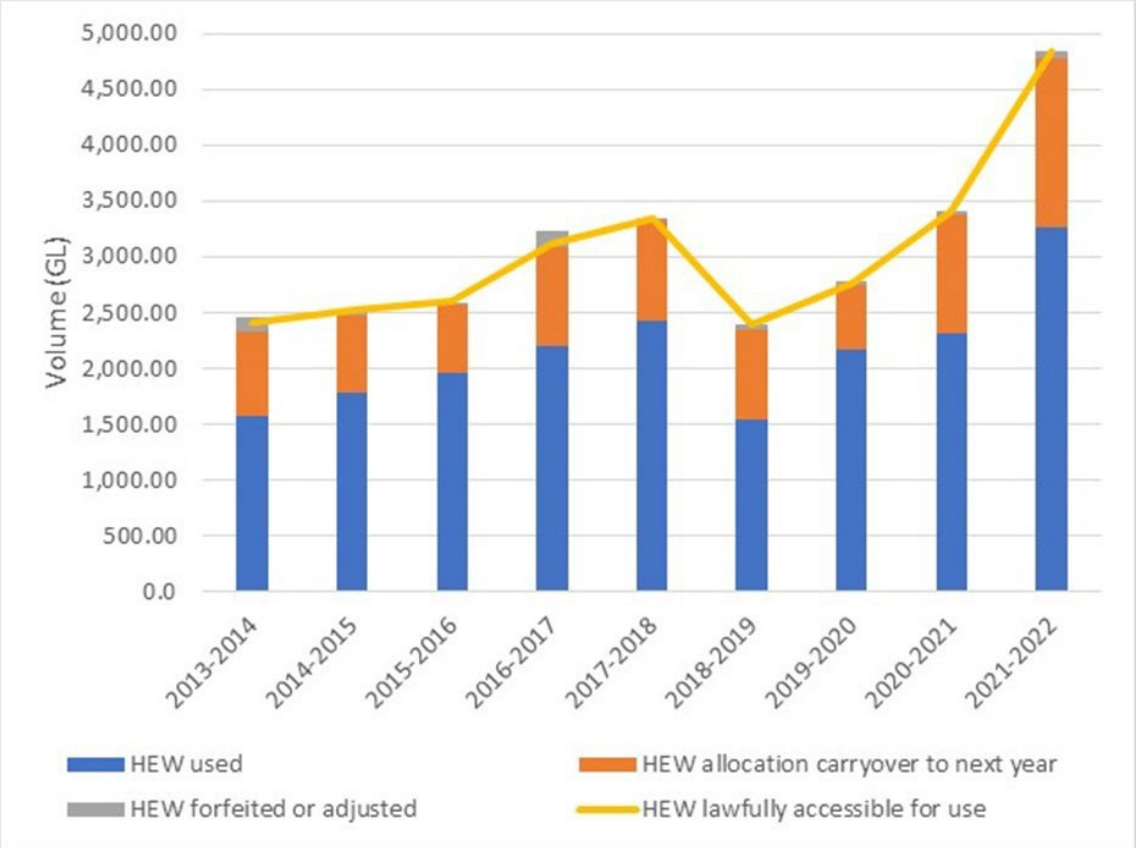


Figure 5-6 Surface water HEW lawfully accessible and how it has been utilised at a Basin scale 2013–14 to 2021–22

The volume of HEW available for use and actual use in the wetter years of 2016–17, 2020–21 and 2021–22, increased relative to 2018–19 where parts of the Basin were in drought and less environmental water was available. Regardless of the volume of rainfall and the availability of environmental water to be used, the proportion of carryover in the Basin remains relatively steady at around 20–30% of the HEW available to be used. This is occurring even when there is more water available for use. This indicates environmental water holders are consistently using around 70–80% of their HEW allocations regardless of climatic conditions. As a proportion of HEW lawfully accessible for use, the percentage of HEW carried over at the end of 2020–21 and 2021–22 was 31%.

For consumptive users, a similar pattern of deferring use of allocation, through uptake of carryover, is observed. Carryover enables environmental water managers to cover the high use during the winter-spring period before seasonal allocations are announced. More information about the use of carryover by environmental water holders can be accessed from their respective websites.

Even though owners and managers of HEW have the same set of rights and obligations as other owners of the same class of entitlement, concern has previously been raised that the volume of HEW carried over may be impacting on storages and the rights of other users to that storage. Table 5-3 and Figure 5-7 shows that at a Basin scale, HEW carryover as a proportion of actual dam storage had a slight increase from 7% to 8% at 30 June 2022, averaging at with a long term average of about 8% since 2014. By comparison, consumptive carryover as a proportion of actual dam storage was 29% at 30 June 2021, decreasing to 26% at 30 June 2022, and has averaged about 27% since 2014. Carryover as a percentage of actual storage for a single storage may be different to the values in Table 5-3 and can vary across the Basin.

Table 5-3 HEW and consumptive carryover as a percentage of actual storage and total carryover as at 30 June 2012–13 to 2021–22

Year as at 30 June	HEW carryover as proportion of actual storage	Consumptive carryover as proportion of actual storage	HEW carryover as proportion of total carryover	Consumptive carryover as proportion of total carryover
2013	-	28%	0%	100%
2014	6%	27%	18%	82%
2015	8%	32%	20%	81%
2016	8%	26%	19%	77%
2017	6%	29%	17%	83%
2018	8%	26%	23%	77%
2019	12%	31%	28%	72%
2020	7%	19%	27%	73%
2021	7%	29%	20%	80%
2022	8%	26%	22%	78%
Average (2013 – 2022)	8%	27%	20%	80%

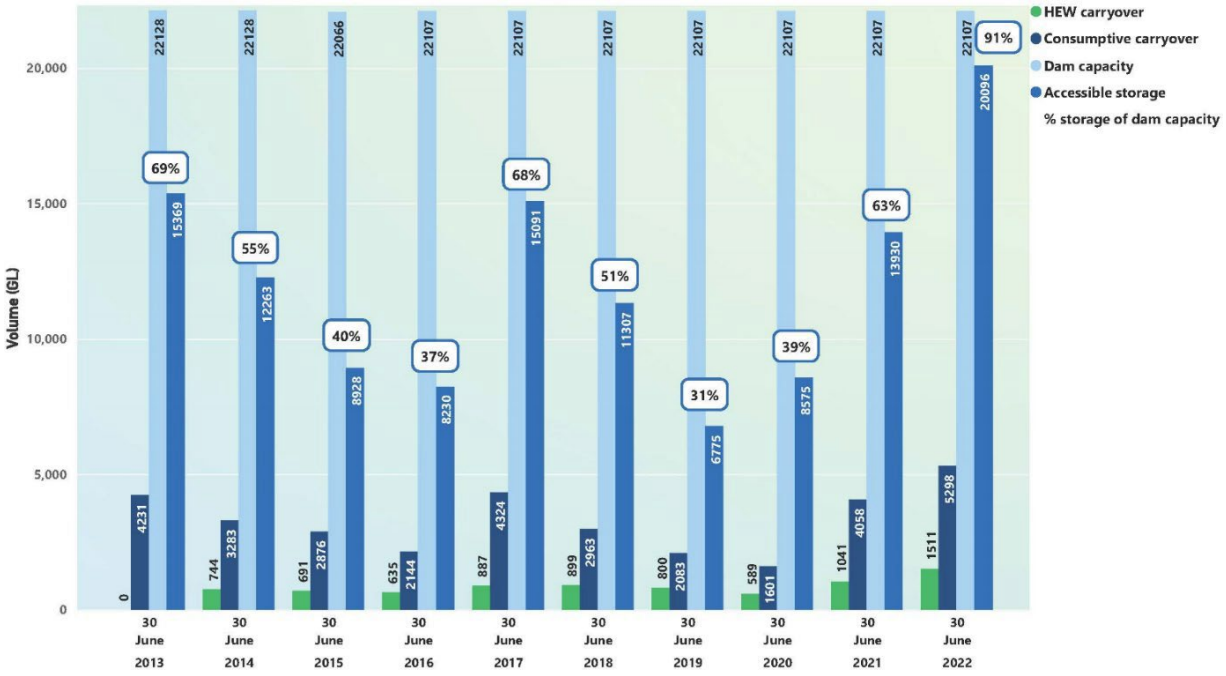


Figure 5-7 Comparison of consumptive and HEW carryover as a proportion of end of year actual storage as at 30 June 2013 to 30 June 2022 at a Basin scale (total and actual storage data provided by Bureau)

From the perspective of the proportion of carryover at a Basin scale to the volume of water lawfully accessible for use or WLAT, on average environmental water holders and consumptive users are carrying over a similar proportion of water available from their respective accounts (Table 5-4). On average environmental water holders are carrying over 28% of the amount of water lawfully available for their use, which equates to an average of 6% of the total Basin WLAT (i.e. environmental and consumptive water).

Table 5-4 HEW and consumptive carryover as a percentage of water lawfully accessible for use/take (WLAT) as at 30 June 2012–13 to 2021–22

Year as at 30 June	HEW Carryover as proportion of HEW WLAT	Consumptive carryover as proportion of SW WLAT	HEW carryover as proportion of total WLAT (C + E)	Consumptive carryover as proportion of total WLAT (C + E)
2013	-	27%		27%
2014	31%	27%	5%	23%
2015	27%	28%	5%	23%
2016	24%	23%	5%	18%
2017	28%	35%	6%	28%
2018	27%	28%	6%	21%
2019	33%	27%	8%	20%
2020	21%	34%	6%	25%
2021	31%	34%	7%	27%
2022	31%	38%	6%	28%
Average (2013 – 2022)	28%	30%	6%	24%

This analysis suggests, at a Basin scale, the volume of HEW carryover is not impacting on storage volumes and/or volumes of water available, representing a small proportion of total carryover. Further, if a storage was to fill to capacity, the same rules would apply to both HEW and consumptive carryover.

5.4.3 Augmentation of the Adelaide desalination plant

The Adelaide Desalination Plant (ADP) was completed in 2012, to support the diversification of Adelaide's water supply and to reduce reliance on the River Murray, particularly during dry years in the River Murray system.

As part of the *National Partnership Agreement on Water for the Future*, the Australian and South Australian governments agreed to expand the capacity of the ADP from 50 to 100 GL. Under Schedule 1 of the Implementation Plan for the Augmentation of the ADP (the agreement), South Australia was required to provide water for the environment.

Under clause S-III, a 6 GL high reliability water entitlement was to be acquired; this was achieved by 30 June 2013. Since 2012–13, allocations against this entitlement have been used for environmental outcomes in South Australia, for a total of 56 GL over ten years (Table 5-5). This high reliability entitlement meets the requirements of 'bridging the gap' water and contributes to reducing the limit on take from the BDL towards the SDL.

Table 5-5 Water delivered (GL) under Clause S-III (allocation of high reliability water entitlements) for the period 2012–13 to 2021–22

Year	High reliability water entitlement under Clause S-III Allocation (GL)	High reliability water entitlement under Clause S-III Actual use (GL)
2021–22	6.0	6.0
2020–21	6.0	6.0
2019–20	6.0	6.0
2018–19	6.0	6.0
2017–18	6.0	6.0
2016–17	6.0	6.0
2015–16	6.0	6.0
2014–15	6.0	6.0
2013–14	6.0	6.0
2012–13	2.0	2.0

Under clause S-IV, an additional environmental provision was required in eligible years. The volume required was up to 24 GL in any year but no more than 120 GL over a sequence of 10 eligible years. Subsequent to the signing of the Agreement, the environmental provision was required to be available for bridging the gap (if necessary), that is, they were required to have been previously used for consumptive purposes under the BDL. The addition of this requirement created mutually exclusive clauses, which rendered this part of the Agreement practically inoperable and generated uncertainty in how to implement this clause.

Under clause S-IV, all years from 2012–13 have been assessed as eligible years, South Australia provided 67 GL of allocation towards the environmental provision over the past ten years (Table 5-6). Additionally, over 145 GL of potable water has been produced by the ADP since operations began in 2011–12 (Table 5-6). If not produced by the ADP, an equivalent volume may have otherwise been taken from the River Murray for use in Metropolitan Adelaide. The River Murray allocations not taken were left in-river for environmental outcomes.

However, there has been an issue in previous years in accounting for the ADP production towards the environmental provision because a climate-adjusted model for determining the annual permitted take for Metropolitan Adelaide was not available at the time the Agreement was put in place. A model has now been accredited as part of the SA River Murray WRP and has been used to determine the Metropolitan Adelaide component of the annual permitted take for the SA Murray SDL resource unit in this report. From 2019–20, appropriate adjustments can be made to inform the Register of Take to account for the acquisition of HEW due to the operation of the ADP.

Table 5-6 Water delivered under Clause S-IV (allocation under environmental provision) for the period 2012–13 to 2021–22

Year	Environmental provision under S-IV Allocation (GL)	Environmental provision under S-IV Use (GL)	Water not diverted through use of Adelaide desalination plant (GL)
2021–22	12.00	12.00	0.0
2020–21	12.00	12.00	0.0
2019–20	1.60	1.60	0.0
2018–19	4.94	4.94	5.0
2017–18	2.95	2.95	4.4
2016–17	2.77	2.77	4.1
2015–16	6.51	4.52	7.7
2014–15	1.10	1.10	22.8
2013–14	11.11	11.11	61.0
2012–13	12.00	12.00	36.5
2011–12	-	-	4.2
Cumulative	**67.0**	**65.0**	**145.6**

5.5 Activation of held environmental water

HEW is drawn from the same pool of available water as consumptive water. It has the same water access rights as consumptive water, and therefore receives the same level of allocations and access to trade as consumptive water. These allocations can be accessed by relevant environmental water managers and in 2021–22 have been used to achieve significant environmental outcomes (Examples are included on this website: Water for the environment is making a difference - DCCEEW).

As there has been insufficient information available to model patterns of environmental water use, the methods set out by Basin States in water resource plans to determine the permitted take (for SDL compliance purposes), generally assumes that the utilisation of HEW will be the same as that of water taken by consumptive users. However in reality, the use of HEW may differ from consumptive use. Differences may include the timing within the year, the ability to deliver it and where in the Basin it is used, as the way water is used to achieve environmental outcomes will usually differ from the behaviour of consumptive users.

A difference between the environmental and consumptive use of water may be the level of utilisation of an entitlement, carryover and/or trading of allocations. Therefore, it is important to understand if there is any substantive difference between modelled assumptions of HEW use, and actual HEW use.

5.5.1 Held environmental water use relative to consumptive use

As HEW is drawn from the same pool of available water as consumptive water, and the use of HEW is relatively new and evolving over time, it has been assumed for the purposes of modelling that HEW

use would follow the same pattern to consumptive use. Figure 5-8 shows the use of surface water for both consumptive purposes and HEW, since 2013–14. Noting this representation is for all HEW surface water, including entitlements that are pre-basin plan and post basin plan (i.e. this includes entitlements that contribute to bridging the gap, non-gap bridging such as TLM and Snowy Water for Rivers, and efficiency measures), both state and commonwealth owned entitlements. Consumptive water use is represented by annual actual take as a proportion of WLAT for all forms of take, excluding interceptions.

The data has been displayed as a percentage to allow for direct comparison between these two water types despite the difference in the volume available to these two water groups. Across the Murray–Darling Basin, HEW use as a proportion of the water lawfully accessible for use was very similar to the consumptive use as a proportion of water lawfully accessible for take (WLAT) for the years 2013–14 to 2021–22 (65–80%). This suggests, based on the limited data available to date, that the volumes being utilised for entitlements since they were converted from consumptive to HEW have not changed at the Basin-scale.

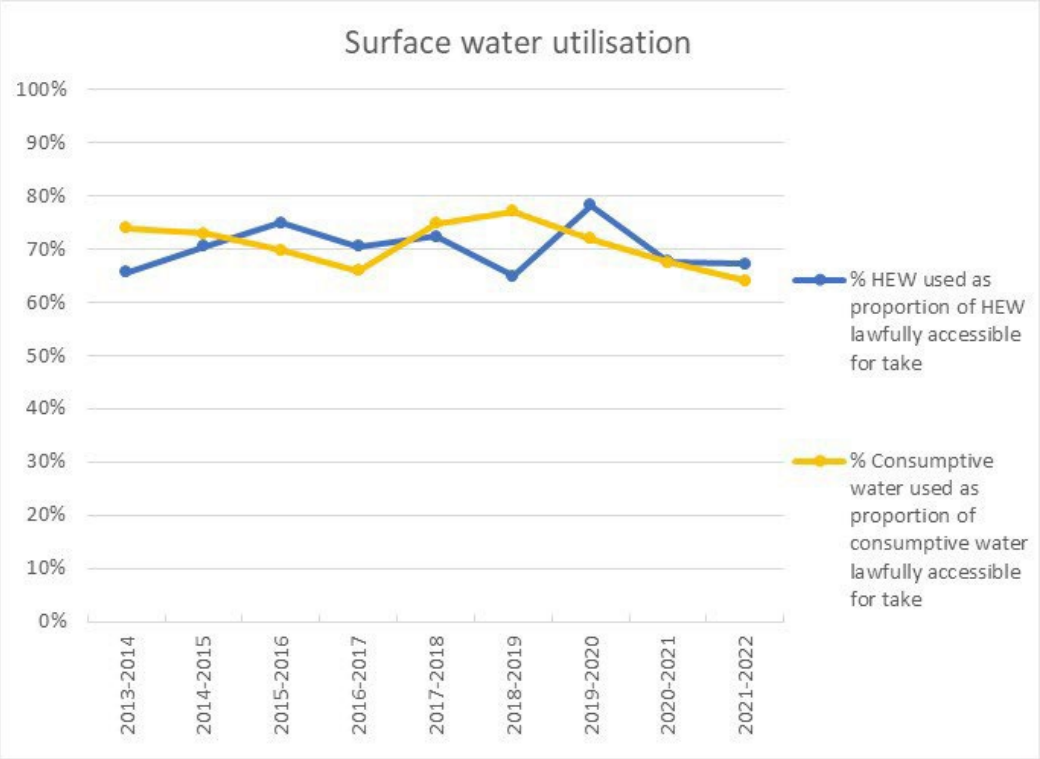


Figure 5-8 Proportion of Consumptive and held environmental water used against water lawfully accessible for take (or use) from 2013–14 to 2021–22, at a basin scale.

However, some differences can be seen, when comparing the Northern Basin to the Southern Basin (Figure 5-9) Noting in the Southern Basin, rivers are highly regulated while in the Northern Basin only a few rivers are regulated. This means flow is highly variable in the north compared to the Southern Basin, with flow in the northern Basin mainly managed based on rules rather than releases from dams. The Southern Basin proportion of use in both consumptive and environmental use is similar to the Basin level, at around 70%. However, HEW use, as a proportion of water lawfully accessible for use, has been less in the Northern Basin compared with the Southern Basin until the most recent water years.

The pattern of HEW use in the Northern Basin during the period 2015–16 to 2017–18 is likely to have been influenced by water availability, policy decisions and evolving trends in HEW use. Much of the NSW portion of the Northern Basin was in an extended dry period before above average rainfall during the 2016–17 water year resulted in significant flows, however environmental water use decreased in this wet year to 42% of what was lawfully accessible for use. Water accounting for HEW usage is continually improving, the trends observed in Figure 5-9 potentially are a reflection on this improvement over time.

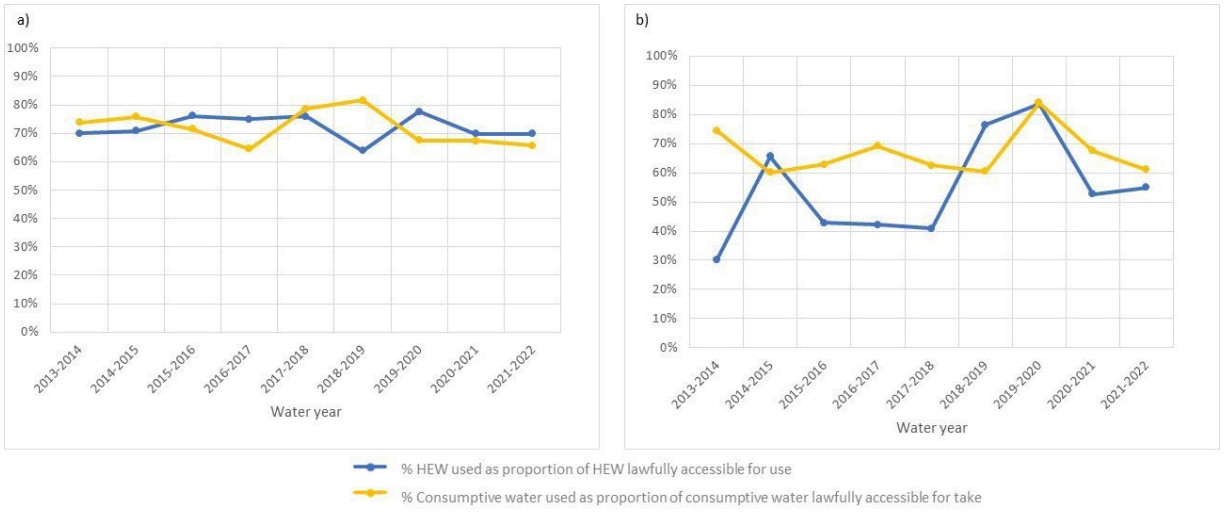


Figure 5-9 Proportion of Consumptive and held environmental water used against water lawfully accessible for take (or use) from 2013–14 to 2021–22, for a) Southern Basin and b) Northern Basin SDL resouce units.

Figure 5-10 displays differences in use at a Basin state level, for example in South Australia where all HEW lawfully accessible for use is used, as volumes include water that remains in-river for environmental outcomes at the end of the year. Another example is in Queensland where the percentage of HEW used (blue line) is influenced by use of regulated held environmental water in the Queensland Border rivers.

Note the use of water for the environment is evolving and these patterns will likely change over time. The use patterns observed to date are just starting to give us a sense of how HEW use compares to consumptive use. Overall, the proportions of use between the two pools have been quite similar. As this work is relatively new, further analysis of this data, and improvements in reporting methods are required to determine what might be driving these patterns or trends.

Figure 5-10 Proportion of consumptive and held environmental water used against water lawfully accessible for take (or use) from 2013–14 to 2021–22, for a) New South Wales, b) VictoriaVictoria, c) South Australia and d) Queensland SDL resouce units

5.5.2 Held environmental water use relative to modelled use (environmental water adjustment)

Hydrological models are part of the method of calculating annual permitted take for SDL compliance requirements. These models generally consider all available entitlements as one, that is there is no distinction within the models between entitlements available for the environment and/or consumptive use. It is not possible to explicitly model the use of water for the environment at this stage as methods to model use of water for the environment are still evolving. With the exception of Queensland, who model permitted take of HEW in accordance with the Water Accounting Methods Reports (i.e. full entitlement modelling, which assumes that water is taken if there is opportunity to take it under WRP rules). Therefore, modelling scenarios use the best available information, but where information is limited assumptions need to be made.

The approach taken is to assume the delivery of water for the environment follows the same pattern as the historical irrigation (or consumptive) pattern, rather than building rules into the model to represent when and where the allocated water for the environment is used. The modelled diversions are generally then adjusted or scaled down to account for environmental entitlements (or HEW), and these scaled volumes are considered to represent HEW use. The scaling method is applied in different ways by each state, as stated in accredited WRPs. For example, scaling could be applied in proportion to the target recovery, or in proportion to the various entitlement types actually recovered.

The modelled representation of HEW use is shown in Figure 5-11, compared to the amount of HEW actually used and HEW lawfully accessible for use. This comparison shows the actual use of HEW was similar to the modelled use for the period between 2013–14 and 2019–2020. The modelled HEW use compared to the volume of HEW actually used does not need to match to be considered within range of these assumptions. The unregulated in-stream use of HEW could potentially be a significant contributor in the difference between modelled vs actual HEW used in recent wetter years. The differences between modelled assumptions and HEW used, may be a reflection in the change of methods, improved reporting of HEW, trade and/or carryover.

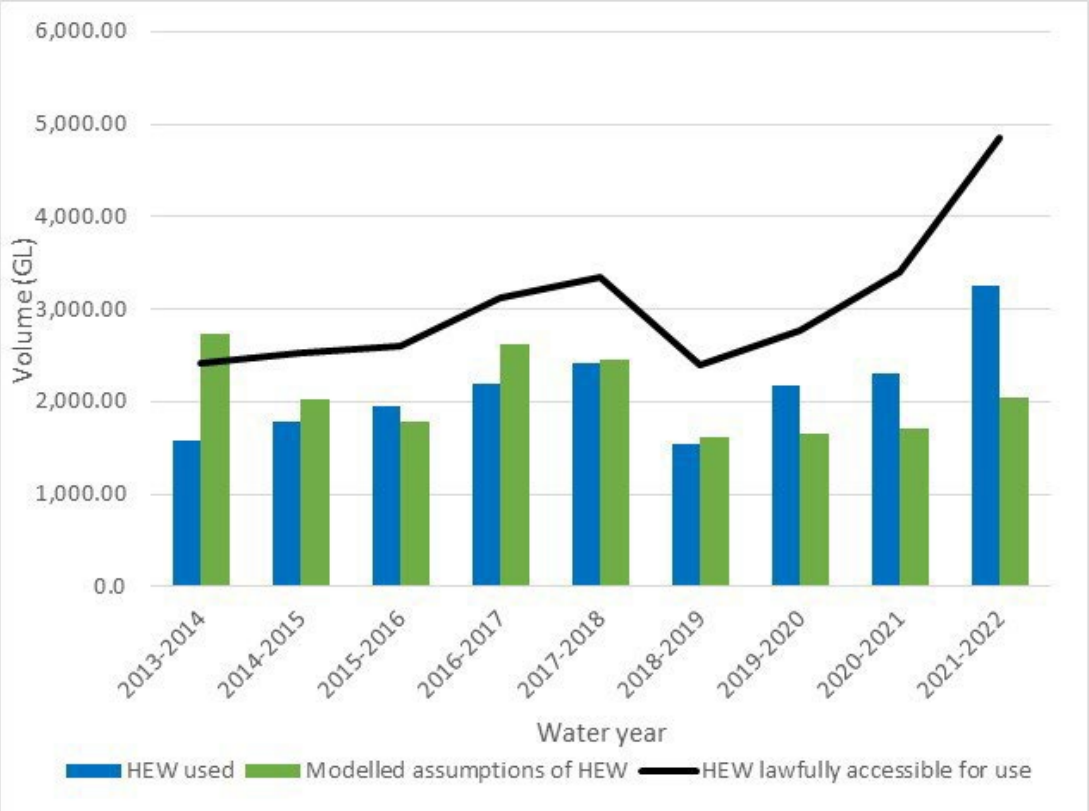


Figure 5-11 The modelled assumptions of HEW compared to HEW used and HEW lawfully accessible for use for the period 2013 to 2022

5.6 Planned environmental water

Planned Environmental Water (PEW) is water that is committed or preserved for achieving environmental purposes or environmental outcomes and cannot be used for any other purpose. PEW is rules-based environmental water that is not held under any water access rights and is generally not callable, although there are some exceptions to this, where both rule-based and callable (account-based) forms exist.

Across the Basin, PEW was established and is protected under state water plans. As water resource plans are developed, PEW rules and arrangements are included in those plans to ensure ongoing environmental benefits. Planned environmental water may maintain minimum flows; ensure a proportion of water flowing into a storage is passed through the storage and released from the dam; or be the residual water that is prevented from being taken as consumptive use. In unregulated surface water systems and groundwater SDL resource units, PEW is most often created by rules that limit the volume of water that can be taken for consumptive use.

There is often a mix of rules and arrangements to manage PEW in different circumstances. Different states have different arrangements with respect to how their legislation may require them to consider or outline how PEW is dealt with. For instance, in New South Wales, PEW is the residual water that is prevented from being taken for consumptive use, however there are also specific PEW allowances that may be held in storage and called for release to achieve specific environmental benefits. While in Victoria, the use of PEW otherwise known as “above cap water”, is considered to be water that remains in the system after water is taken under a water access right, or water that remains in the system setting a minimum passing flow or establishing baseflows. However, in the Condamine–Balonne WRP area, PEW is the remaining share of the water resource that is not in the consumptive water share.

The Water Act and the Basin Plan require that there be no net reduction in the protection of pre-existing PEW in water resource plans. The setting of the Basin Plan SDLs assumes this continued protection. PEW is required to be identified in WRPs and once accredited, Basin States are required to report annually on their compliance with delivering PEW, under Matter 9.2 of Schedule 12 of the Basin Plan. This reporting began from 1 July 2019 using methods outlined in accredited WRPs. The volume of PEW available and the proportion used in 2021–22 is presented in Appendix 5 and Table 5-7.

As shown in Table 5-7, an increase in the availability of PEW has occurred over the three years of reported data. A substantial increase in available volumes of PEW occurred in Queensland and South Australia in 2021–22 compared to previous years. This is attributed to the increased rainfall events triggering flows throughout the water year. This increase in availability and use has provided in-stream benefits throughout the Basin. For further understanding of environmental benefits achieved from PEW, refer to the Basin Plan annual report 2021–22 | Murray–Darling Basin Authority (mdba.gov.au) .

Table 5-7 Reported availablity and use of Planned Environmental Water (PEW) from 2019–20 to 2021–22 water years

	2019–20		2020–21		2021–22	
SDL resource unit	**Available PEW (GL)**	**USE of PEW (GL)**	**Available PEW (GL)**	**USE of PEW (GL)**	**Available PEW (GL)**	**USE of PEW (GL)**
Queensland	100.4	100.4	201.4	201.4	1,003.0	1,003.0
New South Wales	205.4	40.9	764.3	250.4	684.7	151.2
Australian Capital Territory[1]	35.6	49.3	46.3	320.8	848.9	848.9
Victoria[2]	N/A as there is no set annual volumes, rather there are defined flow rates at which licensed diversions are increasingly restricted.					
South Australia[3]	1,133.3	1,133.3	2,475.9	1,782.4	13,391.0	8,213.8
Basin total	**1,474.7**	**1,323.8**	**3,488.0**	**2,555.0**	**15,927.6**	**10,216.9**

1. Available PEW has been reported as the required environmental flow under licence for 2019–20 and 2020–21, for 2021–22 available PEW has been reported to equal total use.
2. Victoria report with qualitative remarks, due to the complex nature of minimum flow requirements, with different flow requirements at multiple sites along the system.
3. The total volume of PEW available for South Australia will not be equal to total use of PEW, as PEW may be "available" in more than one unit but "used" in only one.

Queensland reported the volume of water provided for environmental purposes under specific flow event management rules in the relevant water management protocols. For example, the flow event management rule for managing flows to support Narran Lakes (under Section 170 of the Condamine and Balonne Water Management Protocol) was activated in the Lower Balonne in March, April and May 2022. Application of the flow event management rule triggered a total period of 30 days of 10% reductions to the maximum rate of take for water harvesting entitlements. These rules provided in stream benefits in the QLD Border Rivers SDL resource unit, the Lower Balonne tributaries and the Warrego River, for 2021–22.

In NSW, PEW may be either rules-based or callable (account based). Rules based include end of system flows, translucency/transparency rules and environmental share of supplementary events. NSW reported a decrease in the availability of PEW in 2021–22, even though the water year shifted from drought recovery to flood risk management and all major rural storages were near full, compared to 2020–21, which was considered a drier year. This shift in availability is primarily due to the storage spill account resetting processes required under the plans. As NSW report PEW based on an annual summary, a decision is required each year, specifically in a wetter year to determine if the spill volumes from storage accounts are considered 'available' for PEW. This means the water available throughout the water year is variable, where available volumes may decrease even when storages are full or in flood. Therefore, volumes were excluded from the water available provided (see Appendix 5).

Flow releases from the ACT reservoirs are strictly regulated by the ACT EPA under Icon Water's Licence to Take Water, which in turn is developed with reference to the Environmental Flow Guidelines. Flows specified for these catchments are the minimal requirement for healthy aquatic ecosystems, while ensuring that both water supply and conservation objectives can be met. This approach is appropriate for these catchments as the intensive monitoring of the system allows annual permitted take adaptive management to be implemented. Adaptive management provides the flexibility to vary flow regimes in response to changing climatic conditions, reflecting natural

variation, resulting in changes to yearly volumes. For 2021–22, Icon Water met and exceeded all environmental watering requirements under licence by providing 849 GL of total environmental flow against the 46 GL of required environmental flow under licence.

Victoria report qualitatively on PEW due to the complexity of the three systems where PEW is identified in the Northern Victoria WRP area (for further information see Appendix 5). No PEW exists or has been identified in the Wimmera–Mallee and Victoria Murray WRP areas as per Victoria's accredited WRPs. The Ovens system (Buffalo and King Rivers), the upper broken System, Goulburn River, lower Broken Creek, Campaspe River and Loddon Valley wetlands all received environmental water to maintain flows and provide environmental freshes.

In 2021–22, of the 8,213.8 GL of PEW available in South Australia, 344 GL was environmental water received at the South Australian border from upstream states (i.e. NSW HEW). The flow over the barrages may be represented as use of either PEW or HEW, in 2021–22 this flow increased by over 4,000 GL compared to 2020–21, largely attributed to the unregulated flows and any PEW within the SA Murray SDL resource unit that was not used.

Part 2: The Murray–Darling Basin Cap on diversions

6 The Cap on diversions

Limits on water take at a Basin scale were first implemented after the Murray–Darling Basin Ministerial Council (MinCo) 1995 agreement to introduce the Murray–Darling Basin Cap on diversions (the Cap); the Cap Register commenced in 1997–98. Prior to this, any limits on take were a function of the relevant Basin state water sharing and allocation arrangements.

The Cap was introduced in response to increasing levels of surface water take from the Basin's watercourses. It was recognised at the time that increases in the levels of take could not be sustained over the long-term as they were impacting on the health of the riverine environment and undermining the reliability of existing entitlements.

Cap arrangements are set out under Schedule E of the Murray–Darling Basin Agreement 2008 and can only be changed through agreement by all members of the Ministerial Council. Cap accounting applies only to consumptive surface water diversions from watercourses (regulated and unregulated rivers and streams). Expansion of Cap accounting arrangements to cover all forms of surface water diversions as per the original decision of the Ministerial Council will now be achieved through the implementation of SDL accounting and compliance under the Basin Plan.

In most cases, the long-term Cap limit for a designated Cap valley is set at the volume of water that would have been diverted under the 1993–94 level of development. This includes the water sharing rules and infrastructure in place at that time.

The Cap on diversions water take management system continues in parallel with SDL accounting until Schedule E of the Murray–Darling Basin Agreement is repealed. The MDBA is working with Basin States to cease Cap reporting upon full implementation of SDLs, which will occur once all WRPs have been accredited. The repeal of the Cap will not be actioned until all WRPs are accredited. MDBA is working closely with NSW to finalise all outstanding WRPs. In the meantime, MDBA acknowledges the continued efforts by Basin States with accredited WRPs on Cap reporting.

6.1 How the Cap works

Schedule E identifies the designated Cap river valleys in each Basin state and defines the long-term Cap limit for each of those valleys. There are 24 Cap valleys in total.

The Cap arrangements require the Basin States and the MDBA (for the River Murray upstream of South Australia) to develop models that would determine an annual Cap target for each valley. The models must demonstrate that the annual Cap targets, if run over the relevant historical climate sequence, usually 1 January 1891 to 30 June 1997, would achieve the long-term Cap limit.

The Cap models must be independently reviewed. The MDBA then accredits these models based on the outcomes of the review and the ability of the models to 'fairly determine the relevant annual diversion [Cap] target given the climate conditions experienced in any year' (cl. 11(5) of Schedule E). Basin States then use the Cap models to inform water sharing arrangements for each Cap valley that aim to ensure that over the long-term, annual diversions will not exceed the long-term Cap limit. The models and long-term average targets can be updated based on improved knowledge or information in line with the definition specified in Schedule E.

To enable assessment of Cap compliance, Basin States are required to provide an annual report to the MDBA that includes, for each designated Cap valley, data relating to:

- annual Cap target from the model
- diversions made within and to the Cap valley
- water entitlements, announced allocations of water and declarations which permit use of flows within the Cap valley
- trading of water entitlements/allocations within, to or from the Cap valley.

Basin States must also report on their compliance with each annual Cap target for the relevant water year. The annual reporting data is required to be provided within four months of the end of each water year (by 31 October).

The MDBA uses the data provided by the Basin States to verify the self-assessment of Cap compliance. The MDBA first applies the relevant adjustments for trade in and out of a Cap valley and the agreed adjustments for environmental water recovery in the valley to the annual Cap target for each valley as determined by the relevant Cap model. Basin state data on diversions is then compared against the adjusted annual Cap target. If the annual diversions are less than the adjusted annual Cap targets, an annual credit is recorded in the Cap Register. If annual diversions are more than the annual Cap targets, an annual debit is recorded.

The Cap Register is the formal record of annual diversions and Cap compliance in the Basin and provides details for every designated Cap valley since 1997–98. Appendix 6 provides data going back 10 years. The full set of Cap data is available on the MDBA Cap Compliance website.[32]

For most Cap valleys, the compliance assessment works on the basis that the annual debits and/or credits in each valley are added to those from the previous year to create a continuous cumulative balance. For example, assuming the cumulative balance in a valley was zero at the start of a four-year period, if the annual credits/debits over that period were 5 GL, 5 GL, –5 GL and 5 GL, then the cumulative balance recorded at the end of year four would be a credit of 10 GL.

The cumulative balance is also recorded in the Cap Register and if that balance is a debit of 20% or more of the long-term Cap target, Schedule E requires the MDBA to arrange for an independent audit of Cap implementation in the affected valley. If the independent audit confirms that long-term actual take has exceeded the long-term Cap, the MDBA must make a declaration of the exceedance and advise the Murray–Darling Basin Ministerial Council of the breach. The Minister of the state in which the breach occurred must then advise the Ministerial Council about how it will address the issue.

6.1.1 The Diversion Formula Register

When Basin States report annual diversions for each Cap valley, they do so in accordance with the formula for each valley as set out in the Diversion Formula Register for the Murray–Darling Basin. The Diversion Formula Register is a protocol established under paragraph 4(1)(b) of Schedule E of the

[32] Cap compliance reports | Murray–Darling Basin Authority (mdba.gov.au)

Murray–Darling Basin Agreement. It was established by agreement of the Ministerial Council at Meeting 43 on 12 October 2007.

The purposes of the Diversion Formula Register are twofold:

- Qualitative — to define in-principle what a diversion is
- Quantitative — to provide formulas that define how water diversions from the river system of the Murray–Darling Basin are to be determined and reported for the purposes of the Murray–Darling Basin Cap on diversions.

The Diversion Formula Register may be amended from time to time by the MDBA where new information about the nature of diversions in a particular Cap valley becomes available. The diversions recorded in this report have been determined in accordance with version 6 of the Diversion Formula Register.

Version 6 of the Diversion Formula Register was confirmed in June 2018 and incorporates two amendments. The first amendment was formally requested by Victoria to reflect the outcomes of infrastructure upgrades as part of the Swan Hill Modernisation Project. The second amendment corrects an error in how Beechworth town diversions are accounted. A copy of the current version of the Diversion Formula Register is available on the MDBA Cap Compliance website[33].

6.1.2 History of Cap compliance reporting

The Cap took full effect from 1 July 1997. However, reporting on Cap implementation has been underway since 1994–95. Up to and including the 2011–12 water year, the outcomes of the annual assessment of Cap compliance by the MDBA (and previously by the Murray–Darling Basin Commission) were presented in annual water audit monitoring reports.

Annual reports on Cap implementation were also prepared by the Independent Audit Group (IAG) established under Schedule E. Both sets of reports are available through the MDBA Cap Compliance website. The annual reports of the Independent Audit Group also contain information about any special audits that were conducted and any recommendations for improvements to Cap implementation.

From 2012–13 to 2018–19, Cap compliance outcomes have been included in the MDBA's series of Transition Period Water Take Reports. Special audits that have since been conducted by the Independent Audit Group are available on the MDBA Cap Compliance website. From 2019–20, Cap compliance forms part of the Water Take Report.

6.1.3 Annual Cap targets

The annual Cap target is the volume of water that is permitted to be taken from the designated Cap valleys for consumptive purposes. After the end of each water year, the MDBA assesses each Basin

[33] diversion-formula-register-v6.pdf (mdba.gov.au)

state's determination of the annual Cap target for each Cap valley for that water year. The annual Cap target has two components:

- modelled component
- unmodelled component.

The portion of the annual Cap target determined by Cap models is called the modelled component. The Cap models use observed climatic and hydrologic data, as well as water use patterns to generate the annual Cap target. The diversions from unregulated sections of the river systems for which there are no models are called the un-modelled component. The Basin States except for Queensland use their respective Cap models. Queensland has switched from its Cap models to its WRP models starting 2018–19, following the accreditation of the Queensland WRPs.

The un-modelled component of the annual Cap target is usually determined based on estimates. The total annual Cap targets are the sum of the modelled and un-modelled components.

Except for the models for Queensland and the Victorian Wimmera–Mallee Cap valley, the available Cap models determine the annual Cap targets that would have applied prior to water recovery efforts commencing. Since the Cap limits must be calculated as they apply to consumptive use, the annual Cap targets calculated by the models have to be adjusted to remove Held Environmental Water entitlements that were available for use in the relevant Cap valley in the relevant year.

The annual Cap targets are also adjusted to reflect net trade that occurred between Cap valleys. The detail of the adjustments to annual Cap targets for each water year are provided in the Cap Register in Appendix 6.

6.1.4 Environmental water adjustment

The need to adjust annual Cap targets to account for held environmental water that is available did not arise until a number of years after Cap compliance had commenced. As different programs aimed at recovering water entitlements for environmental use have emerged, the volume of held environmental entitlements in different valleys increased and the need to account for these in determining annual Cap targets for consumptive use became more pressing.

In May 2008, the Murray–Darling Basin Ministerial Council endorsed the 'Schedule E protocol' enabling long-term and annual Cap targets to be adjusted for environmental water entitlement recovery. This protocol means that diversions reported under the Cap should exclude held environmental water entitlements, thus enabling the assessment of Cap compliance against consumptive entitlement diversions only. The protocol enables the annual Cap targets to be adjusted for environmental entitlement recovery through the following approaches:

- hydrological models
- estimates: e.g. fixed, allocations, or usage
- other methods: for example, a 'scaling approach'.

Under both Cap and SDL accounting and compliance arrangements, the MDBA and Basin States have been working together to improve the methods used to recognise environmental water recovery. Consistent with the Schedule E protocol, different Basin States developed different methods as

appropriate to their existing water sharing arrangements. Final agreement between the MDBA and each Basin state to these methods for Cap (and the transition period) was reached in 2015.

This report uses the current methods as agreed with Basin States for the adjustment of annual Cap targets in recognition of environmental water recovery. Environmental water adjustments for Cap reporting are provided in Table 8-8 in Appendix 6.

6.2 Compliance with the Cap

Table 6-1 and Table 6-2 show that, for the 2021–22 water year, all Cap valleys are compliant with the Cap. In particular, Table 6-2 deals with Cap compliance for the Metropolitan Adelaide, and associated country towns Cap valley in South Australia, which operates under a rolling five-year limit rather than cumulative or annual targets as is the case for all other Cap valleys.

It is possible for a Cap valley to be compliant but not the corresponding SDL resource unit(s) (or vice versa). The reasons for difference in compliance outcomes between Cap and SDL accounting are:

- Cap has different methods for determining annual Cap targets.
- Cap includes take from rivers (regulated and unregulated), floodplain harvesting (Queensland only).
- No interceptions such as take by runoff dams, net take by commercial plantations and take under basic rights are included in Cap.
- Floodplain harvesting reporting under SDL in NSW is driving the difference in NSW catchments.
- The geographical extent of Cap valleys and SDL resource units also differ.
- This year is only the third year of SDL enforcement. Cap has been in place for many years, and cap valleys are currently in cumulative credit. Therefore, even if large Cap debits were recorded in 2021–22, it will not bring the Cap valley to non-compliance due to previous years' accumulation of credits.

Table 6-1 Summary assessment of Cap compliance for the 2021–22 water year

Cap valley	Long-term Cap (GL/y)	Unadjusted annual Cap target [a] (GL)	Adjustment to Cap target (GL)		Adjusted annual Cap target (GL)	Total diversion (GL)	Annual Cap credit [d] (GL)	Cumulative Cap credit [e] (GL)	Cap exceedance trigger [f] (GL/y)	Cap compliance
			Trade	Environment						
Intersecting Streams [b]	N/A	N/A	0.0	0.0	N/A	5.8	N/A	N/A	N/A	N/A
Border Rivers	234.0	174.4	-11.5	0.0	163.0	106.7	56.2	950.6	46.8	Yes
Gwydir	350.2	303.4	0.0	-37.1	266.3	279.2	-12.9	360.3	70.0	Yes
Namoi/Peel	363.9	266.2	0.0	0.0	266.2	236.8	29.4	623.8	72.8	Yes
Macquarie/Castlereagh/Bogan	491.7	520.8	0.0	-13.6	507.2	224.3	282.9	1,672.2	98.3	Yes
Barwon–Darling/Lower Darling	322.0	467.0	-5.3	-116.8	344.9	228.2	116.7	529.8	64.4	Yes
Lachlan	335.4	251.0	0.0	-18.9	232.1	161.9	70.2	440.1	67.1	Yes
Murrumbidgee	2,358.4	2,121.9	-111.3	-734.2	1,276.3	1,557.0	-280.6	3,188.4	471.7	Yes
Murray	1,907.7	1,956.4	-56.0	-316.4	1,583.9	1,145.4	438.5	3,155.5	381.5	Yes
Total New South Wales	**6,363.2**	**6,061.1**	**-184.1**	**-1237.1**	**4,639.9**	**3,945.2**	**700.4**	**10,920.7**		
Goulburn/Broken/Loddon Cap valley	2,033.7	1,673.5	-147.6	-528.3	997.6	879.1	118.5	4,060.3	406.7	Yes
Campaspe	121.8	74.9	0.6	-29.6	45.9	33.2	12.6	674.0	24.4	Yes
Wimmera–Mallee	45.1	35.3	0.0	0.0	35.3	17.0	18.3	228.8	9.0	Yes
Murray/Kiewa/Ovens Cap valley	1,702.0	1,626.8	171.8	-223.5	1,575.1	1,138.3	436.7	4,555.5	340.4	Yes
Total Victoria	**3,902.6**	**3,410.5**	**24.8**	**-781.4**	**2,653.9**	**2,067.7**	**586.2**	**9,518.5**		
Metropolitan Adelaide and ACA [b,c]	N/A	N/A	-40.0	0.0	N/A	107.9	28.7	N/A	Rolling average	See Table 6.2
Lower Murray swamps	94.2	94.2	-54.8	-9.1	30.3	17.4	12.9	215.4	18.8	Yes
Country towns	50.0	50.0	-0.2	0.0	49.8	41.1	8.7	91.7	10.0	Yes
All other purposes	449.9	456.8	174.7	-191.6	439.9	436.6	3.3	957.4	90.0	Yes
Total South Australia	**594.1**	**601.0**	**79.7**	**-200.7**	**520.0**	**603.0**	**53.6**	**1,264.5**		
Condamine/Balonne	748.0	1,502.8	0.0	-341.1	1,161.7	1,043.7	118.1	929.4	149.6	Yes
Border Rivers	296.0	495.8	11.5	-33.1	474.1	198.2	275.9	518.0	59.2	Yes
Moonie [b]	41.0	82.1	0.0	-5.7	76.4	6.7	69.7	N/A	Annual debit	Yes
Nebine [b]	9.8	10.8	0.0	-4.4	6.4	4.6	1.7	N/A	Annual debit	Yes
Warrego [b]	61.9	80.7	0.0	-26.3	54.5	27.3	27.2	N/A	Annual debit	Yes
Paroo [b]	0.9	0.1	0.0	0.0	0.1	0.0	0.1	N/A	Annual debit	Yes
Total Queensland	**1,157.6**	**2,172.2**	**11.5**	**-410.5**	**1,773.2**	**1,280.5**	**492.7**	**1,447.4**		
Australian Capital Territory	**40.5**	**26.0**	**0.0**	**0.0**	**26.0**	**2.8**	**23.2**	**410.6**	**8.1**	**Yes**
Total Basin	**12,057.9**	**12,270.8**	**-68.2**	**-2,629.8**	**9,612.8**	**7,899.2**	**1,856.0**	**23,561.8**		

Note: A negative sign in trade indicates water traded out of the valley, while in environmental adjustment this indicates the amount to be taken off the Cap target.

a. Unadjusted Cap Targets - includes 'model component' and 'non-model component'

b. 'N/A' denotes that the Cap model is not completed, Cap target is not determined or not required in a Cap valley

c. Metropolitan Adelaide and Associated Country Areas (see Table 6.2 for more information)

d. Annual Cap credit is reported as positive and debit as negative

e. Cumulative credits since 1997–98 water year

f. Exceedance trigger does not apply to Intersecting Streams, Moonie, Nebine, Warrego, Paroo and Metropolitan Adelaide Cap valleys. If diversions in the Moonie, Nebine, Warrego and Paroo exceed the Cap targets annually, a special audit will be triggered. For Metro Adelaide the cap is assessed against a 5-year rolling average (see Table 6.2 for more information). The Cap target for intersecting streams is currently unable to be assessed.

Table 6-2 Cap assessment of Metropolitan Adelaide and associated country areas as at 30 June 2022

Metropolitan Adelaide & associated country areas	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
Annual diversions	42.1	73.2	145.0	34.7	71.1	157.6	113.4	131.4	107.9
5-year rolling diversions against 650 GL Cap[1]	296.2	312.5	401.0	376.7	366.1	481.5	561.7	548.1	621.3
5-year Cap Target	650.0	650.0	650.0	650.0	650.0	650.0	650.0	650.0	650.0
Difference between rolling diversions and cap target	353.8	337.5	249.0	273.3	283.9	168.5	88.3	101.9	28.7
Cap assessment	below the 5-year cap target	below the 5-year cap target	below the 5-year cap target	below the 5-year cap target	below the 5-year cap target	below the 5-year cap target	below the 5-year cap target	below the 5-year cap target	below the 5-year cap target

1. First use licence was excluded in error from these volumes in the table presented in the *Transition Period Water Take Report 2016–17*

In 2021–22, all Cap valleys were compliant, as per Table 6-1 and Table 6-2. While Cap compliance is assessed at the valley level, all states have maintained cumulative Cap credits at the Basin state scale. All Cap valleys with a cumulative system were compliant as of 30 June 2022, with credits in their balances. All Cap valleys with an annual system such as four valleys in Queensland were compliant as at 30 June 2022, as their diversions were less than their Cap targets. These two assessment systems work as per Schedule E of the Murray–Darling Basin Agreement:

- For all valleys except the Moonie, Nebine, Warrego and Paroo in Queensland and Metropolitan Adelaide in South Australia, the trigger for assessment of Cap compliance is when the cumulative Cap balance for a valley is a debit amount equal to or more than 20% of the long-term Cap.
- For the four Queensland valleys, the trigger for assessment of compliance with the Cap is if the annual diversions are greater than the annual Cap target,
- For the Metropolitan Adelaide and associate country areas Cap valley, compliance with the Cap is assessed against a five-year rolling balance.

As Cap models are improved over time and new information on diversions becomes available there can be changes to the cumulative balances calculated in a previous year. Through this process an exceedance of Cap shown in a previous years' Cap Register (i.e. already published) may no longer appear as an exceedance in this year's Cap Register.

Compliance outcomes:

- All valleys are compliant with the long-term Cap limit.
- There are two Cap valleys where annual diversions exceed annual cap target. They are the Murrumbidgee (-280.6 GL) and Gwydir (-12.9 GL)
- Other Cap valleys recorded annual credits in 2021–22.
- The Cumulative Cap Balance (i.e. credits) up to last year as at 2020–21 is reduced by 308.7 GL. This is due to the model refresh and better information for previous years.

6.2.1 Queensland

All Queensland Cap valleys were compliant with the Cap in 2021–22 (Table 6-1). From 2018–19, Queensland has switched from its Cap models to its WRP models to generate the annual Cap targets. This change has resulted in a notable decrease in the cumulative credits of the two Queensland valleys using cumulative balances, Condamine–Balonne, and the Border Rivers from 2018–19, when the switch took effect.

6.2.2 New South Wales

All New South Wales Cap valleys were compliant with the Cap in 2021–22 (Table 6-1). While annual Cap debits were recorded in Gwydir and Murrumbidgee, both valleys remained compliant due to their cumulative credits from previous years. NSW have confirmed differences in the accredited Murrumbidgee and NSW Border Rivers Cap valleys long-term Cap and the current models used in determining Cap compliance. The differences in the accredited models and current models used are due to corrections made to the accredited models since 2016. NSW has advised that the differences are relatively insignificant compared to the long-term Cap and would not impact the Cap compliance status of either valley. The MDBA will work with NSW over the next 12 months on a pragmatic approach to align the published long-term values with the model being used, and to note any differences with accredited values. In the interim, the long-term Cap values supplied by NSW have been retained in the 2021–22 Cap register.

6.2.3 Australian Capital Territory

The Australian Capital Territory Cap valley was compliant with the Cap in 2021–22 and continued to accumulate the Cap credits (Table 6-1).

6.2.4 South Australia

All South Australian Cap valleys were compliant with the Cap in 2021–22 (Table 6-1 and Table 6-2).

Metropolitan Adelaide and associated country areas

Under the Cap arrangements, the Cap limit of the 'Metropolitan Adelaide and associated country areas' Cap valley works differently to all other Cap valleys. The Metropolitan Adelaide Cap covers diversions for water supply purposes delivered to Metropolitan Adelaide and associated country areas through the Swan Reach–Stockwell, Mannum–Adelaide and Murray Bridge– Onkaparinga pipeline systems. A model is not used to determine the Cap target in the Metropolitan Adelaide, instead diversions for the past five years are compared with a target of 650 GL as per Schedule E of the Murray Darling Basin Agreement. The Ministerial Council (MinCo), Out of Session 75 on 15 January 2020, agreed for water to be traded out of the Metro Adelaide Cap valley for four years from 2019–20. The five-year total diversion as at 2021–22 was 621.3 GL after adjusting for the 'First Use Licence' and the outward trades, which was less than the five-year Cap target of 650 GL (Table 6-2)

6.2.5 Victoria

All Victorian Cap valleys were compliant with the Cap in 2021–22 and continued to accumulate the Cap credits (Table 6-1).

6.3 Operation of the Cap post 30 June 2022

With the commencement of SDL water accounting and compliance under the Basin Plan in the 2019–20 water year, SDL compliance and annual water take reporting has replaced the transition period water take reports. Cap compliance will continue to be reported for as long as the Cap is in place, alongside SDL reporting.

Any decision to revoke or amend the Cap arrangements set out under Schedule E to the Murray–Darling Basin Agreement is a matter for the Murray–Darling Basin Ministerial Council (MinCo). The MDBA is working with Basin States to cease Cap reporting upon full implementation of SDLs, which will occur once all water resource plans have been accredited.

Any Cap credits or debits that have accrued as at 30 June 2022 will continue for Cap purposes. They will not however transfer over to the formal SDL Register of Take.

Part 3: Future work

7 Data improvements and future work

7.1 Data improvements and constraints over the 2021–22 water year

Basin States and the MDBA continue to work to improve the completeness and accuracy of the data that is used to apply SDL water take accounting in ways that are consistent with the requirements under the Water Act and the Basin Plan.

Prior to the commencement of the Basin Plan, data for groundwater take, floodplain harvesting, runoff dams, net take by commercial plantations and take under basic rights were not routinely or consistently collected. Consequently, Basin States and the MDBA have worked together to make sure that the best available information can be provided each year for all forms of take as required by the Basin Plan.

Further improvements made include:

- Reporting by SDL resource unit
- Under the bilateral agreement, NSW used the best available models for determination of annual permitted take.
- NSW improved and re-designed the determination of water lawfully accessible for take, consistent with the NSW water register.
- NSW improved the reporting of allocation trade 'within' and across SDL resource units, covering both consumptive and environmental pools
- Expanding reporting data on actual water taken from watercourses and regulated rivers to include estimates of actual water taken under basic rights, by floodplain harvesting, by runoff dams, net take by commercial plantations and groundwater
- Development by some Basin States of new models on which to base estimates of actual take by runoff dams
- Separately reporting actual water taken by each form of take.

However, as was reported in the previous water take reports, work is ongoing and not all improvements have been fully implemented across all Basin States or for all forms of take. Despite many WRPs now being accredited or in the process of being accredited, future work is planned to improve accounting arrangements under the SDLs. For example, this includes addressing the continued use of the long-term average estimates for take under basic rights, runoff dams and net take by commercial plantations when reporting annual actual take and annual permitted take. These forms of take are complex to measure or estimate with conventional methods. While the use of long-term averages may currently be the best available information, it does not reflect levels of annual actual take that will vary in response to climate conditions.

In cases where there are no other improved methods or estimates in place, the Basin States may use the information (i.e. the long-term estimates) from the accredited WRP models or draft WRP models as agreed in the bilateral agreements for SDL reporting from the water year.

MDBA will continue to work collaboratively with Basin States for annually variable data for each form of take, where effort is commensurate with the risk profile of the resource.

7.2 SDL Accounting Framework Improvement Strategy 2023

SDLs are a key element of the Basin Plan and as such the SDL accounting process needs to be a credible and transparent process that allows for adaptation and improvement over time to ensure best practice water management. To ensure that best practice is applied to the SDL water accounts, the MDBA engaged an independent review panel in November 2018 to assess the robustness of the SDL Reporting and Compliance Framework, available on the MDBA website [34] The review was completed in June 2019 and found that while the SDL accounting framework is conceptually sound, there are a range of issues that need to be addressed to improve existing water accounting methods to align with best practice. The SDL accounting 'health check' independent panel review is available on the MDBA website [35]

The issues identified by the independent panel review, as well as additional issues identified since the review was finalised, informed the development of a work program to progressively address issues identified: the *SDL accounting framework improvement strategy 2020–2025* (the strategy 2020)[36]. To determine the priority of each activity for implementation, the MDBA considered several factors including the volumetric risk profile of each issue in relation to the SDL accounts, both the capacity and capability of the MDBA, Basin States and other Commonwealth stakeholders to perform the work, linkages to relative state-based information improvements and other Basin Plan policy-related timeframes. This prioritisation initially resulted in activities spread across six years, divided into three equal two-year tranches from 2020–25.

Work on a number of these activities has progressed with support from the relevant Basin States. Detailed Progress against the strategy 2020 was published in the *Sustainable diversion limit accounting improvement strategy 2023* (the strategy 2023). Figure 7-1 details the progress against the activities in the strategy at the end of tranche 1.

[34] Sustainable Diversion Limit Accounting and Reporting Framework document | Murray–Darling Basin Authority (mdba.gov.au)
[35] SDL Accounting 'health check' – independent panel review | Murray–Darling Basin Authority (mdba.gov.au)
[36] Sustainable diversion limit accounting improvement strategy 2020 – 2025 | Murray–Darling Basin Authority (mdba.gov.au)

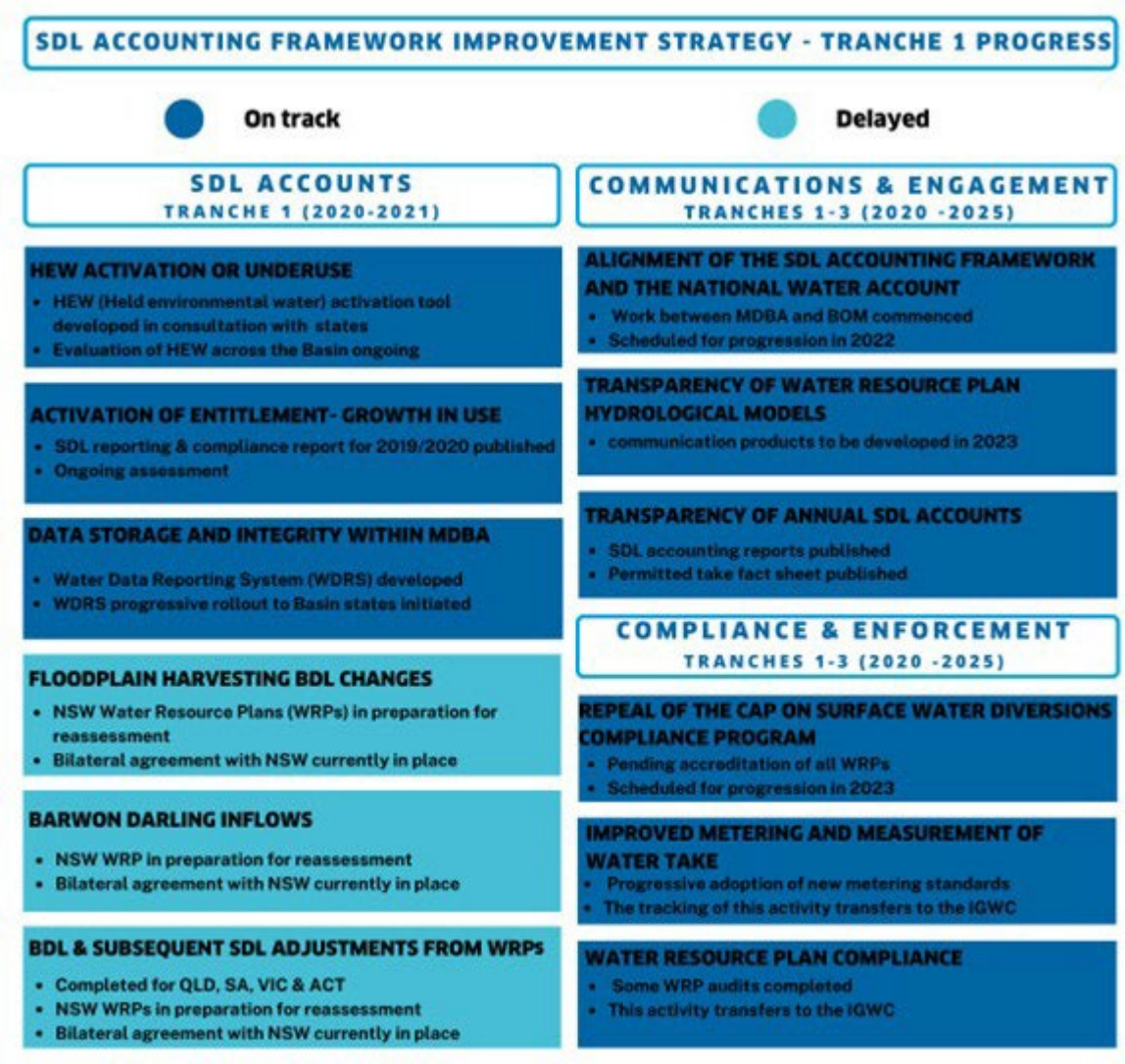


Figure 7-1 The SDL accounting framework improvement strategy progress at the end of tranche 1

The original strategy was designed to be adaptable and flexible to accommodate changes to activities and priorities. At the end of tranche 1, the MDBA evaluated the progress of the strategy 2020 and determined that a refresh was required to update the improvement strategy to effectively deliver continuous improvement to the SDL accounts, including to inform the Basin Plan review in 2026.

The following key factors were considered:

- progress in tranche 1 and outstanding activities
- legislative change establishing the IGWC
- changes to the broader operating context including feedback from Basin States and stakeholders
- learnings associated with implementation of the SDL accounts to date and
- framing of the contextual activities.

Figure 7-2 summarises the transition of the strategy 2020 to the 2023 version[37].

[37] Sustainable diversion limit accounting improvement strategy 2023 (mdba.gov.au)

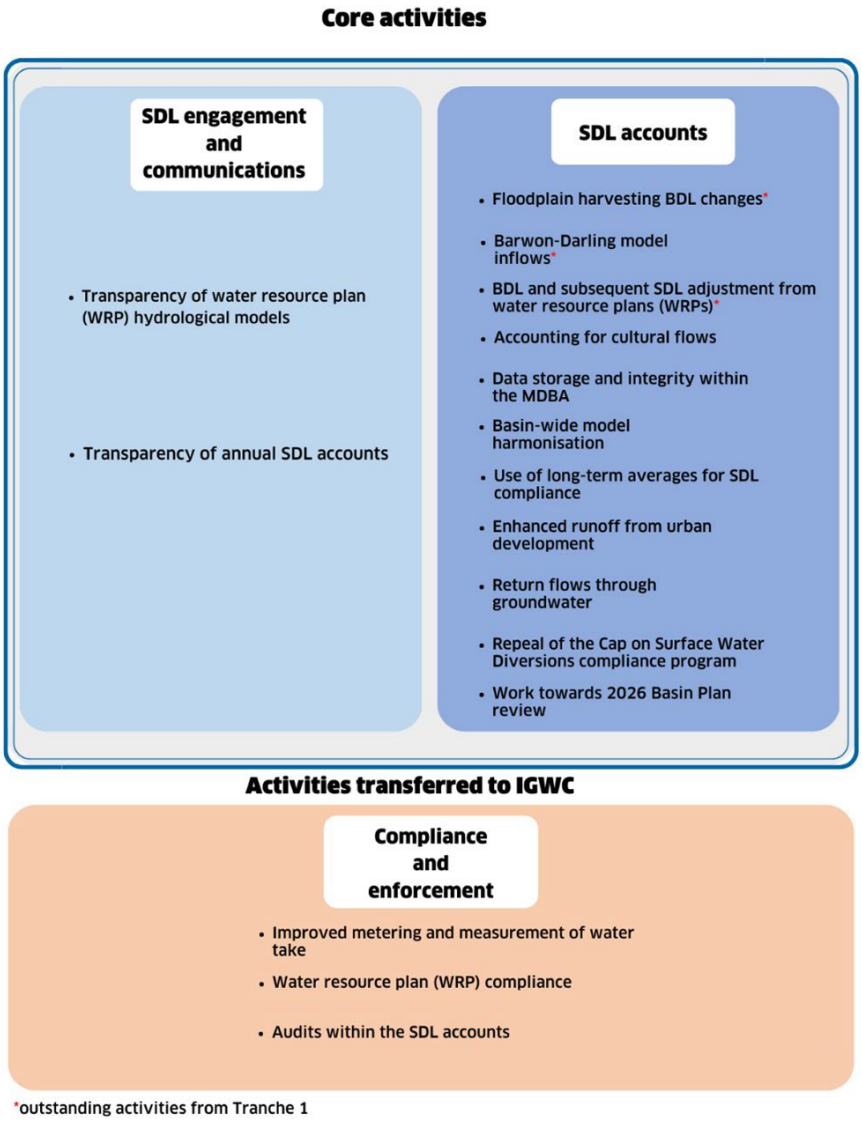


Figure 7-2 SDL accounting improvement strategy 2023 showing core activities to be delivered by the MDBA and Basin States from 2022 onwards, and the activities transferred to the Inspector-General

The strategy 2023 prioritises activities ahead of the Basin Plan review in 2026. The scope of these activities remains largely consistent with that described in the strategy 2020. The three outstanding activities from tranche 1 of the 2020 strategy remain as high priorities for delivery in the work schedule. Further descriptions of the strategy 2023 activities are set out in Figure 7-3 below. The arrows in Figure 7-3 indicate where the work program is expected to continue beyond 2026, either as a business-as-usual activity, or as a specific improvement activity.

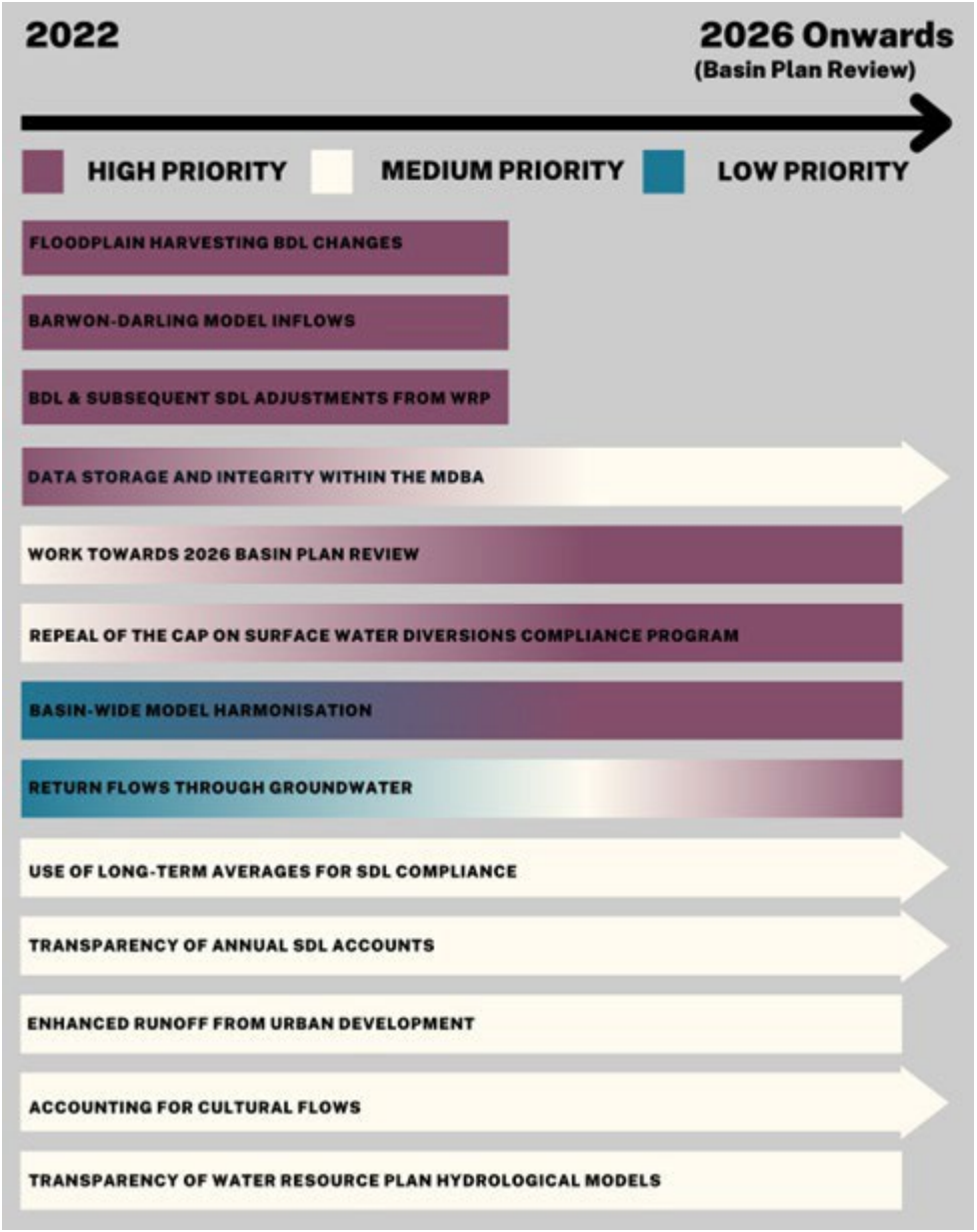


Figure 7-3 Improvement strategy priorities towards the Basin plan and beyond. The colour scheme show prioritisation towards Basin Plan review. Arrow head indicates activity is expected to continue beyond 2026.

The estimate of the amount of work required to deliver various activities in the improvement strategy 2023 varies significantly, ranging from months to years for the more resource and consultation intensive activities. In view of the variations, the MDBA worked with Basin States to develop a work plan to scope and schedule tasks on an annual basis to deliver the activities in the improvement strategy 2023.

7.3 Water Data Reporting System

In 2021–22, the MDBA continued with the development of the Water Data Reporting System (WDRS) for the management of data submitted by Basin States under Section 71 of the Water Act, as well Cap data (required by the Murray–Darling Basin Agreement) and HEW data (also required under the Act).

The WDRS aims to improve the accuracy, timeliness and consistency of data submitted by the Basin States. Other benefits will include the ability to provide timely feedback regarding data quality issues and improved version control and data transparency, all which amount to increased productivity and efficiency.

In the reporting period, new reporting templates (Data Submission Forms) were finalised for the remaining two Basin States ahead of the current reporting period (this follows new reporting templates being finalised for the first three Basin States in the prior water year). All Basin States used the WDRS data portal to submit their new templates and other required documents for data relating to the 2021–22 water year. Concurrently, work progressed to develop the reporting and visualisation capability of the system and automated workflows for quality assurance processes.

8 Appendices

Appendix 1: Surface water lawfully accessible for take

Identifying the annual volumes of water that are lawfully accessible for take as irrigation diversions from regulated systems and some unregulated systems is generally simple and has been well-established. In contrast, determining annual volumes of water that are lawfully accessible for take by floodplain harvesting, runoff dams, commercial plantations and under basic rights and from groundwater is still being established. Some forms of lawful access to water (e.g. basic rights including stock and domestic or riparian rights) do not include an annual volumetric limit on take. However, capacity to take may be limited by the water management rules in the relevant catchment. For example, in Victoria, the capacity to take groundwater for basic rights is expressly limited to uses specified in the Water Act (1985). In such cases, components of annual actual take estimates are being used to determine some components of the annual volumes of water lawfully accessible for take. Specifically, estimates are used where formal announcements via annual determinations (allocations) or similar arrangements are not made.

Annual volumetric allocations are the volumes of water determined by Basin States as accessible for take by water entitlement holders in a given year. These determinations are expressed as a percentage or share component of the total share value of the entitlements held. Allocations are made in response to factors such as available water in storage, minimum expected stream flows, forecast rainfall and other seasonal conditions.

Annual allocations are referred to differently across the Basin. In NSW they are known as 'available water determinations', in the Victorian Murray they are 'seasonal determinations' and in South Australia they are 'allocations'. Allocations frameworks can also be used as a mechanism to reduce growth in use. The annual allocation volume, subject to any use limits and/or periods of access, is one of the key factors influencing the total volume of water that is actually taken from regulated rivers and watercourses during a water year.

'Water lawfully accessible for take' considers carryover available from the previous year, where applicable. Carryover increases the capacity of individual entitlement holders to manage their water portfolio, including for risks with respect to securing access to water across water years. The rules around access to carryover volumes vary between Basin States and may depend on the nature of the entitlement. Subject to these rules and usually depending on the volume of water available during a water year, access to carryover may be cancelled or forfeited. This often occurs where water is considered as being 'spilled' from the storages. The available carryover (often referred to as 'net carryover') considers the cancellations and forfeiture that have occurred. Carryover has been a prominent factor in water use and hence on determining the annual volume of water lawfully accessible for take. A number of factors can influence the use of carryover by entitlement holders. These include climatic conditions, cropping choices, allocation price volatility and seasonality of flows. As some water can be carried over across multiple years, the carryover as at the start of one year may include the carryover from previous years, depending on the rules in the SDL resource units and entitlements.

The MDBA is working to develop alternative ways of presenting the available data including how the data might look for each year, when it is considered as part of a sequence of years, rather than as a standalone year; and to consider other decisions made by irrigators (for example to carry over water), rather than just to use the water. In this report, the volumes of surface water lawfully accessible for take consists of annual allocations (including NSW valley use limits where applicable), net carryover, allocation trade and estimated interceptions. To separate out the annual allocation component of the water lawfully accessible for take in the river systems, Table 8-1 below sets out both water lawfully accessible for take through explicit allocation decisions (i.e. s.71(1)(d) data only) and with interceptions (i.e. take by runoff dams and net take by commercial plantations).

Table 8-1 Surface water lawfully accessible for take by Basin State and SDL resource units for the 2021–22 water year (in GL)

SDL resource unit	Carry-over from last year	Announced allocations in regulated systems	Use in unregulated systems[38]	Other water used [39]	Net allocation trade	Carryover cancelled + Allocations forfeited + dam spills during this year[40]	Water lawfully accessible for take excluding interceptions	Authorised interceptions	Total water lawfully accessible for take including interceptions[41]
Total ACT	**0.00**	**76.64**	**0.00**	**0.00**	**0.00**	**0.00**	**76.64**	**15.64**	**92.28**
Paroo	0.00	0.00	0.00	0.26	0.00	0.00	0.26	10.60	10.86
Warrego	0.00	2.53	25.54	0.32	0.00	0.00	28.39	13.50	41.89
Nebine	0.00	0.00	0.00	4.75	0.00	0.00	4.75	11.00	15.75
Condamine–Balonne	11.64	110.58	747.02	235.95	0.00	0.00	1,105.20	265.00	1,370.20
Moonie	0.00	0.00	1.46	5.59	0.00	0.00	7.05	51.00	58.05
Queensland Border Rivers	0.00	77.15	119.73	66.15	7.98	0.00	271.02	78.00	349.02
Total Qld	**11.64**	**190.27**	**893.75**	**313.02**	**7.98**	**0.00**	**1,416.66**	**429.10**	**1,845.76**
NSW Border Rivers	121.82	180.62	16.00	215.94	-4.93	-41.53	487.92	95.00	582.92
Intersecting Streams	0.00	0.00	5.80	2.50	0.00	0	8.30	111.00	119.30
Gwydir	217.40	605.37	11.00	189.12	0.08	-16.69	1,006.29	125.00	1,131.29
Namoi	207.95	303.89	78.00	111.11	0.00	-199.44	501.51	165.00	666.51
Macquarie–Castlereagh	324.26	851.92	44.00	198.96	0.10	-615.69	803.55	310.00	1,113.55
Lachlan	365.35	1,514.49	16.00	9.09	1.30	-1351.09	555.13	316.00	871.13
Murrumbidgee	321.02	1,818.10	42.00	200.82	-49.16	-237.69	2,095.08	501.00	2,596.08
Barwon–Darling Watercourse	827.49	166.13	0.00	30.30	0.00	-538.32	485.60	0.00	485.60
Lower Darling	1.16	23.48	0.00	0.45	-5.33	-13.51	6.25	5.50	11.75
NSW Murray	554.26	1,260.19	28.00	150.79	-44.81	-249.85	1,698.59	104.00	1,802.59
Total NSW	**2,940.71**	**6,724.20**	**240.80**	**1,109.07**	**-102.74**	**-3263.81**	**7,648.22**	**1,732.50**	**9,380.72**
Vic Murray	454.28	1,238.10	5.50	157.48	98.31	-451.03	1,502.65	36.60	1,539.25
Kiewa	0.00	2.21	4.59	1.00	0.00	0.00	7.80	15.50	23.30
Ovens	0.00	42.94	4.96	2.90	0.00	0.00	50.80	57.50	108.30
Broken	6.40	22.71	2.90	2.50	-4.57	0.00	23.55	31.60	55.15
Goulburn	546.06	816.63	18.30	187.33	-22.34	0.00	1,545.98	76.40	1,622.38
Campaspe	12.96	67.77	0.90	1.60	-2.32	0.00	80.91	22.30	103.21
Loddon	6.66	24.58	8.90	16.07	-8.67	-3.37	44.17	40.20	84.37
Wimmera–Mallee	76.48	31.48	0.82	1.78	0.00	0.00	110.55	29.80	140.35
Total Vic	**1,102.85**	**2,246.42**	**46.86**	**370.65**	**60.41**	**-460.80**	**3,366.39**	**309.90**	**3,676.29**
SA Murray	0.00	618.00	0.00	6.06	73.65	0.00	697.71	0.00	697.71
SA Non-Prescribed Areas	0.00	0.00	0.00	23.34	0.00	0.00	23.34	0.00	23.34
Marne Saunders	0.18	0.18	0.00	0.00	0.00	0.00	0.36	1.39	1.76
Eastern Mount Lofty Ranges	0.57	16.68	0.00	3.48	0.00	0.00	20.73	7.51	28.24
Total SA	**0.76**	**634.85**	**0.00**	**32.89**	**73.65**	**0.00**	**742.14**	**8.91**	**751.05**
Total Basin	**4,055.96**	**9,872.38**	**1,181.41**	**1,825.64**	**39.30**	**-12,072.43**	**13,250.06**	**2,496.05**	**15,746.10**

[38] For Queensland, actual use of 'unsupplemented water with flow & no flow conditions' For NSW, 'actual use of unregulated entitlements', except for Barwon–Darling as it uses allocation to accounts. For Victoria, actual use of unregulated streams. For SA, unregulated allocation is in column 'Announced allocations in regulated systems'.

[39] For Queensland, actual use of 'floodplain harvesting', 'unsupplemented water licences', 'urban use' and 'basic rights'. For NSW, actual use of 'supplementary water' and 'basic rights'. For Victoria, 'system losses', 'basic rights' and the net transfers of supplemented water.

[40] For NSW, it includes unavailable allocations, during and end of year forfeits. For Queensland and Victoria, it includes net forward-draw and carryover forfeited due to 50% carryover limit respectively as applicable.

[41] In NSW SDL resource units where flow conditions, water authorisations can only occur when specific river flow thresholds are met and extraction is subject to individual daily extraction limits. The use of authorised water is also subject to further considerations, most notably available flows in the river in excess of minimum flow thresholds (for example, the unregulated Barwon–Darling system).

Appendix 2: Surface water consumptive entitlements

Table 8-2 Surface water consumptive entitlements as at 30 June 2022

SDL resource unit Entitlement type	Entitlements (GL)[1]
Queensland	
Paroo	
Unsupplemented[2]	0.1
Water licences & Permits	0.0
Warrego	
Unsupplemented[2]	29.0
Supplemented Water Allocations[3]	2.6
Water licences & Permits	0.2
Nebine	
Unsupplemented[2]	2.0
Water licences & Permits	0.1
Condamine–Balonne	
Unsupplemented[2]	435.0
Supplemented Water Allocations[3]	115.1
Water licences & Permits	4.1
Overland flow licence[3]	15.6
Moonie	
Unsupplemented[2]	27.22
Water licences & Permits	0.4
Overland flow licence[4]	15.5
Queensland Border Rivers	
Unsupplemented[2]	160.7160.7
Supplemented Water Allocations[3]	87.5
Water licences & Permits	3.43.4
Overland flow licence[4]	63.8
New South Wales	
NSW Border Rivers	
High security	1.5
General security – A	22.0
General security – B	238.4
Supplementary Access	118.6
Unregulated	44.6
Local water utility & Stock & Domestic	1.6
Intersecting Streams	
Unregulated	17.9
Gwydir	
High security	14.5

SDL resource unit Entitlement type	Entitlements (GL)[1]
General security	403.0
Supplementary Access	157.8
Unregulated	53.1
Local water utility & Stock & Domestic	7.0
Namoi	
High security	4.8
General security	271.1
Supplementary Access	115.5
Unregulated	180.5
Local water utility & Stock & Domestic	21.4
Macquarie–Castlereagh	
High security	17.9
General security	457.8
Supplementary Access	40.3
Unregulated	292.2
Local water utility & Stock & Domestic	24.7
Lachlan	
High security	26.0
General security	490.7
Conveyance	17.9
Supplementary Access	3.1
Unregulated	55.2
Local water utility & Stock & Domestic	28.5
Murrumbidgee	
High security	350.7
General security	1,413.6
Conveyance[5]	301.2
Supplementary Access	362.4
Unregulated	85.2
Local water utility & Stock & Domestic	73.7
Barwon–Darling Watercourse	
Unregulated[6]	166.1
Lower Darling	
High security	3.0
General security	10.1
Supplementary Access	-
Unregulated	9.7
Local water utility & Stock & Domestic	11.5
NSW Murray	
High security	164.7
General security	1,189.4
Regulated River Conveyance	285.2
Supplementary Access	152.4

SDL resource unit Entitlement type	Entitlements (GL)[1]
Unregulated	29.3
Local water utility & Stock & Domestic	62.4
Australian Capital Territory (Surface Water)	
Urban	71.0
Non urban	5.6
Victoria	
Victorian Murray	
High reliability	898.9
Low reliability	290.7
Unregulated	29.9
Urban[7]	59.7
Kiewa	
Unregulated	18.2
Urban[7]	2.2
Ovens	
Unregulated	56.9
Urban[7]	10.4
Broken	
High reliability	17.1
Low reliability	3.3
Unregulated	10.1
Urban[7]	2.3
Goulburn	
High reliability	558.8
Low reliability	305.6
Unregulated	37.8
Urban[7]	37.6
Campaspe	
High reliability	119.5
Low reliability	79.2
Unregulated	7.4
Urban[7]	50.9
Loddon	
High reliability	134.9
Low reliability	67.0
Unregulated	27.8
Urban[7]	7.3
Wimmera–Mallee (Surface Water)	
High reliability	44.7
Low reliability	-
Unregulated	0.5
Urban[7]	2.4
South Australia	

SDL resource unit Entitlement type	Entitlements (GL)[1]
SA Murray	**618.0**
High reliability[8]	438.0
Urban[9]	180.0
SA Non-Prescribed Areas	**-**
Marne Saunders	
Unregulated	0.2
Eastern Mount Lofty Ranges	
Unregulated	16.7

Notes:
1. Queensland unsupplemented water allocations includes both with flow and no flow conditions
2. Queensland supplemented water allocations includes all priority classes
3. Queensland overland flow means floodplain harvesting in the Basin Plan. Does not include the volume authorised to be taken under licences managed under instantaneous volumetric limit rule.
4. NSW conveyance includes Coleambally Irrigation, Murrumbidgee Irrigation and Regulated River Conveyance
5. Barwon–Darling unregulated includes A, B, C classes and Stock & Domestic, town, industrial, recreation licences
6. Victoria urban entitlements include stock & domestic, industrial & commercial, and Urban bulk entitlements
7.South Australia Class 4 Recreation and Class 3 Irrigation merged here.
8. South Australia Class 1 Stock & domestic, Class 2 Country towns urban and Class 6 Metro Adelaide merged here.

Appendix 3: Actual take by SDL resource unit

Figure 8-1 Consumptive surface water take across SDL resource units (extract).

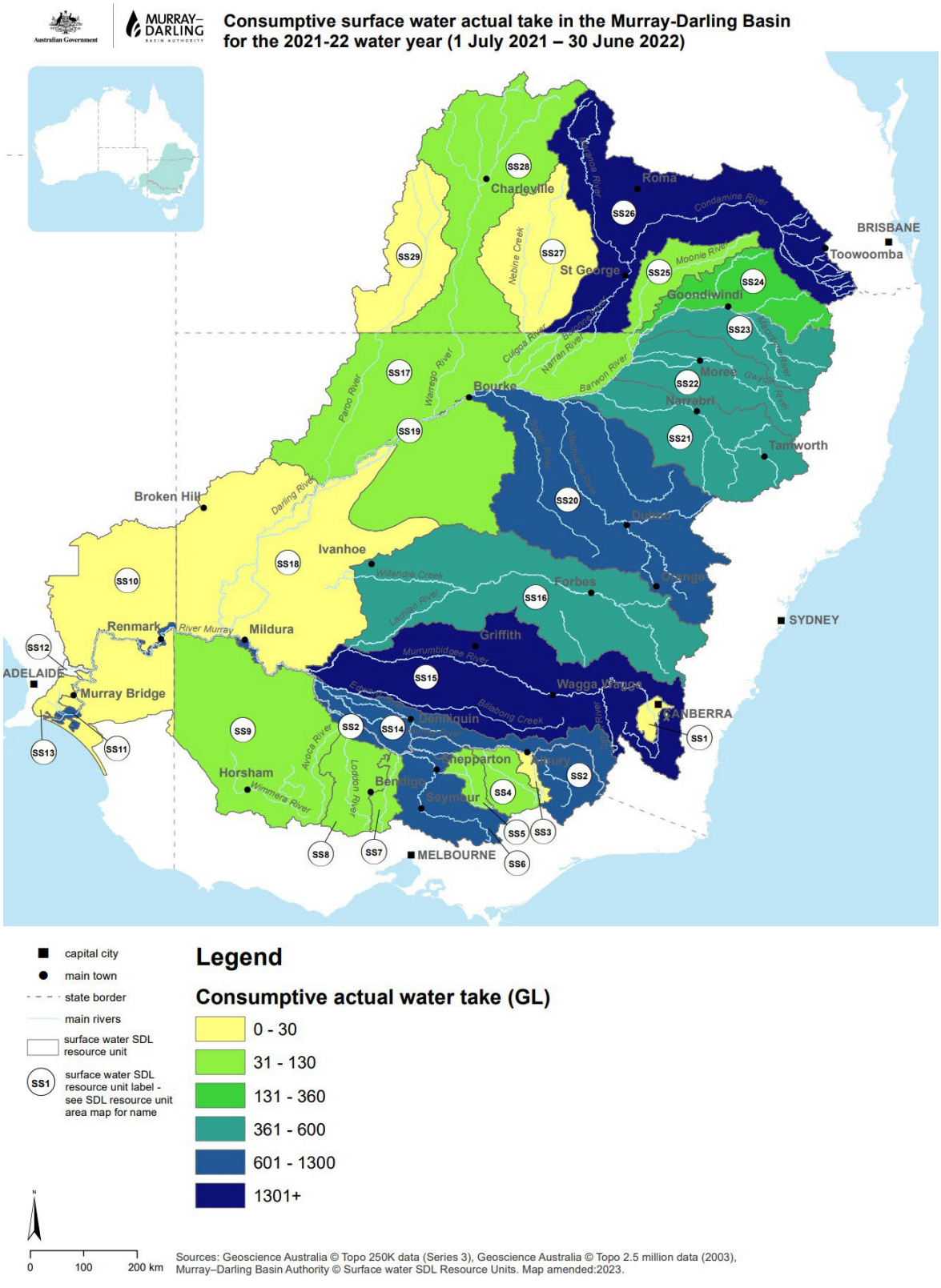
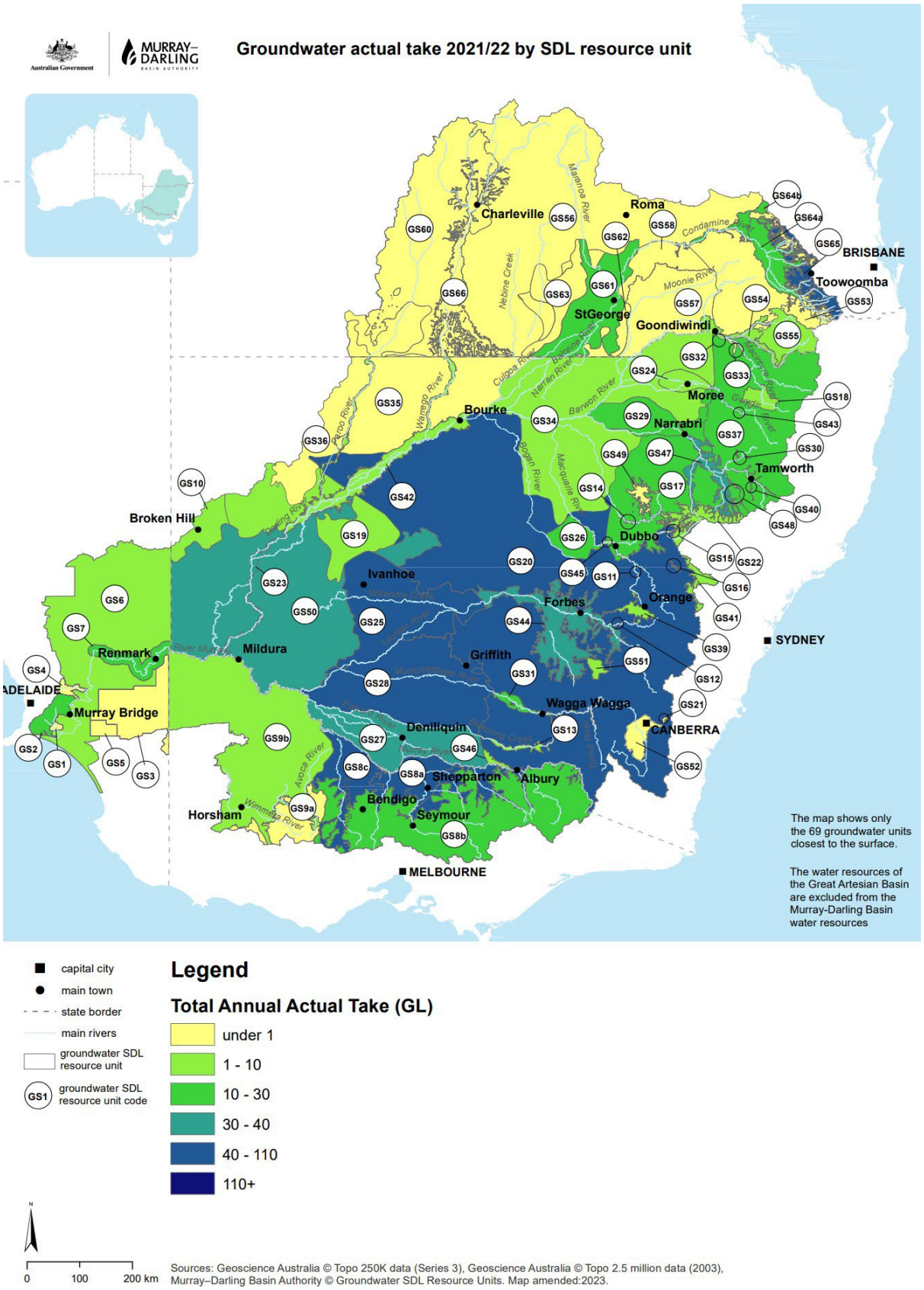


Figure 8-2 Groundwater take across SDL resource units (extract).



Appendix 4: Held environmental water accounts

Table 8-3 Total surface water held environmental water (HEW) entitlements available as at 30 June for 2021 and 30 June 2022

	30 June 2021		30 June 2022	
SDL resource unit	HEW entitlements (GL) [42]	long-term HEW (GL/y LTDLE)	HEW entitlements (GL) [42]	long-term HEW (GL/y LTDLE)
Queensland				
Paroo	-	-	-	-
Warrego	19.0	20.1	19.0	20.1
Unsupplemented	19.0	20.1	19.0	20.1
Nebine	1.0	3.8	1.0	3.8
Unsupplemented	1.0	3.8	1.0	3.8
Condamine–Balonne	90.1	86.0	90.1	86.0
Medium	0.0	0.0	0.0	0.0
Unsupplemented	49.8	46.9	49.8	46.9
Overland flow licence	40.3	39.1	40.3	39.1
Moonie	2.6	2.8	2.6	2.8
Unsupplemented	2.6	2.8	2.6	2.8
Queensland Border Rivers	23.6	14.4	23.6	14.4
Medium	15.5	6.2	15.5	6.2
Unsupplemented	8.1	8.2	8.1	8.2
Queensland total	**136.3**	**127.2**	**136.3**	**127.2**
New South Wales				
NSW Border Rivers	4.2	1.9	4.2	1.9
General security B	2.8	0.9	2.8	0.9
Supplementary Access	1.4	1.0	1.4	1.0
Intersecting Streams	17.8	13.8	17.8	13.8
Unregulated	8.1	4.1	8.1	4.1
Unregulated - special additional high flow	9.7	9.7	9.7	9.7
Gwydir	136.0	57.1	136.0	57.1
High security	5.8	5.1	5.8	5.1
General security	106.6	40.5	106.6	40.5
Supplementary Access	23.6	11.4	23.6	11.4
Namoi	14.9	10.5	14.9	10.5
General security	14.9	10.5	14.9	10.5
Macquarie–Castlereagh	187.3	97.7	187.3	97.7
General security	174.6	90.1	174.6	90.1
Supplementary Access	9.7	5.7	9.7	5.7
Unregulated	2.9	1.9	2.9	1.9
Lachlan	127.2	51.8	127.2	51.8
High security	2.7	2.5	2.7	2.5
General security	124.5	49.3	124.5	49.3
Murrumbidgee	1225.1	669.1	1,225.1	669.1
High security	66.8	64.3	66.8	64.3
General security	490	296.4	490.0	296.4
Coleambally Irrigation Conveyance	12.7	11.3	12.7	11.3
Murrumbidgee Irrigation Conveyance	5.1	53.3	59.1	53.3
Regulated River Conveyance	3.0	2.7	3.0	2.7
Supplementary Access	28.7	10.8	28.7	10.8

[42] Total entitlements are based on differing classes of entitlements and are provided for comparison against the corresponding LTDLE totals (e.g. as a rough indication of aggregate security of entitlements)

SDL resource unit	30 June 2021		30 June 2022	
	HEW entitlements (GL) [42]	long-term HEW (GL/y LTDLE)	HEW entitlements (GL) [42]	long-term HEW (GL/y LTDLE)
Supplementary Access (Lowbidgee)	554.7	225	554.7	225.0
Unregulated	10.1	5.2	10.1	5.2
Barwon–Darling Watercourse	30.4	30.4	30.4	30.4
Unregulated	1.5	1.5	1.5	1.5
Unregulated (A class)	0.3	0.3	0.3	0.3
Unregulated (B class)	16.1	16.1	16.1	16.1
Unregulated (C class)	12.5	12.5	12.5	12.5
Lower Darling	324.1	93.8	324.1	93.8
High security	4.7	3.6	4.7	3.6
General security	69.4	67.1	69.4	67.1
Supplementary Access	250.0	23.1	250.0	23.1
NSW Murray	673.3	446.8	673.3	446.8
High security	25.0	22.2	25.0	22.2
General security	484.7	351.4	484.7	351.4
Regulated River Conveyance	50.2	46.1	50.2	46.1
Supplementary Access	100.2	17.9	100.2	17.9
Unregulated	13.1	9.2	13.1	9.2
New South Wales total	**2740.3**	**1472.9**	**2,740.3**	**1,472.9**
Australian Capital Territory				
Australian Capital Territory (Surface Water)	-	-	-	-
Regulated	-	-	-	-
Australian Capital Territory total	**-**	**-**	**-**	**-**
Victoria				
Victorian Murray	709.5	568.4	709.5	568.4
High reliability	473.9	461.5	473.9	461.5
Low reliability	152.2	62.4	152.2	62.4
Provision	-	-	-	-
Unregulated	83.3	44.4	83.3	44.4
Kiewa	-	-	-	-
Ovens	0.1	0.1	0.1	0.1
Regulated	0.1	0.1	0.1	0.1
Broken	0.6	0.4	0.6	0.4
High reliability	0.6	0.4	0.6	0.4
Low reliability	0.0	0.0	0.0	0.0
Goulburn	660.1	545.8	660.2	545.8
High reliability	428.9	415.1	428.9	415.1
Low reliability	231.2	130.6	231.2	130.6
Provision	-	-	0.1	0.1
Campaspe	35.8	31.0	35.8	31.0
High reliability	25.7	24.4	25.7	24.4
Low reliability	8.4	4.8	8.4	4.8
Provision	1.7	1.7	1.7	1.7
Coliban urban & rural	0.0	0.0	0.0	0.0
Loddon	17.4	14.1	17.4	14.1
High reliability	5.8	4.4	5.8	4.4
Low reliability	2.6	0.6	2.6	0.6
Provision	9.1	9.1	9.1	9.1
Wimmera–Mallee (Surface Water)	69.6	62.4	69.6	62.4
Wetlands entitlement provision	1.0	1.0	1.0	1.0
Wimmera Mallee Pipeline Product	40.6	38.2	40.6	38.2
Wimmera irrigation product including losses	28.0	23.2	28.0	23.2
Victoria total	**1,493.3**	**1,222.1**	**1,493.3**	**1,222.1**
South Australia				
SA Murray	252.7	231.1	252.9	231.3
Class 1	0.1	0.1	0.1	0.1
Class 3	206.4	184.9	206.6	185.0

SDL resource unit	30 June 2021		30 June 2022	
	HEW entitlements (GL) [42]	long-term HEW (GL/y LTDLE)	HEW entitlements (GL) [42]	long-term HEW (GL/y LTDLE)
Class 9	46.2	46.2	46.2	46.2
SA Non-Prescribed Areas	-	-	-	-
Marne Saunders	-	-	-	-
Eastern Mount Lofty Ranges	-	-	-	-
South Australia total	**252.7**	**231.1**	**252.9**	**231.3**
Basin total	**4,622.5**	**3,053.3**	**4,622.7**	**3,053.5**

Table 8-4 Surface water HEW that was lawfully accessible for use in 2021–22 at an SDL resource unit level

SDL resource unit	Allocated in 2021–22 (GL)	HEW carryover from 2020–21 GL)	Allocation forfeiture during year (or water remaining within river)* (GL)	Supplementary access and unregulated entitlement used in 2021– 22 (GL)	Net trade between SDL resource units (GL)	Net Trade from Consumptive use (GL)	Net transfer (out of MDB) (GL)	Return flow credit (GL)	HEW lawfully accessible for use 2021–22 (GL)
Queensland									
Paroo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warrego	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	20.0
Nebine	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	1.3
Condamine-Balonne	0.0	0.0	0.0	319.5	0.0	0.0	0.0	0.0	319.5
Moonie	0.0	0.0	0.0	5.7	0.0	0.0	0.0	0.0	5.7
Queensland Border Rivers	8.1	5.3	0.0	20.0	0.0	0.0	0.0	0.0	33.4
Queensland total	**8.1**	**5.4**	**0.0**	**366.4**	**0.0**	**0.0**	**0.0**	**0.0**	**379.8**
New South Wales									
NSW Border Rivers	1.5	1.3	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Intersecting Streams	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gwydir	121.9	71.6	0.0	5.1	0.0	-0.1	0.0	0.0	198.5
Namoi	15.4	12.9	0.0	0.0	0.0	0.0	0.0	0.0	28.4
Macquarie–Castlereagh	307.4	100.7	-229.0	7.8	0.0	-0.1	0.0	0.0	186.8
Lachlan	371.5	63.2	-259.8	0.0	0.0	-1.3	0.0	0.0	173.6
Murrumbidgee	455.8	113.5	0.0	348.1	-19.5	-25.4	-101.9	0.0	770.5
Barwon–Darling Watercourse	0.0	0.0	0.0	45.7	0.0	0.0	0.0	0.0	45.7
Lower Darling	74.1	-0.1	0.0	0.0	27.2	0.0	0.0	0.0	101.3
NSW Murray	443.3	165.1	0.0	0.0	-22.7	-14.0	-35.1	0.0	536.6
New South Wales total	**1,790.9**	**528.1**	**-488.8**	**406.6**	**-15.0**	**-40.8**	**-136.9**	**0.0**	**2,044.1**
Australian Capital Territory									
Australian Capital Territory (Surface Water)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SDL resource unit	Allocated in 2021–22 (GL)	HEW carryover from 2020–21 (GL)	Allocation forfeiture during year (or water remaining within river)* (GL)	Supplementary access and unregulated entitlement used in 2021– 22 (GL)	Net trade between SDL resource units (GL)	Net Trade from Consumptive use (GL)	Net transfer (out of MDB) (GL)	Return flow credit (GL)	HEW lawfully accessible for use 2021–22 (GL)
Australian Capital Territory total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Victoria									
Victorian Murray	682.7	229.2	0.0	83.0	-601.6	-11.3	-49.1	409.1	742.1
Kiewa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ovens	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
Broken	0.7	0.0	0.0	0.0	2.2	0.0	0.0	0.0	2.8
Goulburn	430.1	244.4	0.0	0.0	0.0	0.1	-39.0	57.7	693.3
Campaspe	27.4	5.8	0.0	0.0	2.9	0.0	0.0	0.0	36.2
Loddon	13.5	3.5	0.0	0.0	3.9	0.0	0.0	-0.1	20.8
Wimmera-Mallee (Surface Water)	25.6	25.7	0.0	0.0	0.0	0.0	0.0	0.0	51.3
Victoria total	**1,180.1**	**508.7**	**0.0**	**83.0**	**-592.6**	**-11.1**	**-88.1**	**466.8**	**1,546.6**
South Australia									
South Australian Murray*	252.1	0.0	0.0	0.0	607.6	13.6	0.0	0.0	873.4
SA Non-Prescribed Areas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marne Saunders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eastern Mount Lofty Ranges	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Australia total	**252.1**	**0.0**	**0.0**	**0.0**	**607.6**	**13.6**	**0.0**	**0.0**	**873.4**
Basin total	**3,231.2**	**1,042.1**	**-488.8**	**856.0**	**0.0**	**-38.3**	**-225.1**	**466.8**	**4,843.8**

* South Australian Murray does not have allocation forfeitures. This volume represents water that remained unused at the end of the year and remained in-river for environmental outcomes.

Notes:

=-ve trade means HEW traded to consumptive available

=+ve trade means consumptive allocation traded to HEW available

=-ve transfer out means water has been transferred out of the Basin to Snowy

Table 8-5 Use of surface water HEW for the 2021–22 water year at SDL resource unit level

SDL resource unit	HEW lawfully accessible for use 2021–22 (GL)	Actual HEW used (GL)			2021–22 forfeiture (or water remaining within river)* (GL)	Closing carryover (GL)	Percentage of available HEW used (%)	Percentage of available HEW forfeited (%)	Percentage of available HEW carried over (%)
		Gross use (GL)	Return flow debit (GL)	Net use (GL)					
Queensland									
Paroo	0.0	0.0	0.0	0.0	0.0	0.0	NA	N/A	N/A
Warrego	20.0	20.0	0.0	20.0	0.0	0.0	100%	0%	0%
Nebine	1.3	1.3	0.0	1.3	0.0	0.0	100%	0%	0%
Condamine–Balonne	319.5	319.4	0.0	319.4	0.0	0.1	100%	0%	0%
Moonie	5.7	5.7	0.0	5.7	0.0	0.0	100%	0%	0%
Queensland Border Rivers	33.4	20.0	0.0	20.0	0.0	13.4	60%	0%	40%
Queensland total	**379.8**	**366.4**	**0.0**	**366.4**	**0.0**	**13.5**	**96%**	**0%**	**4%**
New South Wales									
NSW Border Rivers	2.8	0.0	0.0	0.0	0.0	2.8	0%	0%	100%
Intersecting Streams	0.0	0.0	0.0	0.0	0.0	0.0	NA	N/A	N/A
Gwydir	198.5	37.2	0.0	37.2	1.4	159.9	19%	1%	81%
Namoi	28.4	0.0	0.0	0.0	1.3	27.1	0%	4%	96%
Macquarie–Castlereagh	186.8	13.7	0.0	13.7	0.7	172.4	7%	0%	92%
Lachlan	173.6	20.2	0.0	20.2	1.8	151.6	12%	1%	87%
Murrumbidgee	770.5	642.2	0.0	642.2	0.0	128.3	83%	0%	17%
Barwon–Darling Watercourse	45.7	45.7	0.0	45.7	0.0	0.0	100%	0%	0%
Lower Darling	101.3	98.4	0.0	98.4	0.0	2.9	97%	0%	3%
NSW Murray	536.6	266.8	0.0	266.8	43.5	226.4	50%	8%	42%
New South Wales total	**2,044.1**	**1,124.1**	**0.0**	**1,124.1**	**48.6**	**871.4**	**55%**	**2%**	**43%**
Australian Capital Territory									
Australian Capital Territory (Surface Water)	0.0	0.0	0.0	0.0	0.0	0.0	NA	N/A	N/A
Australian Capital Territory total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**NA**	**N/A**	**N/A**
Victoria									
Victorian Murray	742.1	319.0	216.4	102.6	13.0	410.2	43%	2%	55%
Kiewa	0.0	0.0	0.0	0.0	0.0	0.0	NA	N/A	N/A

SDL resource unit	HEW lawfully accessible for use 2021–22 (GL)	Actual HEW used (GL)			2021–22 forfeiture (or water remaining within river)* (GL)	Closing carryover (GL)	Percentage of available HEW used (%)	Percentage of available HEW forfeited (%)	Percentage of available HEW carried over (%)
		Gross use (GL)	Return flow debit (GL)	Net use (GL)					
Ovens	0.2	0.2	0.0	0.2	0.0	0.0	100%	0%	0%
Broken	2.8	2.8	0.0	2.8	0.0	0.0	99%	0%	1%
Goulburn	693.3	500.9	491.3	22.0	8.7	183.7	72%	1%	26%
Campaspe	36.2	32.6	31.0	1.6	0.2	3.4	90%	1%	9%
Loddon	20.8	18.3	9.1	9.2	0.4	2.1	88%	2%	10%
Wimmera–Mallee (Surface Water)	51.3	20.2	0.0	20.2	4.7	26.5	39%	9%	52%
Victoria total	**1,546.6**	**893.9**	**747.8**	**158.4**	**26.9**	**625.8**	**58%**	**2%**	**40%**
South Australia									
South Australian Murray*	873.4	873.4	0.0	873.4	0.0	0.0	100%	0%	0%
SA Non-Prescribed Areas	0.0	0.0	0.0	0.0	0.0	0.0	NA	N/A	N/A
Marne Saunders	0.0	0.0	0.0	0.0	0.0	0.0	NA	N/A	N/A
Eastern Mount Lofty Ranges	0.0	0.0	0.0	0.0	0.0	0.0	NA	N/A	N/A
South Australia total	**873.4**	**873.4**	**0.0**	**873.4**	**0.0**	**0.0**	**100%**	**0%**	**0%**
Basin total	**4,843.8**	**3,257.7**	**747.8**	**2,522.3**	**75.5**	**1,510.7**	**67%**	**2%**	**31%**

* South Australian Murray does not have allocation forfeitures. This volume represents water that remained unused at the end of the year and remained in-river for environmental outcomes

Appendix 5: Availability and use of PEW

Table 8-6 Volume (ML) of PEW available in 2021–22 and the proportion of PEW used for each Surface water SDL resource unit

PEW data and related comments presented as provided by Basin States. No analysis or commentary provided by the MDBA

SDL resource unit	Volume of PEW available (ML)	Use of PEW (ML)	Comments
Queensland			
Paroo	0	0	
Warrego	2,750	2,750	Section 17(3)(a) of the Warrego, Paroo, Bulloo and Nebine Water Management Protocol September 2021, Announced period for the Upper and Lower Warrego water management areas. 2021
Nebine	0	0	
Condamine–Balonne	179,268	179,268	Condamine and Balonne Water Management Protocol Feb 2019 Revision 1 Chapter 9 Part 1 – s166 Passing or storing water for environmental, stock and domestic purposes.
Condamine–Balonne	0	0	Condamine and Balonne Water Management Protocol Feb 2019 Revision 1 Chapter 9 Part 1 – s168 Flow event management rules – managing low flows. Rule not triggered. .
Condamine–Balonne	0	0	Condamine and Balonne Water Management Protocol Feb 2019 Revision 1 Chapter 9 Part 2 – s169 Flow Event Management Rules – managing medium flow events. Rule not triggered. Chapter
Condamine–Balonne	23,000	23,000	Condamine and Balonne Water Management Protocol Feb 2019 Revision 1 Chapter 9 Part 3 – s170 Flow event

SDL resource unit	Volume of PEW available (ML)	Use of PEW (ML)	Comments
			management rules – managing flow events to support Narran Lakes. Chapter
Moonie	0	0	
Queensland Border Rivers	772,927	772,927	Border Rivers and Moonie Water Management Protocol Feb 2019 Revision 1 Chapter 4 Part 1 Water sharing rules – Announced period. Must provide a minimum of 25% of the available volume of unsupplemented flow for the environment in the Border Rivers Water Management Area.
Queensland Border Rivers	21,200	21,200	Border Rivers and Moonie Water Management Protocol Feb 2019 Revision 1 Chapter 4 Part 1 Water sharing rules – Announced period. To provide for the preservation of tributary inflows for the Border Rivers. Chapter
Queensland Border Rivers	3,814	3,814	Macintyre Brook Water Supply Scheme Resource Operations Licence 2019 Condition 3 – releases to provide for environmental flows.
Queensland total	**1,002,959**	**1,002,959**	
New South Wales			
NSW Border Rivers	7,600	0	The Border Rivers stimulus account had an opening balance of 3,600 ML and was credited with an additional 4,000 ML on July 1 2021. No deliveries from the account occurred in 2021–22. 4,000 ML is carried forward to 2022–23.
Intersecting Streams	0	0	
Gwydir	101,532	11,532	The Gwydir ECA had an opening balance of 42,230 ML (carried forward from 2020–21). Total credited water (allowing for account limits) was 59,293 ML. A total of 11,523 ML was delivered and 90,000 ML carries forward to 2022–23. Volume available has been assessed as carryover plus credits.

SDL resource unit	Volume of PEW available (ML)	Use of PEW (ML)	Comments
Namoi	5,000	0	The Peel ECA was credited with 5000 ML as per the requirements of the water sharing plan. No usage of the account occurred in 2021–22. Remaining allocation in the Peel ECA cannot be carried forward to the following water year.
Macquarie–Castlereagh	160,000	57,795	Environmental water allowance: EWA had an opening carryover balance of 80,296 ML on 1st July 2021. Of the carryover balance, 18,394 ML was in the translucent sub account and 61,902 ML in active sub account. A total of 57,795 ML was delivered in 21–22 (39,993 translucent sub account and 17,802 active sub-account). A spill reset of the environmental water allowance (to 160,000 ML) occurred on 1 December 2021. 160,000 ML carries forward to 21–22 (64,000 ML translucent sub-account, 96,000 ML active sub-account).
Lachlan	40,000	14,096	Environmental Water Allowance (EWA) plus Water Quality Allowance (WQA). Usage of water subject to meeting specified conditions in water sharing plan. No carryover provision is applicable
Murrumbidgee	94,808	19,860	Volume of PEW available = carry forward plus accrued volumes for EWA1,2 and 3 minus EWA 1 spill. 68,701 ML is carried forward to 2022–23
Barwon–Darling Watercourse	0	0	
Lower Darling	30,000	0	Remaining balance forfeited at end of year
NSW Murray	245,730	47,890	Volume of PEW includes Barmah–Millewa Allowance (BMA) and Additional Environmental Allowance (AEA). Volume of PEW available presented for BMA is standard carryover volume (343,480), plus account credits (75,000) minus spill and evaporation forfeits (172,750). The borrow account was active in July and August of 2021 and during this time 350,000 ML was unavailable to the environmental holder. All water from the borrow account was recredited to the BMA in September 2021. The volume of PEW available for the AEA is carryover volume (0), plus credits (5,691) minus account limit forfeits (0), minus account spill (5,691). No usage of the AEA occurred prior to the account water being spilled , 0 ML is carried forward to 2022–23

SDL resource unit	Volume of PEW available (ML)	Use of PEW (ML)	Comments
New South Wales total	**684,670**	**151,173**	
Australian Capital Territory			
Australian Capital Territory (Surface Water) – Corin	123,200	123,200	Minimum requirement 14,800 ML
Australian Capital Territory (Surface Water) – Bendora	151,600	151,600	Minimum requirement 21,100 ML
Australian Capital Territory (Surface Water) – Cotter	240,500	240,500	Minimum requirement 6,000 ML
Australian Capital Territory (Surface Water) – Googong	333,600	333,600	Minimum requirement 4,200 ML
Australian Capital Territory total	**848,900**	**848,900**	**0**
Victoria			
Victorian Murray	0	0	
Kiewa	0	0	
Ovens	N/A as there is no set annual volume, rather the bulk entitlement states flow rates that must be met in specified reaches of the river.	N/A as there is no set annual volume, rather there is a defined flow rate that must be met in a particular reach of the river. GMW has released flows in accordance with the requirements of the BE.	Bulk Entitlement (Ovens System – Goulburn–Murray Water) Order 2004. http://waterregister.vic.gov.au/water-entitlements/bulk-entitlements#bulkEntDiv Clause 11 provides rights to take from natural inflows and regulated flows after meeting environmental minimum flow requirements. Clause 12 provides for the minimum and maximum environmental flow. Schedule 4 sets out the operational tolerances for meeting the minimum and maximum environmental flows.
Ovens	N/A as there is no set annual volume, rather there are defined flow rates at which licensed diversions are increasingly restricted.	N/A as there is no set annual volume, rather there are defined flow rates at which licensed diversions are increasingly restricted. GMW has managed the Upper Ovens River Water Supply Protection Area in accordance with its Management Plan. There were no restrictions on any of the reaches of the Upper Ovens WSPA in 2021/22. See GMW's 2021/22 annual report for the Upper Ovens River Water Supply Protection Area Management Plan for more details. https://www.g-mwater.com.au/downloads/gmw/Groundwater/annual_reports	Upper Ovens River Water Supply Protection Area Management Plan http://www.g-mwater.com.au/downloads/gmw/Groundwater/Upper_Ovens_River_WSPA_Water_Management_Plan.pdf The Plan establishes a water sharing regime to manage water use in the Ovens River and tributaries, with a focus on low flow periods when there are increased risks to the

SDL resource unit	Volume of PEW available (ML)	Use of PEW (ML)	Comments
		/2022/20221011_Upper_Ovens_River_WSPA__2021_22_Annual_Report.pdf	environment and other users. Table 11 identifies trigger flows for the water sharing regime between the environment and other users at the Myrtleford compliance point. Prescriptions 3, 4, 5, 6, and 7 apply to the taking of surface water or groundwater under an all-year licence in Management Zone 1 while a restriction Stage is in place – in order to provide for the environmental outcomes as per Table 9.
Broken	N/A as there is no set annual volume, rather the bulk entitlement states flow rates that must be met in specified reaches of the river.	N/A as there is no set annual volume, rather there is a defined flow rate that must be met in a particular reach of the river. GMW released flows in accordance with the environmental minimums and maximums within the allowed tolerances.	Bulk Entitlement (Broken System–Goulburn–Murray Water) Conversion Order 2004 http://waterregister.vic.gov.au/water-entitlements/bulk-entitlements#bulkEntDiv Clause 11 provides rights to take from natural inflows and regulated flows after meeting environmental minimum flow requirements. Clause 12 provides for the minimum and maximum environmental flow. Schedule 4 sets out the operational arrangements and operational tolerances for meeting the minimum and maximum environmental flows.
Goulburn	0	0	
Campaspe	0	0	
Loddon	0	0	
Wimmera–Mallee (Surface Water)	0	0	
Victoria total			
South Australia			
South Australian Murray	336,775	336,775	Unallocated Entitlement + Spill of SA Storage Right
South Australian Murray	59,012	59,012	EMLR outflow to River Murray – this volume is PEW within the EMLR SDL resource unit
South Australian Murray	91,250	91,250	Lindsay River Allowance

SDL resource unit	Volume of PEW available (ML)	Use of PEW (ML)	Comments
South Australian Murray	343,660	0	BED delivery from NSW – this is the delivery of the return flow of HEW from NSW.
South Australian Murray	35,993	35,993	Permanent trade adjustment – SA Entitlement is used to provide allocations against the entitlements that were permanently traded from NSW/Vic prior to 2007. The trade adjustment is the volume delivered from NSW/Vic in lieu of those traded entitlements, based on the allocation levels in those SDL resource units from where the trade originally occurred.
South Australian Murray	5,315,180	1,455,660	Unregulated flow
South Australian Murray	915,000	0	Additional Dilution Flow
SA Non-Prescribed Areas	6,211,176	6,211,176	Flow over the barrages – this volume may be represented as either PEW or HEW within the SA Murray SDL resource unit. In this case, it includes the volume of unregulated flow and any PEW within the SA Murray SDL resource unit that was not used within that unit.
SA Non-Prescribed Areas	23,972	23,972	Outflow from SE into Coorong at Salt Creek
Marne Saunders	18	0	M-S end of system flow – this is also PEW within the SA River Murray SDL resource unit
Eastern Mount Lofty Ranges	58,994	0	EMLR end of system flow – this is also PEW within the SA River Murray SDL resource unit
South Australia total*	**13,391,030**	**8,213,838.7**	**0**

* Total volume of PEW available in South Australia will not be equal to total use of PEW, as PEW may be "available" in more than one unit but "used" in only one.

Appendix 6: Cap Register

Table 8-7 details the volume of allocation (i.e. temporary trade) trade from one Cap valley to another Cap valley. This also includes an adjustment for entitlements that are permanently traded. This value adjusts the annual Cap target for each Cap valley.

Table 8-7 Annual Cap adjustment for trade (GL)

System	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
New South Wales											
Intersecting Streams	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Border Rivers	-26.11	-19.51	-27.44	-1.10	-8.83	0.00	0.00	-29.89	-1.13	-11.25	-11.46
Gwydir	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Namoi/Peel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macquarie/Castlereagh/Bogan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barwon–Darling/Lower Darling	20.00	47.16	55.72	0.00	0.00	25.17	-25.00	0.00	0.00	-7.71	-5.33
Lachlan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Murrumbidgee	5.97	7.07	-71.92	-33.00	-207.31	-47.35	121.27	-44.27	-140.19	-313.66	-111.33
Murray	55.52	102.03	-128.43	36.01	-30.98	-101.57	45.98	97.78	22.58	79.09	-56.02
Total New South Wales	**55.38**	**136.74**	**-172.08**	**1.91**	**-247.12**	**-123.75**	**142.25**	**23.62**	**-118.73**	**-253.54**	**-184.14**
Victoria											0.00
Goulburn/Broken/Loddon Cap valley	-106.37	-188.56	-103.84	-218.14	-72.45	-55.11	-359.37	-345.99	-258.58	-84.34	-147.62
Campaspe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63
Wimmera–Mallee	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Murray/Kiewa/Ovens Cap valley	62.94	13.76	262.90	231.34	259.98	227.69	170.88	219.98	348.46	219.95	171.78
Total Victoria	**-43.43**	**-174.80**	**159.06**	**13.21**	**187.54**	**172.58**	**-188.49**	**-126.01**	**89.89**	**135.61**	**24.80**
South Australia											
Metropolitan Adelaide & associated country areas*	0.00	0.00	0.00	0.00	8.34	0.00	0.00	0.00	-40.00	-40.00	-40.00
Lower Murray swamps	-47.43	-39.79	-51.90	-53.80	-53.32	-58.32	-55.72	-56.06	-59.26	-57.02	-54.80
Country towns	-14.00	-10.57	-13.50	-13.00	-12.00	-17.00	-11.50	-8.03	0.00	-8.62	-0.22
All other purposes	18.59	64.84	47.63	45.93	104.27	24.90	109.07	132.15	121.02	146.46	174.71
Total South Australia	**-42.85**	**14.48**	**-17.77**	**-20.87**	**47.29**	**-50.43**	**41.85**	**68.06**	**21.76**	**40.82**	**79.68**
Queensland											
Condamine/Balonne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Border Rivers	26.11	19.51	27.44	1.10	8.83	0.00	0.00	29.89	1.13	11.25	11.46
Moonie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nebine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Warrego	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paroo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Queensland	**26.11**	**19.51**	**27.44**	**1.10**	**8.83**	**0.00**	**0.00**	**29.89**	**1.13**	**11.25**	**11.46**
Australian Capital Territory	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total Basin	**-4.79**	**-4.07**	**-3.34**	**-4.65**	**-3.46**	**-1.60**	**-4.39**	**-4.44**	**-5.97**	**-65.86**	**-68.20**

* There is a 40GL of trade out of Metro Adelaide Cap Valley in 2019–20 under the Water for Fodder program. This is a new arrangement was approved by the Ministerial Council (MinCo) Out of Session 75 on 15 January 2020, with trade to be allowed out of the Metro Adelaide Cap valley for four years from 2019–20.

Sign convention follows positive (+) value as volume traded in and negative (-) value as volume traded out.

Numbers may not add up precisely to the totals due to rounding.

The full data set for the period from 1997–08 to 2021–22 is available on the MDBA Cap Compliance Reports website:

https://www.mdba.gov.au/publications/mdba-reports/cap-compliance-reports

Table 8-8 details the values for adjustment of annual Cap targets for use of water by the environment water. The annual Cap targets as determined by hydrological models include the use of both consumptive and environmental water. Since compliance with Cap is confined to consumptive use, an adjustment is made to remove environmental use.

Table 8-8 Annual Cap adjustments for environment (GL)

System	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
New South Wales											
Intersecting Streams	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Border Rivers	0.00	-0.27	-0.03	0.00	0.00	0.00	-0.68	0.00	0.00	-0.90	0.00
Gwydir	-1.80	-48.07	-17.34	-56.64	-7.92	-24.89	-36.48	-58.65	-10.60	-18.02	-37.10
Namoi/Peel	0.00	-7.73	0.34	0.00	0.00	-9.11	-5.36	-5.50	0.00	-0.40	0.00
Macquarie/Castlereagh/Bogan	-65.25	-137.72	-17.99	-16.04	-19.16	-62.78	-69.35	-73.71	-4.58	-53.12	-13.62
Barwon–Darling/Lower Darling	-102.31	-48.79	-5.10	0.00	0.00	-50.72	-41.51	0.00	0.00	-142.62	-116.84
Lachlan	-27.55	-66.28	-19.65	-5.82	-47.03	-35.74	-38.81	-21.38	-29.83	-67.45	-18.87
Murrumbidgee	-263.26	-326.62	-290.76	-350.55	-219.45	-475.92	-276.35	-87.27	-46.42	-452.69	-734.22
Murray	-350.53	-416.08	-380.97	-283.98	-147.40	-504.32	-264.41	-82.14	-60.68	-144.59	-316.44
Total New South Wales	**-810.69**	**-1,051.56**	**-731.49**	**-713.02**	**-440.96**	**-1,163.47**	**-732.94**	**-328.65**	**-152.12**	**-879.77**	**-1237.08**
Victoria											
Goulburn/Broken/Loddon Cap valley	-187.86	-216.34	-328.05	-311.99	-233.14	-309.34	-388.93	-240.84	-426.10	-278.37	-528.28
Campaspe	-13.68	-24.91	-13.47	-39.47	-5.66	-22.69	-32.62	-23.36	-29.24	-26.46	-29.64
Wimmera–Mallee	0.00	0.00	0.00	0.00	0.00	-5.00	0.00	0.00	0.00	0.00	0.00
Murray/Kiewa/Ovens Cap valley	-104.32	-320.67	-315.49	-356.62	-536.04	-250.36	-415.50	-325.35	-464.02	-442.82	-223.47
Total Victoria	**-305.87**	**-561.92**	**-657.01**	**-708.08**	**-774.84**	**-587.40**	**-837.04**	**-589.55**	**-919.36**	**-747.65**	**-781.40**
South Australia											
Metropolitan Adelaide & associated country areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lower Murray swamps	-8.08	-8.59	-8.73	-9.02	-9.22	-9.22	-9.22	-9.14	-9.14	-9.14	-9.14
Country towns	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All other purposes	-91.20	-143.90	-143.04	-155.43	-172.30	-165.58	-186.95	-186.91	-184.91	-192.35	-191.60
Total South Australia	**-99.28**	**-152.49**	**-151.77**	**-164.45**	**-181.53**	**-174.80**	**-196.17**	**-196.04**	**-194.05**	**-201.49**	**-200.74**
Queensland											
Condamine/Balonne	-11.51	-63.21	-22.21	-17.18	-10.17	-46.03	-1.78	-1.30	-132.79	-25.49	-341.08
Border Rivers	-9.05	-10.02	-4.02	-3.42	-3.28	-30.73	-5.60	-0.41	-6.14	-22.93	-33.11
Moonie	-1.30	-1.30	-1.30	-1.30	-0.20	-1.30	-2.08	-1.00	-4.37	-4.61	-5.67
Nebine	-3.81	-0.13	-0.17	-0.37	-1.14	-1.12	-0.27	-1.87	-1.94	-4.38	-4.42
Warrego	-14.88	-1.26	-1.28	-6.64	-5.22	-7.51	-6.75	-11.21	-20.06	-10.84	-26.26
Paroo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Queensland	**-40.55**	**-75.92**	**-28.98**	**-28.90**	**-20.00**	**-86.69**	**-16.47**	**-15.79**	**-165.30**	**-68.25**	**-410.54**
Australian Capital Territory	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Basin Total	**-1,256.38**	**-1,841.89**	**-1,569.24**	**-1,614.45**	**-1,417.33**	**-2,012.37**	**-1,782.63**	**-1130.03**	**-1430.83**	**-1897.16**	**-2629.76**

Numbers may not add up precisely to the totals due to rounding. The full data set for the period from 1997–08 to 2021–22 is available on the MDBA Cap Compliance Reports website: https://www.mdba.gov.au/publications/mdba-reports/cap-compliance-reports

Table 8-9 details the annual Cap target for consumptive water after adjusting for trade and environmental water in Table 8-7 and Table 8-8.

Table 8-9 Annual Cap targets adjusted for trade and environment (GL)

System	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
New South Wales											
Intersecting Streams	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Border Rivers	157.10	335.39	256.43	91.50	184.12	411.34	271.89	62.93	56.74	162.11	162.95
Gwydir	229.35	404.51	509.48	140.53	164.26	562.00	200.44	23.26	60.43	156.01	266.32
Namoi/Peel	312.95	421.78	387.20	215.65	204.30	373.36	356.43	126.30	145.30	226.69	266.18
Macquarie/Castlereagh/Bogan	413.62	537.48	269.72	207.36	123.03	605.12	235.80	16.01	118.59	372.74	507.22
Barwon–Darling/Lower Darling*	230.25	327.18	242.91	121.41	160.44	328.32	45.68	87.10	194.37	84.26	344.85
Lachlan	227.30	400.57	358.28	213.77	200.60	274.26	411.44	93.83	69.37	122.33	232.08
Murrumbidgee	2,141.10	2,780.13	2,240.10	1,690.14	1,349.01	1,682.71	2,398.32	1431.07	908.27	1250.76	1276.32
Murray	1,701.88	2,105.35	1,643.65	922.51	814.67	1,523.37	1,302.16	583.30	634.79	1822.66	1583.92
Total New South Wales	**5,413.55**	**7,312.39**	**5,907.76**	**3,602.86**	**3,200.43**	**5,760.49**	**5,222.16**	**2423.80**	**2187.84**	**4197.55**	**4639.85**
Victoria											
Goulburn/Broken/Loddon Cap valley	1,719.64	1,790.10	1,641.65	1,315.83	818.99	1,272.69	843.31	1003.29	1035.53	1260.32	997.62
Campaspe	91.66	127.52	114.19	50.99	61.17	67.43	86.94	74.99	51.92	47.07	45.86
Wimmera-Mallee	74.08	44.84	42.74	33.14	12.67	39.09	45.42	25.94	28.00	26.21	35.34
Murray/Kiewa/Ovens Cap valley	1,621.97	1,580.76	1,643.17	1,836.04	1,224.62	1,439.03	1,611.69	1408.32	1379.27	1444.44	1575.07
Total Victoria	**3,507.35**	**3,543.23**	**3,441.75**	**3,236.00**	**2,117.45**	**2,818.23**	**2,587.36**	**2512.53**	**2494.73**	**2778.03**	**2653.88**
South Australia											
Metropolitan Adelaide & associated country areas	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Murray swamps	38.68	45.82	33.57	31.38	31.66	26.65	29.26	29.00	25.80	28.04	30.26
Country towns	36.00	39.43	36.50	37.00	38.00	33.00	38.50	41.97	50.00	41.38	49.78
All other purposes	353.51	402.76	357.66	381.21	421.69	285.97	404.39	428.52	408.45	412.92	439.94
Total South Australia	**428.20**	**488.01**	**427.73**	**449.59**	**491.35**	**345.62**	**472.15**	**499.50**	**484.25**	**482.34**	**519.98**
Queensland**											
Condamine/Balonne	1,014.04	1,242.06	626.25	418.61	343.61	652.96	213.76	157.47	821.81	582.71	1,161.75
Border Rivers	255.90	520.30	148.41	114.74	76.80	606.76	59.59	42.52	101.64	417.89	474.11
Moonie	80.27	41.63	13.62	1.39	0.46	63.74	16.34	1.65	62.56	62.58	76.39
Nebine	4.45	0.94	1.21	4.16	5.63	4.72	1.93	4.54	4.96	5.80	6.35
Warrego	78.38	5.79	3.47	28.26	17.75	50.34	12.96	25.14	47.46	24.37	54.48
Paroo	0.08	0.05	0.07	0.08	0.08	0.09	0.06	0.08	0.08	0.08	0.08
Total Queensland	**1,433.13**	**1,810.76**	**793.02**	**567.24**	**444.33**	**1,378.61**	**304.65**	**231.38**	**1,038.50**	**1,093.43**	**1,773.15**
Australian Capital Territory	**22.42**	**45.25**	**45.23**	**43.40**	**46.86**	**40.10**	**47.33**	**48.75**	**55.22**	**32.66**	**25.95**
Basin Total	**10,804.65**	**13,199.64**	**10,615.49**	**7,899.09**	**6,300.42**	**10,343.05**	**8,633.64**	**5715.97**	**6260.54**	**8584.02**	**9612.82**

* Modelled Inter-valley trade (IVT) is deducted from annual cap target for Lower Darling.

** From 2018–19, Qld cap targets are as per the WRP models. For preceding years, cap targets as per the cap models where applicable otherwise "N/A". The annual Cap targets are not retrospectively updated for Held Environmental Water.

Numbers may not add up precisely to the totals due to rounding.

The full data set for the period from 1997–08 to 2021–22 is available on the MDBA Cap Compliance Reports website:

https://www.mdba.gov.au/publications/mdba-reports/cap-compliance-reports

Table 8-10 details the actual annual diversions that occurred in each year for each Cap valley. Diversions are calculated as defined in the Diversion Formula Register and includes any water taken or diverted during that water year, regardless of whether it originated from carry over, allocations in that year or purchase (i.e. trade in from other valleys).

Table 8-10 Annual diversions (GL)

System	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
New South Wales											
Intersecting Streams	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31	5.80	5.80	5.80
Border Rivers	157.10	220.60	192.40	62.66	114.58	254.79	155.56	138.65	25.62	113.36	106.75
Gwydir	242.93	424.63	420.66	140.56	120.62	349.45	315.30	103.58	40.09	195.42	279.20
Namoi/Peel	245.49	399.81	405.49	188.34	164.31	331.18	311.99	173.64	97.26	203.16	236.76
Macquarie/Castlereagh/Bogan	266.65	456.43	292.12	114.49	131.47	211.39	375.89	223.59	95.23	138.51	224.31
Barwon–Darling/Lower Darling	166.37	283.94	180.01	73.58	84.16	306.66	96.42	11.70	238.62	202.19	228.16
Lachlan	204.51	343.23	240.73	187.79	166.53	186.36	326.40	267.54	86.02	99.38	161.87
Murrumbidgee	1,719.77	2,282.61	1,833.60	1,688.61	1,321.03	1,639.46	1,646.15	967.20	545.82	1700.36	1556.95
Murray*	1,424.79	1,934.39	1,494.28	1,272.42	714.38	1,175.15	1,289.89	653.04	384.32	974.85	1145.44
Total New South Wales	**4,430.93**	**6,348.93**	**5,062.60**	**3,731.75**	**2,820.38**	**4,457.74**	**4,520.93**	**2542.25**	**1518.77**	**3633.03**	**3945.24**
Victoria											
Goulburn/Broken/Loddon Cap valley	1,009.77	1,235.48	1,165.29	1,124.88	1,080.56	733.53	1,066.78	990.78	784.36	747.26	879.15
Campaspe	28.48	42.55	25.87	35.06	39.29	11.24	15.10	32.23	26.26	43.86	33.22
Wimmera–Mallee	14.21	17.66	15.52	19.34	19.82	14.01	16.56	18.29	17.41	17.37	17.03
Murray/Kiewa/Ovens Cap valley	1,292.36	1,674.26	1,310.70	1,399.81	1,341.75	1,145.81	1,415.36	1355.04	999.68	1107.94	1138.32
Total Victoria	**2,344.83**	**2,969.95**	**2,517.38**	**2,579.09**	**2,481.41**	**1,904.59**	**2,513.80**	**2396.34**	**1827.71**	**1916.43**	**2067.72**
South Australia											
Metropolitan Adelaide & associated country areas	59.03	81.67	42.14	73.19	153.34	34.67	71.07	157.61	113.38	131.41	107.86
Lower Murray swamps	13.99	18.03	15.58	15.67	17.18	12.85	15.18	18.16	16.99	17.96	17.40
Country towns	35.73	37.38	35.37	35.81	36.13	32.99	38.41	41.71	42.69	41.08	41.07
All other purposes	314.67	385.01	349.76	376.20	390.82	344.39	410.21	427.59	401.01	433.13	436.62
Total South Australia	**423.42**	**522.09**	**442.85**	**500.87**	**597.47**	**424.89**	**534.87**	**645.07**	**574.08**	**623.57**	**602.95**
Queensland											
Condamine/Balonne	765.16	1,004.77	611.07	354.08	265.17	561.64	160.94	178.59	733.79	577.31	1043.66
Border Rivers	209.68	378.37	145.71	102.90	89.45	520.31	90.88	69.86	108.28	370.83	198.16
Moonie	18.60	33.62	12.86	3.72	0.78	26.39	14.60	1.14	34.72	7.47	6.69
Nebine	1.00	0.00	0.00	0.08	1.40	0.00	0.00	0.08	0.04	0.03	4.64
Warrego	13.71	2.67	0.80	7.27	2.92	7.14	7.57	9.72	23.05	8.03	27.31
Paroo	0.03	0.03	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Queensland	**1,008.19**	**1,419.46**	**770.48**	**468.06**	**359.72**	**1,115.49**	**273.99**	**259.39**	**899.88**	**963.67**	**1280.47**
Australian Capital Territory**	**8.49**	**18.66**	**18.76**	**16.99**	**20.10**	**16.28**	**21.59**	**22.99**	**22.57**	**10.98**	**2.77**
Total Basin	**8,215.85**	**11,279.09**	**8,812.07**	**7,296.76**	**6,279.08**	**7,918.98**	**7,865.18**	**5866.03**	**4843.00**	**7147.68**	**7899.16**

* 2012–13 NSW Murray diversion revised upward by 29.119GL as per the revised data.

** 2018–19 ACT diversion revised upward by 1.541 GL as per the revised data.

Numbers may not add up precisely to the totals due to rounding.

The full data set for the period from 1997–08 to 2021–22 is available on the MDBA Cap Compliance Reports website:https://www.mdba.gov.au/publications/mdba-reports/cap-compliance-reports

Table 8-11 details the differences between the annual Cap targets (Table 8-9) and the annual Cap diversions (Table 8-10) in for each Cap valley. The MDBA and NSW have confirmed errors in data for the Murrumbidgee and Border Rivers Cap valleys, and investigations are ongoing. Required updates to the Cap register following this investigation will be implemented in the Cap register 2021–22.

Table 8-11 Annual Cap credits (GL)

System	Long term Cap	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
New South Wales (a)												
Intersecting Streams	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Border Rivers	234.00	0.00	114.79	64.03	28.84	69.54	156.55	116.33	-75.72	31.11	48.75	56.21
Gwydir	350.22	-13.58	-20.11	88.82	-0.03	43.64	212.55	-114.86	-80.32	20.34	-39.41	-12.87
Namoi/Peel	363.88	67.46	21.97	-18.30	27.31	40.00	42.19	44.44	-47.34	48.04	23.52	29.42
Macquarie/Castlereagh/Bogan	491.67	146.97	81.05	-22.40	92.88	-8.43	393.73	-140.09	-207.57	23.36	234.24	282.91
Barwon–Darling/Lower Darling	322.00	63.89	43.24	62.90	47.82	76.28	21.67	-50.74	75.40	-44.26	-117.93	116.69
Lachlan	335.37	22.79	57.34	117.55	25.98	34.07	87.90	85.03	-173.70	-16.65	22.95	70.21
Murrumbidgee	2,358.37	421.33	497.52	406.50	1.53	27.98	43.25	752.17	463.87	362.44	-449.60	-280.63
Murray*	1,907.66	277.09	170.96	149.37	-349.91	100.29	348.22	12.27	-69.75	250.47	847.81	438.48
Total New South Wales	**6,363.16**	**985.93**	**966.76**	**848.47**	**-125.59**	**383.36**	**1,306.06**	**704.55**	**-115.14**	**674.87**	**570.33**	**700.41**
Victoria												
Goulburn/Broken/Loddon Cap valley	2,033.68	709.87	554.62	476.36	190.95	-261.56	539.16	-223.47	12.52	251.16	513.06	118.47
Campaspe	121.82	63.18	84.97	88.32	15.93	21.89	56.19	71.84	42.76	25.66	3.20	12.64
Wimmera–Mallee	45.06	59.86	27.18	27.22	13.80	-7.15	25.08	28.87	7.65	10.59	8.84	18.31
Murray/Kiewa/Ovens Cap valley	1,702.03	329.61	-93.49	332.47	436.23	-117.14	293.22	196.32	53.27	379.60	336.50	436.75
Total Victoria	**3,902.59**	**1,162.52**	**573.28**	**924.37**	**656.91**	**-363.96**	**913.65**	**73.56**	**116.19**	**667.02**	**861.60**	**586.16**
South Australia												
Metropolitan Adelaide & associated country areas	0.00	238.69	246.46	353.82	337.53	248.97	273.33	283.94	168.46	88.27	101.86	28.67
Lower Murray swamps	94.20	24.70	27.80	17.99	15.70	14.47	13.81	14.08	10.85	8.81	10.08	12.85
Country towns	50.00	0.27	2.05	1.13	1.19	1.87	0.01	0.09	0.26	7.31	0.30	8.70
All other purposes	449.90	38.84	17.75	7.89	5.01	30.87	-58.42	-5.82	0.93	7.44	-20.21	3.33
Total South Australia	**594.10**	**302.50**	**294.06**	**380.84**	**359.44**	**296.19**	**228.73**	**292.28**	**180.51**	**111.83**	**92.04**	**53.55**
Queensland (b)(c)												
Condamine/Balonne	748.00	248.88	237.29	15.18	64.53	78.43	91.32	52.82	-21.12	88.02	5.40	118.08
Border Rivers	296.00	46.23	141.93	2.70	11.84	-12.64	86.44	-31.29	-27.34	-6.64	47.06	275.94
Moonie	41.00	61.67	8.01	0.75	-2.33	-0.32	37.35	1.74	0.52	27.84	55.11	69.70
Nebine	9.80	3.45	0.94	1.21	4.09	4.23	4.72	1.93	4.46	4.92	5.78	1.71
Warrego	61.90	64.67	3.12	2.67	20.99	14.83	43.20	5.39	15.41	24.41	16.34	27.17
Paroo	0.90	0.05	0.02	0.03	0.07	0.08	0.09	0.06	0.08	0.08	0.08	0.08
Total Queensland	**1,157.60**	**424.94**	**391.30**	**22.54**	**99.18**	**84.61**	**263.12**	**30.66**	**-28.00**	**138.62**	**129.76**	**492.68**
Australian Capital Territory (d)(e)	**40.50**	**13.94**	**26.60**	**26.47**	**26.41**	**26.76**	**23.82**	**25.73**	**25.76**	**32.65**	**21.68**	**23.18**
Total Basin	**12,057.95**	**2,889.82**	**2,252.00**	**2,202.69**	**1,016.36**	**426.96**	**2,735.38**	**1,126.78**	**179.32**	**1,624.99**	**1,675.40**	**1,855.99**

Table 8-11details the annual balance after deducting actual diversions in Table 8-10 from annual Cap targets in Table 8-9 for each Cap valley. Sign convention follows positive (+) value as a credit and negative (-) value as a debit.

(a) 2012–13 NSW Murray diversion revised upward by 29.119GL as per the revised data, which leads to revisions to the Cap credits in the year.

(b) Queensland annual balance from 2018–19 water year is based on WRP model runs after their accreditation in the WRPs.

(c) Condamine/Balonne and Border Rivers are the only Qld valleys with a cumulative balance system. From 2018–19 water year, their cumulative balances are based on WRP model runs after their WRP accreditation.

(d) Due to water restrictions in 2008–09 and 2009–10 in the ACT, there were no Cap credits during this period.

(e) 2018–19 ACT diversion revised upward by 1.541 GL as per the revised data, which leads to revisions to the Cap credits in the year.

Numbers may not add up precisely to the totals due to rounding.

The full data set for the period from 1997–08 to 2021–22 is available on the MDBA Cap Compliance Reports website: Cap compliance reports | Murray–Darling Basin Authority (mdba.gov.au)

Table 8-12 details the cumulative balances of the annual values since the Cap system commenced.

Table 8-12 Cumulative Cap credits (GL)

System	Long term Cap	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
New South Wales												
Intersecting Streams	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Border Rivers	234.00	340.15	454.94	518.97	547.81	617.35	773.90	890.23	814.51	845.62	894.37	950.58
Gwydir	350.22	262.52	242.40	331.22	331.19	374.83	587.38	472.52	392.20	412.54	373.14	360.27
Namoi/Peel	363.88	412.55	434.53	416.23	443.54	483.54	525.72	570.16	522.82	570.86	594.39	623.80
Macquarie/Castlereagh/Bogan	491.67	942.55	1,023.60	1,001.20	1,094.08	1,085.65	1,479.38	1,339.29	1,131.72	1,155.08	1,389.31	1,672.22
Barwon–Darling/Lower Darling	322.00	298.70	341.94	404.84	452.66	528.94	550.61	499.86	575.26	531.01	413.08	529.77
Lachlan	335.37	129.46	186.81	304.36	330.33	364.40	452.30	537.34	363.63	346.98	369.93	440.14
Murrumbidgee	2,358.37	1,363.40	1,860.92	2,267.42	2,268.94	2,296.93	2,340.18	3,092.35	3,556.22	3,918.66	3,469.05	3,188.42
Murray	1,907.66	1,257.24	1,428.21	1,577.57	1,227.67	1,327.95	1,676.18	1,688.45	1,618.70	1,869.17	2,716.98	3,155.46
Total New South Wales	**6,363.16**	**5,006.58**	**5,973.34**	**6,821.81**	**6,696.23**	**7,079.59**	**8,385.65**	**9,090.20**	**8,975.06**	**9,649.93**	**10,220.25**	**10,920.66**
Victoria												
Goulburn/Broken/Loddon Cap valley	2,033.68	1,889.07	2,443.69	2,920.05	3,111.00	2,849.44	3,388.59	3,165.13	3,177.65	3,428.81	3,941.87	4,060.34
Campaspe	121.82	250.59	335.56	423.88	439.81	461.70	517.89	589.72	632.48	658.14	661.34	673.98
Wimmera–Mallee	45.06	68.37	95.56	122.78	136.58	129.43	154.51	183.37	191.02	201.61	210.45	228.76
Murray/Kiewa/Ovens Cap valley	1,702.03	2,301.73	2,208.24	2,540.70	2,976.93	2,859.80	3,153.02	3,349.34	3,402.62	3,782.21	4,118.71	4,555.46
Total Victoria	**3,902.59**	**4,509.77**	**5,083.05**	**6,007.41**	**6,664.33**	**6,300.36**	**7,214.01**	**7,287.57**	**7,403.76**	**8,070.78**	**8,932.38**	**9,518.54**
South Australia												
Metropolitan Adelaide & associated country areas*	see table 7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Murray swamps	94.20	68.93	96.73	114.72	130.43	144.90	158.71	172.79	183.63	192.44	202.52	215.38
Country towns	50.00	68.82	70.88	72.01	73.20	75.07	75.08	75.16	75.43	82.74	83.04	91.75
All other purposes	449.90	969.04	986.79	994.68	999.69	1,030.57	972.15	966.33	967.26	974.26	954.05	957.38
Total South Australia	**594.10**	**1,106.80**	**1,154.39**	**1,181.41**	**1,203.32**	**1,250.53**	**1,205.93**	**1,214.28**	**1,226.32**	**1,249.44**	**1,239.62**	**1,264.50**
Queensland**												
Condamine/Balonne	748.00	913.80	1,151.08	1,166.26	1,230.79	1,309.22	1,400.54	1,453.36	717.90	805.92	811.32	929.40
Border Rivers	296.00	306.72	448.64	451.35	463.18	450.54	536.99	505.70	201.66	195.02	242.07	518.02
Moonie	41.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nebine	9.80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Warrego	61.90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paroo	0.90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Queensland	**1,157.60**	**1,220.51**	**1,599.72**	**1,617.61**	**1,693.97**	**1,759.77**	**1,937.53**	**1,959.06**	**919.56**	**1,000.94**	**1,053.39**	**1,447.42**
Australian Capital Territory	**40.50**	**151.57**	**178.16**	**204.63**	**231.05**	**257.81**	**281.63**	**307.36**	**333.12**	**365.77**	**387.45**	**410.64**
Total Basin	**12,057.95**	**11,995.22**	**13,988.66**	**15,832.88**	**16,488.89**	**16,648.06**	**19,024.75**	**19,858.47**	**18,857.83**	**20,336.85**	**21,833.09**	**23,561.75**

Table 8-12 details the values from Table 8-11on a cumulative basis since Cap commenced. The cumulative balance is the compliance test under the Cap for most, but not all valleys.

* The Metro Adelaide is marked as 'N/A' consistent with the approach applied to other Cap valleys that do not cumulate credits. Previously the annual Cap credit was reported for each year.

** Condamine/Balonne and Border Rivers are the only Qld valleys with a cumulative balance system. From 2018–19 water year, their cumulative balances are based on WRP model runs after their WRP accreditation.

Table 8-13 details the Cap compliance information for Metropolitan Adelaide. A model is not used to determine the Cap target in the Metropolitan Adelaide, instead diversions for the past five years are compared with a target of 650 GL as per schedule F of the Murray Darling Basin Agreement.

Table 8-13 Cap Register – for Metropolitan Adelaide, South Australia (GL)

Year	South Australia – Metropolitan Adelaide Diversion	Gross Metropolitan Adelaide & associated country areas (rolling 5-year Cap is 650 GL)	First use license	Trade Out*	Net Metropolitan Adelaide & associated country areas (rolling 5-year Cap is 650 GL)	Annual Cap Credit - Metro-Adelaide & Associated Country Areas
1997–98	Annual diversion	153.09	0.00	N/A	153.09	
1997–98	Diversion – 5 Years to 1997/98	554.76	0.00	N/A	554.76	95.24
1998–99	Annual diversion	152.88	0.00	N/A	152.88	
1998–99	Diversion – 5 Years to 1998/99	598.47	0.00	N/A	598.47	51.53
1999–00	Annual diversion	138.71	0.00	N/A	138.71	
1999–00	Diversion – 5 Years to 1999/00	576.58	0.00	N/A	576.58	73.42
2000–01	Annual diversion	103.63	0.00	N/A	103.63	
2000–01	Diversion – 5 Years to 2000/01	614.00	0.00	N/A	614.00	36.00
2001–02	Annual diversion	82.45	12.00	N/A	70.45	
2001–02	Diversion – 5 Years to 2001/02	630.76	12.00	N/A	618.76	31.24
2002–03	Annual diversion	164.70	11.00	N/A	153.70	
2002–03	Diversion – 5 Years to 2002/03	642.38	23.00	N/A	619.38	30.62
2003–04	Annual diversion	82.07	9.41	N/A	72.66	
2003–04	Diversion – 5 Years to 2003/04	571.56	32.41	N/A	539.15	110.85
2004–05	Annual diversion	71.61	8.80	N/A	62.81	
2004–05	Diversion – 5 Years to 2004/05	504.45	41.21	N/A	463.25	186.75
2005–06	Annual diversion	73.90	16.00	N/A	57.90	
2005–06	Diversion – 5 Years to 2005/06	474.73	57.21	N/A	417.52	232.48
2006–07	Annual diversion	203.08	0.00	N/A	203.08	
2006–07	Diversion – 5 Years to 2006/07	595.36	45.21	N/A	550.15	99.85
2007–08	Annual diversion	89.45	0.00	N/A	89.45	
2007–08	Diversion – 5 Years to 2007/08	520.11	34.21	N/A	485.90	164.10
2008–09	Annual diversion	149.50	0.00	N/A	149.50	
2008–09	Diversion – 5 Years to 2008/09	587.54	24.80	N/A	562.74	87.26
2009–10	Annual diversion	56.90	0.00	N/A	56.90	
2009–10	Diversion – 5 Years to 2009/10	572.83	16.00	N/A	556.83	93.17
2010–11	Annual diversion	56.44	0.00	N/A	56.44	
2010–11	Diversion – 5 Years to 2010/11	555.37	0.00	N/A	555.37	94.63
2011–12	Annual diversion	59.03	0.00	N/A	59.03	
2011–12	Diversion – 5 Years to 2011/12	411.31	0.00	N/A	411.31	238.69
2012–13	Annual diversion	81.67	0.00	N/A	81.67	
2012–13	Diversion – 5 Years to 2012/13	403.54	0.00	N/A	403.54	246.46

Year	South Australia – Metropolitan Adelaide Diversion	Gross Metropolitan Adelaide & associated country areas (rolling 5-year Cap is 650 GL)	First use license	Trade Out*	Net Metropolitan Adelaide & associated country areas (rolling 5-year Cap is 650 GL)	Annual Cap Credit - Metro-Adelaide & Associated Country Areas
2013–14	Annual diversion	42.14	0.00	N/A	42.14	
2013–14	Diversion – 5 Years to 2013/14	296.18	0.00	N/A	296.18	353.82
2014–15	Annual diversion	73.19	0.00	N/A	73.19	
2014–15	Diversion – 5 Years to 2014/15	312.47	0.00	N/A	312.47	337.53
2015–16	Annual diversion	153.34	8.34	N/A	145.00	
2015–16	Diversion – 5 Years to 2015–16	409.37	8.34	N/A	401.03	248.97
2016–17	Annual diversion	34.67	0.00	N/A	34.67	
2016–17	Diversion – 5 Years to 2016–17	385.01	8.34**	N/A	376.67	273.33
2017–18	Annual diversion	71.07	0.00	N/A	71.07	
2017–18	Diversion – 5 Years to 2017/18	374.40	8.34	N/A	366.06	283.94
2018–19	Annual diversion	157.61	0.00	N/A	157.61	
2018–19	Diversion – 5 Years to 2018/19	489.88	8.34	N/A	481.54	168.46
2019–20	Annual diversion	113.38	0.00	40.00	153.38	
2019–20	Diversion – 5 Years to 2019/20	530.07	8.34	40.00	561.73	88.27
2020–21	Annual diversion	131.41	0.00	0.00	131.41	
2020–21	Diversion – 5 Years to 2020/21	508.14	0.00	40.00	548.14	101.86
2021–22	Annual diversion	107.86	0.00	0.00	107.86	
2021–22	Diversion – 5 Years to 2020/21	581.33	0.00	40.00	621.33	28.67

* A new column 'trade out' is added from 2019–20 under the new arrangements (i.e. MinCo Out of Session 75 on 15 January 2020 agreed for trade to be allowed out of the Metro Adelaide Cap valley for four years from 2019–20).

Numbers may not add up precisely to the totals due to rounding.

Table 8-14 compares the cumulative Cap credits for the last water year as determined using the best available data provided for the current water year, with that determined using the best available data provided in the last water year. The Cap register is updated each water year with the best available information which may lead to variations between Cap. Variations could be due to a more current model run (for determining the Cap target), changes in trade and environmental adjustments and improvements in accuracy of actual diversions.

Table 8-14 Difference in cumulative Cap credits between Cap register 2020–21 and Cap register 2021–22

System			Difference in cumulative Cap credit	Difference in cumulative Cap credit due to:			
System	Cumulative Cap credit up to year 2020–21 in Water Take Report 2020–21	Cumulative Cap credit up to year 2020–21 in Water Take Report 2021–22	Difference in cumulative Cap credit	Model Cap targets	Cap adjustment for trade	Cap adjustment for environment	Diversions
New South Wales							
Intersecting Streams	N/A	N/A	N/A	N/A	0.00	0.00	0.00
Border Rivers	896.95	894.37	-2.58	-2.58	0.00	0.00	0.00
Gwydir	373.78	373.14	-0.64	-0.64	0.00	0.00	0.00
Namoi/Peel	594.74	594.39	-0.35	-0.35	0.00	0.00	0.00
Macquarie/Castlereagh/Bogan	1380.82	1389.31	8.50	8.50	0.00	0.00	0.00
Barwon–Darling/Lower Darling	488.28	413.08	-75.20	-75.20	0.00	0.00	0.00
Lachlan	373.44	369.93	-3.51	-3.51	0.00	0.00	0.00
Murrumbidgee	3708.48	3469.05	-239.43	-239.43	0.00	0.00	0.00
Murray	2727.14	2716.98	-10.16	-10.16	0.00	0.00	0.00
Total New South Wales	**10543.64**	**10220.25**	**-323.39**	**-323.39**	**0.00**	**0.00**	**0.00**
Victoria							
Goulburn/Broken/Loddon Cap valley	3926.18	3941.87	15.69	15.69	0.00	0.00	0.00
Campaspe	662.32	661.34	-0.97	-0.97	0.00	0.00	0.00
Wimmera–Mallee	210.45	210.45	0.00	0.00	0.00	0.00	0.00
Murray/Kiewa/Ovens Cap valley	4118.74	4118.71	-0.03	-0.03	0.00	0.00	0.00
Total Victoria	**8917.69**	**8932.38**	**14.69**	**14.69**	**0.00**	**0.00**	**0.00**
South Australia							
Metropolitan Adelaide & associated country areas (a)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Murray swamps	202.52	202.52	0.00	0.00	0.00	0.00	0.00
Country towns	83.04	83.04	0.00	0.00	0.00	0.00	0.00
All other purposes	954.05	954.05	0.00	0.00	0.00	0.00	0.00
Total South Australia	**1239.62**	**1239.62**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Queensland (b) (c)							
Condamine/Balonne	811.32	811.32	0.00	0.00	0.00	0.00	0.00
Border Rivers	242.07	242.07	0.00	0.00	0.00	0.00	0.00
Moonie	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nebine	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Warrego	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paroo	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Queensland	**1053.39**	**1053.39**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Australian Capital Territory	**387.45**	**387.45**	**0.00**	**-0.00**	**0.00**	**0.00**	**0.00**
Total Basin	**22141.79**	**21833.09**	**-308.70**	**-308.70**	**0.00**	**0.00**	**0.00**

The numbers contain minor rounding differences.

(a) Under schedule E of the Murray Darling Basin Agreement, Metro Adelaide does not cumulate credits and so will no longer be reported in this table.

(b) For Moonie, Nebine, Warrego and Paroo, these valleys do not cumulate credits and are assessed on an annual basis.

Appendix 7: Core concepts and useful links

A.7.1 Water Act 2007 (Cwlth)

Legislative background

The *Water Act 2007* (Cwlth) and the *Basin Plan 2012* provide the legislative background that informs the requirements of this water take report.

Water Act 2007 (Cwlth)

Section 71

Section 71 sets out reporting obligations of the Basin states to provide the MDBA with information regarding the use and management of all Basin water resources for an annual water accounting period.

Section 32

Section 32 requires the MDBA to identify and account for all held environmental water on an annual basis, including all water access entitlements recovered for the environment through reforms prior to the Basin Plan.

Schedule 1

Schedule 1 of the Water Act contains the Murray–Darling Basin Agreement. Schedule E of this agreement establishes a long-term Cap on surface water use in river valleys across the Basin. Schedule 1 also requires each Basin State to report to the MDBA on a range of matters.

The Water Act is available online via the Federal Register of Legislation <https://www.legislation.gov.au/Home/>

A.7.2 The Basin Plan 2012

Schedule 2 of the Basin Plan sets out the long-term average sustainable diversion limits (SDLs) for each surface-water SDL resource unit within the 19 water resource plan areas for surface water. It also includes estimates by the MDBA of the quantity of water represented by the SDLs. Long-term average sustainable diversion limits (SDLs) are the maximum long‑term annual average quantities of water that can be taken on a sustainable basis from Basin water resources as a whole, and from each SDL resource unit, from 2019. They are the means for ensuring that consumption of water is maintained at an environmentally sustainable level.

Schedule 3 of the Basin Plan sets out the baseline diversion limits (BDL) for each surface water SDL resource unit within the 19 surface-water water resource plan areas and includes estimates by the MDBA of the quantity of water represented by the BDL, in Gigalitres per year. BDLs define a baseline from which to measure reductions in diversions. A surface water baseline diversion limit is the sum of the long-term

annual average limits (or where there is currently no limit, the long-term annual average take) for all forms of take from a surface water SDL resource unit.

Schedule 4 of the Basin Plan sets out the baseline diversion limits (BDLs) and the long-term average sustainable diversion limits (SDLs) for each groundwater SDL resource unit within the 19 groundwater water resource plan areas. Groundwater BDLs are the best estimates of the MDBA of the quantity of water that could be taken under the Basin state planning regimes when the Basin Plan was made. Groundwater SDLs are the maximum long-term average annual average quantities of water that can be taken on a sustainable basis from each SDL resource unit. They are the means for ensuring that consumption of water is maintained at an environmentally sustainable level of take.

Schedule 12 of the Basin Plan sets out reporting requirements for the Australian Government, Basin states, and the MDBA. As part of this reporting, under Matter 9 of Schedule 12, MDBA, Basin states and the Australian Government are required to identify environmental water, both held and planned environmental water and monitor its use. Matter 9 reporting is broken up into 3 areas, these are:

- Matter 9.1 Identification and accounting of held environmental water;
- Matter 9.2 Identification and accounting of planned environmental water; and
- Matter 9.3 Monitoring the use of environmental water.

Contained in this report is the Basin State information received for Matter 9.1 and 9.2. The report for Matter 9.3 is provided in the relevant Basin Plan annual report *published on the MDBA website at: https://www.mdba.gov.au/basin-plan/basin-plan-annual-report*.

The Basin Plan 2012 is available online via the Federal Register of Legislation. <https://www.legislation.gov.au/Home/>

A.7.3 Core concepts with regard to take

A.7.3.1 What is take?

The term ‘take’ means the take of water from a water resource. Take includes taking the water by means of:

- diverting it from a main river system into an irrigation district or other distribution network
- pumping water directly from the river or aquifer
- diverting water as the water flows across the land into a dam
- intercepting water before it reaches a river to grow a commercial forestry plantation.

A.7.3.2 Forms of take

The Basin Plan defines forms of take as:

- take from a watercourse/unregulated river
- take from a regulated river
- take by floodplain harvesting
- take by runoff dams
- net take by commercial plantations

- take from groundwater
- take under basic rights.

A.7.3.3 Sustainable diversion limits

The Basin Plan establishes sustainable diversion limits (SDLs) for surface and groundwater. The SDL is the limit on how much water can be sustainably taken for consumptive uses (including domestic, urban and agricultural use) from an SDL resource unit. The SDL includes all forms of take and is a volume in Gigalitres per year (GL/y). The SDL is a long-term annual average limit.

There is an SDL volume for each SDL resource unit in a water resource plan (WRP) area.

A.7.3.3.1 Surface water SDL resource units

The boundaries of the 29 surface water SDL resource units as defined by the Murray–Darling Basin Plan can be found on the MDBA website http://www.mdba.gov.au/

A.7.3.3.2 Groundwater SDL resource units

The boundaries of the 66 groundwater SDL resource units as defined by the Murray–Darling Basin Plan can be found on the MDBA website http://www.mdba.gov.au/

This includes 7 groundwater SDL resource units for deep groundwater that can be found on the MDBA website http://www.mdba.gov.au/

Note that there are six WRP areas that apply to both surface water and groundwater, therefore the total number of WRP areas is 36. The WRP areas incorporate a total of 110 SDL resource units.

A number of other maps and alternative formats for the above maps are available on the MDBA website http://www.mdba.gov.au/

A.7.3.4 Reporting Take

Take is accounted for over a water accounting period, which follows the 12-month period 1 July to 30 June. The Basin states report take of surface water and groundwater to the MDBA. The MDBA is responsible for assessing the data before recording it on a Register of Take for each SDL resource unit. The purpose of this register is to record compliance by Basin states with the SDL for each SDL resource unit. Compliance commences in the first water accounting period after 30 June 2019 following the commencement of an accredited water resource plan.

A.7.3.5 Annual actual take and annual permitted take

For a water accounting period, annual permitted take is the sum of the maximum quantities of water permitted to be taken by each form of take for consumptive use from an SDL resource unit. The water resource plan must have a method to determine annual permitted take for each form of take in each SDL resource unit in the WRP area. This method must be designed to be applied at the end of each water accounting period. The water resources available during the accounting period are a very important consideration in the method.

Because of varying water availability between water accounting periods, annual permitted take will vary and will rarely, if ever, equal the SDL. Importantly, while annual permitted take can vary, the SDL of each resource unit in the WRP area must be complied with over the term of the water resource plan.

For the same water accounting period, annual actual take is the sum of the quantities of water actually taken by each form of take for consumptive use from the SDL resource unit.

A water resource plan must have rules to ensure that annual actual take does not exceed annual permitted take. If applicable, water allocation rules need to be included.

Data provided annually by Basin states comes from a range of sources including: state registers and databases; outputs from state river models; estimates from surveys and other methods. Therefore, data may range from very accurate and reliable to potentially limited or with high levels of uncertainty. This range of data sources is acceptable to be added together to calculate either the annual permitted take or actual take. The Basin Plan provides some flexibility with this data uncertainty by allowing the Basin State to have a cumulative balance of actual take over permitted take of up to 20% of the SDL before the Basin State would be considered non-compliant, for an SDL resource unit.

A.7.3.6 Roles and responsibilities

Following amendments to the Water Act 2007 (the Water Act) and the Basin Plan 2012 (Basin Plan), the Murray–Darling Basin Authority (MDBA) is no longer responsible for enforcing compliance with the Basin Plan.

This responsibility now belongs to the Inspector-General of Water Compliance (IGWC) which was formally established on 5 August 2021.

Under new legislation, the IGWC has oversight of water management in the Basin and inquiry powers to investigate the implementation of the Water Act, the Basin Plan and intergovernmental agreements, including the Murray–Darling Basin Agreement.

Following the formal establishment of the IGWC, the MDBA retains its responsibility for overseeing implementation of the Basin Plan, including independent monitoring and evaluation, and running the River Murray on behalf of Basin state governments. The MDBA will provide technical advice on request and as required or directed by the Inspector-General and fully cooperate with any inquiries or reviews relevant to the work of the MDBA. Basin states retains their responsibility for managing the water activities within their state, in accordance with the accredited water resource plans.

A.7.3.7 Implementation process

The Basin Plan's management arrangements implement SDLs in each SDL resource unit, which are within a water resource plan area. A water resource plan area may include several SDL resource units. Basin states are responsible for preparing water resource plans for these water resource plan areas. A water resource plan has to ensure that the SDL of each resource unit in the water resource plan area is complied with over the term of the water resource plan.

Basin states propose water resource plans to the MDBA, who assesses them and recommends to the Australian Government Minister responsible for Water whether a water resource plan should be accredited or not. The Minister considers the recommendations and makes a decision whether or not to

accredit a water resource plan. Accredited water resource plans have effect until either it ceases to have effect or until three years after an amendment to the Basin Plan that affects water resource plan accreditations.

A.7.4 Useful links

This section includes links to key legislation, reports, maps and other information sources referred to throughout this report. The links may be useful for readers seeking further information for context, background, or as a starting point to explore this report in more detail.

A.7.4.1 Reports

MDBA Annual Reports:

The Basin Plan annual reports track the progress of the Basin Plan and associated water reforms and are available on the MDBA website <http://www.mdba.gov.au/>

The Commonwealth Water Act 2007 <https://www.legislation.gov.au/Details/C2021C00539

The Basin Plan 2012 <https://www.legislation.gov.au/Details/F2021C01067>

Environmental Water Recovery Progress <https://www.mdba.gov.au/climate-and-river-health/water-environment/water-recovery/progress-water-recovery

A.7.5 Glossary

Accessible storage	The volume of water that a water storage can hold between the minimum supply level and full supply level; equal to the total storage capacity excluding the dead storage capacity. It is the sum of this capacity that is reported for a collection of water storages.
Actual take	Total quantity of water actually taken from the water resources of a water resource plan area during a water accounting period.
Allocation	The annual volume of water to which the holder of an access licence is entitled as recorded in the water allocation account for the licence.
Annual Exceedance Probability	The likelihood that the volume recorded will be exceeded in any one year.
Baseline Diversion Limit	Baseline diversion limit (BDL) means the baseline limit of take from a sustainable diversion limit (SDL) resource unit. The baseline limit is: o for a surface water SDL resource unit — the quantity of water calculated in accordance with column 2 of the table in Basin Plan Schedule 3 for that SDL resource unit.

	○ for a groundwater SDL resource unit — the quantity of water calculated in accordance with column 3 of the table in Basin Plan Schedule 4 for that SDL resource unit. The baseline generally reflects the limit on the level of take at 30 June 2009. It is a combination of limits established by state law (e.g. existing water resource plan limits) or limits established by the Cap arrangements, and defined levels of take where there are no established limits. The BDL establishes a baseline from which to determine required reductions in diversions to achieve the SDL.
Basin Plan, the	Means the Basin Plan adopted by the Minister under section 44 (as amended from time to time) of the *Water Act 2007* (Cth) (Water Act). It is the legislation that sets out the BDL and SDL for each resource unit and the reporting requirements.
Basin States	The states and territories within the Murray–Darling Basin, namely, New South Wales, Victoria, Queensland, South Australia, and the Australian Capital Territory.
Bulk entitlement	A perpetual entitlement of water granted to water authorities by the Crown of Victoria under the *Water Act 1989* (Vic).
Carryover	A way to manage water resources and allocations that allows entitlement holders to take a portion of unused water from one water year into a new water year.
Cap, The	A limit, implemented in 1997, on the volume of surface water that can be diverted for consumptive use, specified in the Murray–Darling Basin Agreement, Schedule E.
Cap, Outside of	Surface water that is not included in Cap models, thus not in the BDLs. These volumes do not count towards water recovery (i.e. bridging the gap).
Class of entitlement	Water entitlements are divided into differing 'classes' of security, where 'security' refers to the frequency with which water allocated under that entitlement is able to be supplied in full. Higher security entitlements have higher average and less variable yields than lower security entitlements.
Consumptive use	Use of water for irrigation, industry, urban, stock and domestic use, or for other private consumptive purposes.
Diversion	The removal of water from a river system by means of pumping or gravity channels.

Entitlement	See definition for 'Water entitlement'.
Environmentally sustainable level of take	Average level of take allowing for environmental needs to be met.
Environmental water	Held environmental water or planned environmental water.
Floodplain harvesting	The taking of water from a floodplain, including after it leaves a watercourse during a flood.
Gigalitre (GL)	One billion or 10^9 litres.
Groundwater	Water occurring naturally below ground level (in an aquifer or otherwise).
Held environmental water	Water available under: (a) a water access right, or (b) a water delivery right, or (c) an irrigation right, for the purposes of achieving environmental outcomes (including water that is specified in a water access right to be for environmental use).
Inflow	Source of the water that flows into a specific body of water — for a lake, inflow could be a stream or river, and inflow for a stream or river could be rain.
Interception	The interception of surface water or groundwater that would otherwise flow, directly or indirectly, into a watercourse, lake, wetland, aquifer, dam, or reservoir that is a Basin water resource.
Irrigation	The application of water to land to grow crops, usually through supplying water by means of channels or pipes.
Long-term diversion limit	Ratio used by water planners to represent the expected use of water in the various water access entitlements of a given river system.
Megalitre (ML)	One million or 10^6 litres.
Ministerial Council, The	Murray–Darling Basin Ministerial Council.
Murray–Darling Basin Agreement	The agreement between the Australian Government and the Basin states. The current agreement is the 2008 Agreement.
Net carryover	Is the volume of water that is carried over from the previous water year less any carryover cancelled or forfeited during the current year water.
On-farm storage	Privately-owned infrastructure used to store various types of water take, including allocation for use in later seasons.

Overland flow	A term used by Queensland for floodplain harvesting, see definition for 'Floodplain harvesting'.
Permitted take	Total quantity of water permitted to be taken during a water accounting period in a water resource plan area, varying from year to year according to the interaction of climate, inflows, and water resource plan rules (e.g. allocation rules, access rules).
Planned Environmental Water	Water used for environmental outcomes which is not associated with an entitlement but is managed through rules set out in water management plans or laws.
Regulated system	A surface water system in which water in a watercourse can be stored or flow levels are controlled, through the use of structures such as large dams and large weirs.
Salinity	The concentration of dissolved salts in water usually expressed in EC units. Applies to both surface and groundwater.
Surface water	Includes water in a watercourse, lake or wetland, and any water flowing over or lying on the land after having precipitated naturally or after having risen to the surface naturally from underground.
Supplemented water	In Queensland, supplemented water allocations are entitlements where the reliability is supplemented or enhanced by infrastructure such as a dam or weir, which is managed under a resource operations licence. They represent a share of a regulated system.
Sustainable diversion limit (SDL)	The maximum long-term annual average quantity of water that can be taken, on a sustainable basis, from the Basin water resources as a whole, and the water resources, or particular parts of the water resources, of each water resource plan area.
System delivery	Water received by end users, customers and/or passed to other systems.
System losses	Represent the amount of water lost after the point of extraction from a river or other water system e.g. loss via evaporation or seepage. Noting these losses are counted within diversions (i.e. actual take) for SDL accounting purpose.
Take	Take is the removal of water, or the reduction in flow of water, from a water resource.
Unregulated streams	Streams that are not controlled or regulated by releases from major storages.
Unsupplemented water	In Queensland, unsupplemented surface water allocations are water entitlements representing a share of the access to natural run-of-the-

	river flows or groundwater resource. They may be further split into two groups: those with flow conditions and those without flow conditions.
Utilisation	The amount of water available for diversion that is actually diverted.
Water accounting	A systematic process of identifying, recognising, quantifying, reporting, and assuring information about water, the rights or other claims to water, and the obligations against water.
Water audit monitoring (WAM) Report	MDBA prepared annual reports providing a comprehensive overview of water use and management in the Basin. The Cap method precursor to Water Take Reporting.
Water entitlement	The volume of water authorised to be taken and used by an irrigator or water authority. It includes bulk entitlements, environmental entitlements, water rights and sales water for surface water and groundwater licences.
Water lawfully accessible for take	The granting of permission, either annually or on a long-term basis, to take water from a water source under a form of take in a Basin state in accordance with that state's legal frameworks for take.
Water quality	The condition of water and its related suitability for different purposes. It refers to a combination of physical, chemical and/or biological characteristics of water in the context of the proposed use of that water.
Water resource	Groundwater — water that occurs naturally beneath the ground level (whether in an aquifer or otherwise), or water that has been pumped, diverted, or released to an aquifer for the purpose of being stored there. Murray–Darling Basin groundwater resources exclude groundwater in the Great Artesian Basin. Surface water — includes water in a watercourse, lake or wetland, and any water flowing over or lying on land after having precipitated naturally, or after having risen to the surface naturally from beneath the ground level.
Water resource plans (WRPs)	Statutory management plans developed for particular surface water and groundwater systems under the Commonwealth Water Act and Basin Plan.
Water year	A continuous 12-month period, usually starting 1 July, or any other month as prescribed under the water regulation or a resource operations plan, but usually selected to begin and end during a relatively dry season. Used as a basis for processing streamflow and other hydrologic data.

Office locations – *First Nations Country*
Adelaide – *Kaurna Country*
Canberra – *Ngunnawal Country*
Goondiwindi – *Bigambul Country*
Griffith – *Wiradjuri Country*
Mildura – *Latji Latji Country*
Murray Bridge – *Ngarrindjeri Country*
Wodonga – *Dhudhuroa Country*

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