

Department of Planning and Environment

dpie.nsw.gov.au



General Purpose Water Accounting Report for the NSW Murray Catchment 2021–22

[Month and Year]



Acknowledgement of Country

The Department of Planning and Environment acknowledges Aboriginal people as Australia's First Peoples practicing the oldest living culture on earth and as the Traditional Owners and Custodians of the lands and waters on which we rely.

We acknowledge the people of the Barkindji, Barapa Barapa, Maljangapa, Maraura, Mutthi Mutthi, Ngiyampaa, Nyeri Nyeri, Tati Tati, Wadi Wadi, Wemba Wemba, Weki Weki, Wiradjuri and Yorta Yorta Nations and that the land and waters of the NSW Murray River catchment area is of spiritual, cultural, customary and economic importance.

We recognise the intrinsic connection of Traditional Owners to Country and acknowledge their contribution to the management of the catchment landscape and natural resources.

Published by NSW Department of Planning and Environment

dpie.nsw.gov.au

General Purpose Water Accounting Report for the NSW Murray Catchment 2021–22

First published: March 2023

ISSN: 2652-4988

Department reference number: PUB22/1320

More information

This report may be cited as NSW Department of Planning and Environment (2022) General Purpose Water Accounting Report 2021–22: NSW Murray Catchment, NSW Department of Planning and Environment

Acknowledgements

Produced by the water resource insights team, NSW Department of Planning and Environment – Water group

Copyright and disclaimer

© State of New South Wales through Department of Planning and Environment 2023. Information contained in this publication is based on knowledge and understanding at the time of writing, March 2023, and is subject to change. For more information, please visit dpie.nsw.gov.au/copyright

TMP-MC-R-DC-V1.2

Contents

Director's foreword	9
Contextual statement	10
Upper Murray	10
Central Murray	11
Lower Murray	11
Accounting extent.....	11
Snapshot	13
Climate	13
Dam inflows and volume	17
Surface water resources and management	27
Temporary trading (allocation assignments)	38
Permanent trading (share assignments and licence transfers).....	40
Environmental water	44
Water accounting statements	50
Significant water accounting policies.....	51
Quantification of data	51
2021–22 Physical flows mass balance diagram	52
Statement of water assets and liabilities.....	53
Statement of changes in water assets and liabilities	54
Note disclosures	58
Reconciliation and future prospect descriptions.....	59
Water assets available to settle water liabilities and future commitments within 12 months of reporting date.....	60
Note 1 – Allocation accounts	65
Note 2 – Available water determination (allocation announcement)	68
Note 3 – Allocation account usage	73
Note 4 – Account water trading (allocation assignments).....	75
Note 5 – Inter-valley trade account.....	77
Note 6 – Held environmental water.....	81
Note 7 – Environmental provisions.....	85
Note 8 – Surface water storage	89
Note 9 – River channel storage.....	91
Note 10 – Snowy required annual release	92
Note 11 – Storage inflow	94
Note 12 – Storage evaporation and storage rainfall.....	96
Note 13 – River evaporation and river rainfall	97
Note 14 – Gauged tributary inflow	99
Note 15 – Ungauged runoff estimate.....	101

Note 16 – Dam releases, river inflow from dam releases.....	102
Note 17 – End of system/flow leaving	104
Note 18 – NSW extractions from river.....	106
Note 19 – Victorian extractions.....	107
Note 20 – Snowy water savings transfer.....	108
Note 21 – Basic rights extractions.....	110
Note 22 – Supplementary/uncontrolled-flow extractions	111
Note 23 – Unaccounted difference.....	116
Note 24 – Prior year account adjustments	118
References.....	119

Abbreviations

Acronym	Description
ARCGIS	mapping and spatial analysis platform for designing and managing solutions through the application of geographic knowledge
AWAS 1	Australian Water Accounting Standard 1
AWD	available water determination
CAIRO	computer-aided improvements to river operations
D/S	downstream
DISV	dry inflow sequence volume
EWA	environmental water allowance
GPWAR	general purpose water accounting report
MDBA	Murray–Darling Basin Authority
MIL	Murray Irrigation Limited
ML	megalitres (1,000,000 litres)
ML/d	megalitres per day
MODFLOW	modular three-dimensional, finite-difference groundwater flow model
SILO	climatic data provision system run by Queensland government for the provision of both measured and modelled data.
U/S	upstream

Glossary

Term	Definition
allocation	the specific volume of water allocated to water allocation accounts in a given season, defined according to rules established in the relevant water plan
allocation assignments	the transfer of water between licence holder allocation accounts as a result of a trade agreement The assignment becomes part of the receiver's current year allocation account water.
allocation account	water account attached to an access licence used to track the balance of account water
available water determination (AWD)	the process by which water is made available for use and shared amongst water users who hold a water access licence It determines the volume of water that is to be added to an individual's licence allocation account.
Australian Water Accounting Standard (AWAS)	a national standard that prescribes the basis for preparing and presenting a general-purpose water accounting report (GPWAR) It sets out requirements for the recognition, quantification, presentation and disclosure of items in a GPWAR.
back-calculation	a calculation approach using a mass balance to determine an unknown variable (used to calculate storage inflows based on balancing the change in storage volume where inflow is the only unknown)
basic rights	the non-licensed right to extract water to meet basic requirements for household purposes (non-commercial uses in and around the house and garden) and for watering of stock It is available for anyone who has access to river frontage on their property.
computer aided improvements to river operations (CAIRO)	a spreadsheet-based water balance model used for optimising river operations (orders and releases)
carryover	the volume or share component that may be reserved by a licence holder for use in the subsequent year
catchment	the areas of land that collect rainfall and contribute to surface water (streams, rivers, wetlands) or to groundwater A catchment is a natural drainage area, bounded by sloping ground, hills or mountains, from which water flows to a low point.
dead storage	the volume in storage that is generally considered unavailable for use (e.g. water level below release valves) due to access and often poor water quality
effective storage	the total volume of storage minus the dead storage component – the volume generally considered as useable
effluent	flow leaving a place or process Sewage effluent refers to the flow leaving a sewage treatment plant. An effluent stream is one which leaves the main river and does not return.
entity	a defined geographical area or zone within the accounting region Transactions and reports are produced for each entity.

Term	Definition
end of system	the last defined point in a catchment where water information can be measured and/or reported
environmental water	water allocated to support environmental outcomes and other public benefits Environmental water provisions recognise the environmental water requirements and are based on environmental, social and economic considerations, including existing user rights.
evaporation	the process by which water or another liquid becomes a gas Water from land areas, bodies of water, and all other moist surfaces is absorbed into the atmosphere as a vapour.
evapotranspiration	the process by which water is transmitted as a vapour to the atmosphere as the result of evaporation from any surface and transpiration from plants
extraction	the pumping or diverting of water from a river or aquifer by licensed users for a specific purpose (irrigation, stock, domestic, towns, etc.) The volume is measured at the point of extraction or diversion (river pump, diversion works, etc.).
general purpose water accounting report (GPWAR)	a report prepared according to the Australian Water Accounting Standard It comprises a number of components including a contextual statement, a statement of water assets and water liabilities, a statement of change in water assets and water liabilities, a statement of physical water flows, notes and disclosures, and an assurance and accountability statement.
General Security licence	a category of water access licence implemented under the <i>Water Management Act 2000</i> This forms the bulk of the water access licence entitlement volume in NSW and is a low-priority entitlement (i.e. it only receives water once essential and High Security entitlements are met in the available water determination process).
groundwater	Water location beneath the ground in soil pore spaces and in the fractures of rock formations
High Security licence	a category of water access licence implemented under the <i>Water Management Act 2000</i> It receives a higher priority than General Security licences but less priority than essential requirements in the available water determination process.
HYDSTRA database	a database used by NSW Department of Planning and Environment to store continuous, time-series data such as river flow, river height, and water quality
inflows	surface water runoff and deep drainage to groundwater (groundwater recharge) and transfers into the water system (both surface and groundwater) for a defined area
inter-valley trade	trade of licence holder allocation account water via allocation assignment from one catchment to another catchment (or state)
intra-valley trade	trade of licence holder allocation account water via allocation assignment within the same catchment
median	the middle point of a distribution, separating the highest half of a sample from the lowest half
non-physical transaction	an accounting transaction representing a process that is not a component of the water cycle (e.g. an available water determination)
physical transaction	an accounting transaction representing a process of the water cycle (e.g. an extraction)

Term	Definition
regulated river	a river system where flow is controlled via one or more major man-made structures such as dams and weirs For the purposes of the <i>Water Management Act 2000</i> , a regulated river is one that is declared by the minister to be a regulated river. Within a regulated river system, licence holders can order water against a held entitlement.
share component	an entitlement to water specified on the access licence, expressed as a unit share or, in the case of specific purpose licences (e.g. Local Water Utility, Major Water Utility and Domestic and Stock), a volume in megalitres The amount of water a licence holder is allocated as a result of an available water determination and the amount they can take in any year is based on their share component.
storage	a state-owned dam, weir or other structure that is used to regulate and manage river flows in the catchment and the water bodies impounded by these structures
storage reserve	proportion of water in a storage reserved in the resource assessment process for future essential or High Security requirements (e.g. town water)
storage volume	the total volume of water held in storage at a specified time
supplementary water	unregulated river flow available for extraction under a Supplementary Water licence
surface water	all water that occurs naturally above ground including rivers, lakes, reservoirs, creeks, wetlands and estuaries
tributary	a smaller river or stream that flows into a larger river or stream Usually, a number of smaller tributaries merge to form a river.
ungauged catchment	a catchment without a flow gauge to accurately record stream flows Modelled estimates must be used to approximate the contribution of ungauged catchments to the main river.
water accounting	the systematic process of identifying, recognising, quantifying, reporting, assuring and publishing information about water, the rights or other claims to that water, and the obligations against that water
water assets	the physical water held in storage, as well as any claims to water that are expected to increase the future water resource (e.g. external water entering the system through inter-valley trading)
water liabilities	claims on the water assets of the water report entity including water that has been allocated to licence holder accounts or environmental accounts, but yet to be taken at the end of the reporting period
water sharing plan	a water management plan that defines the rules for sharing of water within a region under the <i>Water Management Act 2000</i>

Director's foreword

This is the 10th annual release of the general-purpose water accounting report (GPWAR) for the regulated component of the NSW Murray Regulated River Water Source. It has been prepared for the accounting period 1 July 2021 to 30 June 2022 under the Australian Water Accounting Standard 1 (WASB, 2012).

The GPWAR provides stakeholders with a consolidated, comparable and publicly accessible set of water accounting information for the water source. The information presented is also used internally for a range of water planning functions and legislative reporting obligations.

Included in the GPWAR are:

- a contextual statement summarising the climatic conditions, water resources, environmental holdings, water trading market and water resource management in the water source for 2021–22
- a physical flow diagram illustrating changes in storage volumes and the associated inflows and outflows
- water accounting statements presenting the opening and closing balances, and itemised changes to these balances for available water resources (water assets) and licenced allocation accounts (water liabilities)
- disclosure notes (linked to the figures within the water accounting statements) providing detailed information of accounting components including:
 - access licence account balances
 - planned and held environmental water account balances
 - a detailed available water determination report
 - temporary trading by licence category
 - supplementary announcements and usage by river reach
 - physical inflows and outflows to the system for the water year.

Detailed information on groundwater sources is excluded from the GPWAR. Detailed information on the Lower Darling Regulated River Water Source is provided in a separate GPWAR. Reporting datasets used in the GPWAR are available by sending an email request of your required information to water.wams@dpi.nsw.gov.au

As Director Water Analytics, NSW Department of Planning and Environment I hereby declare:

- the information presented in these accounts is a faithful representation of the management and operation of the NSW Murray Regulated River Water Source for the reporting period
- all data presented in this report is based on the best available information at the time of publication
- NSW Department of Planning and Environment has prepared this GPWAR in accordance with the Australian Water Accounting Standard 1.



Danielle Baker

Director Water Analytics
NSW Department of Planning and Environment

Contextual statement

The NSW Murray catchment stretches over southern New South Wales, northern Victoria and south-eastern South Australia. The main drainage feature is the Murray River, which begins in the mountains of the Southern Alps of NSW and Victoria and flows in a westerly direction for over 2,500 kilometres to its outlet on the South Australian coast near Goolwa. It forms the boundary between NSW and Victoria for 1,880 kilometres (Figure 1). At Wentworth in south-west NSW, the Murray is joined by its major tributary the Darling River, which drains an area of 116,000 square kilometres of NSW and Queensland. The NSW Murray catchment represents one-fifth of the total area of the Murray–Darling Basin, one of the most significant agricultural areas in Australia.

In NSW the Murray River moves through three distinct landscapes. The following three sub-sections combine to form the NSW Murray catchment:

- Upper Murray
- Central Murray
- Lower Murray.

Upper Murray

The Upper Murray comprises the headwaters and unregulated reaches of the Murray River upstream of Hume Dam to Lake Mulwala, near Yarrowonga. The river begins its course amongst the high mountain peaks of Mount Kosciusko and Mount Jagungal in the Snowy Mountains, marking the border between NSW and Victoria through to Hume Dam.

The upper catchment is generally rugged and mountainous, which has restricted agricultural and urban development. Vast areas of the catchment remain forested with native vegetation and over one-third of the catchment is protected within national parks. Elevations across the catchment range from approximately 2,200 metres around the alpine peaks in the east to approximately 150 metres at Hume Dam.

Hume Dam is the main operational storage for the Murray River. It has been supplying regulated deliveries of water to the Murray River system since its completion in 1936 (the wall was raised in 1961). The Mitta Mitta River is the major Victorian tributary to Hume Dam. It flows northwards from the high country near Omeo and enters Hume Dam near Tallangatta. Dartmouth Dam was constructed on the Mitta Mitta River in 1979, and with a capacity of nearly 4,000,000 megalitres is the largest storage in the Murray system. Dartmouth Dam is primarily used as a drought reserve for the system, with bulk transfers of water released to Hume Dam as required.

The most extensive land use in the Upper Murray is for conservation, with nearly one-third of the catchment designated as national parkland. Forestry and grazing are also dominant land uses.

Central Murray

Central Murray broadly covers the central Murray River from Yarrawonga in the east to the Darling River–Murray River confluence at Wentworth, in the west. Major tributaries include the Goulburn, Campaspe and Loddon rivers in Victoria, and the Murrumbidgee and Wakool rivers in NSW.

As the Murray River enters Lake Mulwala (the major storage in central Murray), it continues west through Yarrawonga Weir. Flows are diverted from the Murray through various creeks and channels to the Edward (Kolety)–Wakool River system, which aligns with the Murray River floodplain, west of Deniliquin. The Wakool River joins the Murray River west of Moulamein. In the central Murray, the Murray River system receives inflow from the Murrumbidgee catchment via Billabong Creek and the Murrumbidgee River. The Murray River then flows into Mildura Weir, surrounded by Mallee River Basin and Benanee Basin.

The majority of the Central Murray is used for agricultural purposes, with grazing being the dominant land use. The flat riverine plains make the region suitable for a variety of dryland- and irrigated-cropping enterprises. The Murray Irrigation Area also resides within Central Murray (Murray Riverina catchment) and is the largest irrigation scheme in NSW.

Lower Murray

The Lower Murray covers the area between the confluence of the Darling and Murray Rivers at Wentworth through to the Murray River outlet on the South Australian coast near Goolwa. The Lower Murray covers around 100,000 square kilometres. Its major tributaries include the Darling River, the Great Darling Anabranch and the Marne River.

The Darling River delivers inflow to the Murray River. A component of the resources held in the Menindee Lakes Scheme is dedicated to meeting the Murray River system requirements. Lake Victoria, located in the western Riverina region of south-western NSW, is a naturally occurring shallow freshwater lake of the Murray catchment that is used as a re-regulating storage to transfer water to South Australia.

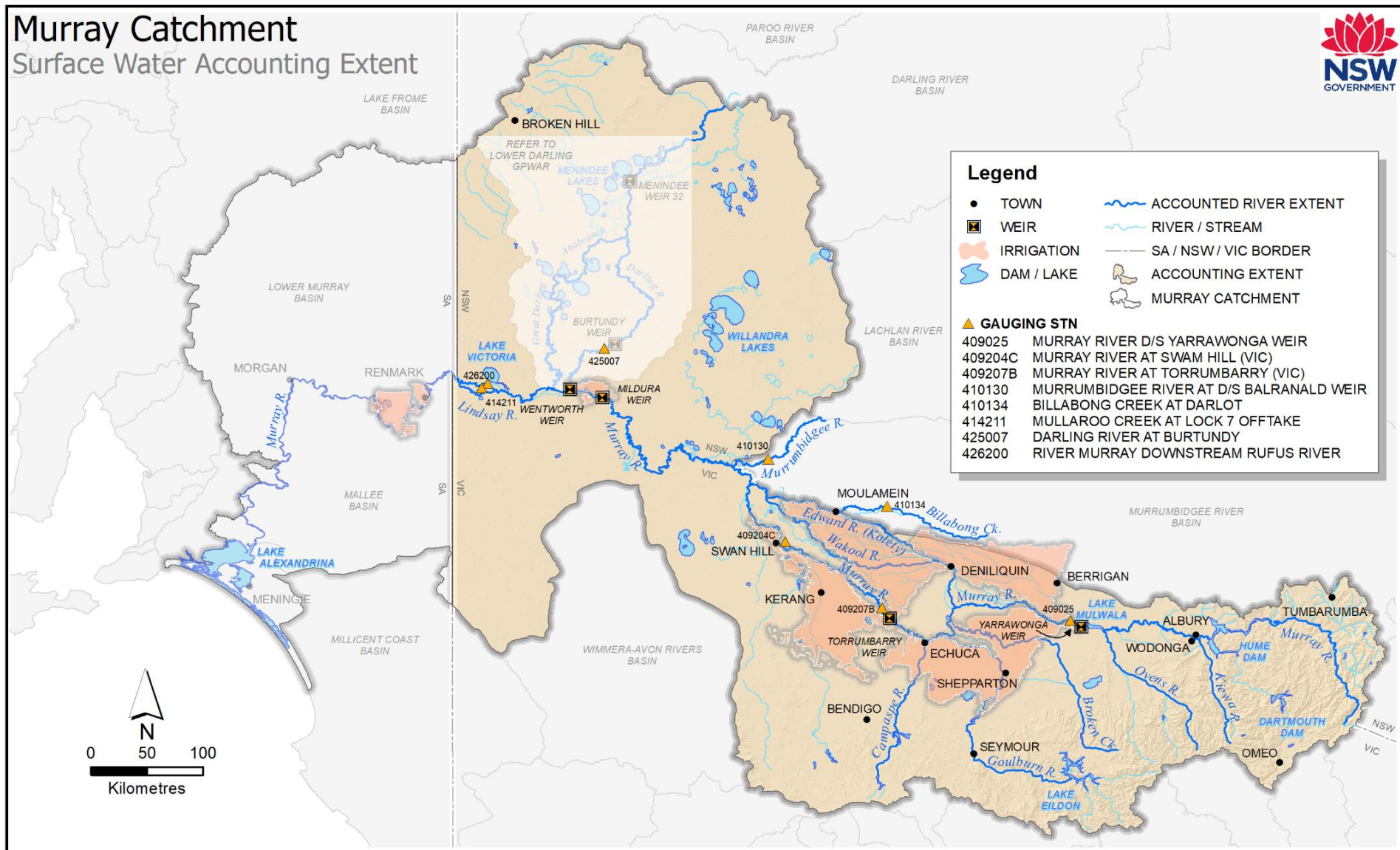
Downstream of Lake Victoria, the Murray River flows into South Australia and turns south for its final 500 kilometres before it reaches Lake Alexandrina, and finally, the Murray Mouth. The main tributary in South Australia that feeds the Murray River is the Marne River.

Accounting extent

This report covers the extent illustrated in [Figure 1](#), and includes the water features, licences, entitlements and management covered by the NSW Murray Regulated River Water Source managed under the rules stipulated in the *Water Sharing Plan for the NSW Murray and Lower Darling Regulated Rivers Water Sources*.

Physical groundwater volumes that interact with the regulated river are not explicitly represented in the GPWAR statements (interactions form part of the unaccounted difference). Supporting information on groundwater in the NSW Murray region is available separately on the NSW Planning and Environment website (www.dpie.nsw.gov.au/water/home).

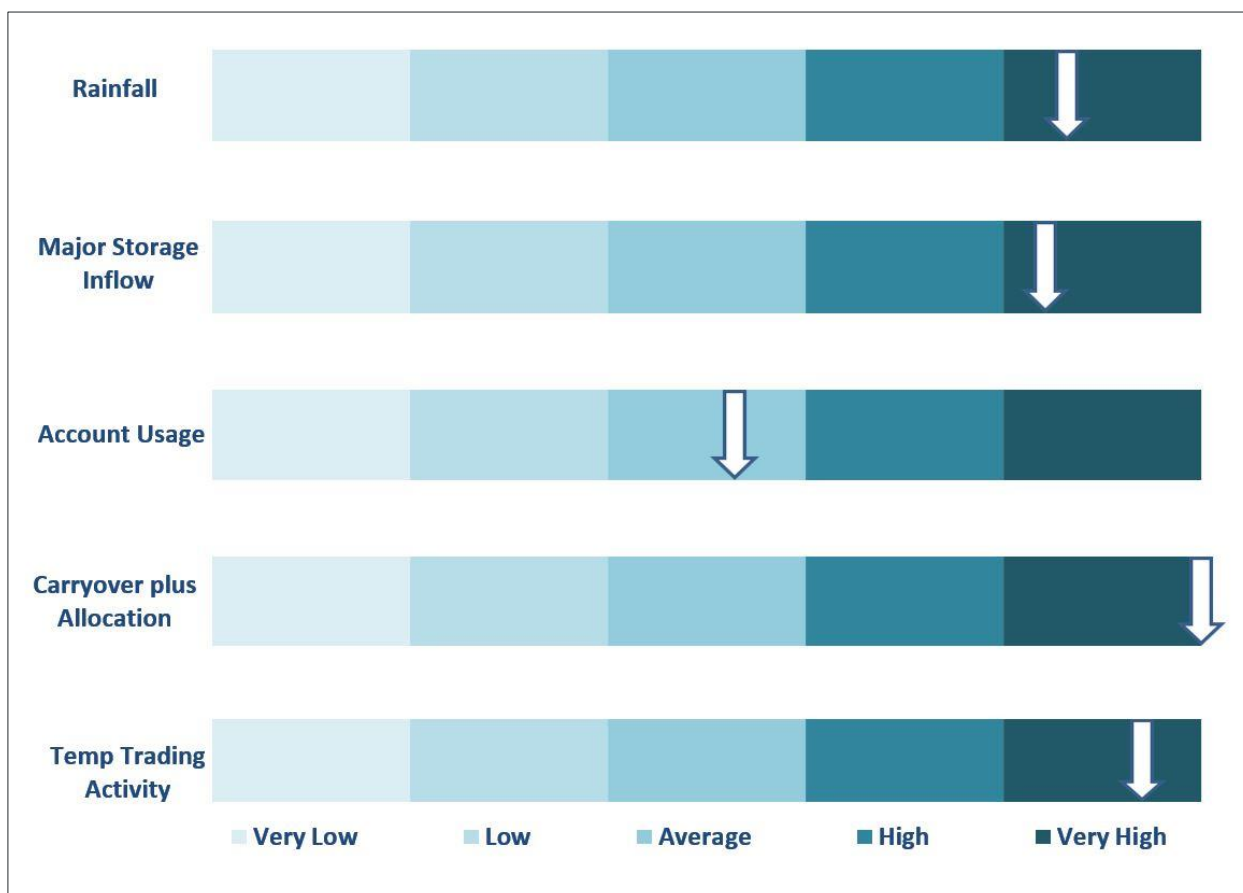
Figure 1: Surface water geographical extent of the accounts



Snapshot

The key climatic and water resource indicators for 2021–22 relative to historical water years managed under water sharing plan conditions are presented in Figure 2. Rainfall, storage inflow, effective allocation (carryover plus allocation) and temporary trading activity were all in the very high range. Account usage from water access licences was in the average range.

Figure 2: 2021–22 summary indicators



Climate

At Tumbarumba (upper catchment), 1350 mm of rainfall was recorded in the reporting period (Table 1). Comparatively, this volume of rainfall is:

- 139% of the long-term historical median rainfall for this location
- 81% of the highest volume on record at the location.

Most rainfall was in Nov 2021 (231 mm) and Jan 2 2022 (187 mm) (Figure 3 and Figure 4).

At Berrigan (central catchment), 526 mm of rainfall was recorded in the reporting period (Table 2). Comparatively, this volume of rainfall is:

- 123% of the long-term historical median rainfall for this location
- 56% of the highest volume on record at the location.

Most rainfall was in November 2021 (99 mm) and January 2022 (84 mm) (Figure 3 and Figure 4).

At Moulamein (lower catchment), 463 mm of rainfall was recorded in the reporting period (Table 3). Comparatively, this volume of rainfall is:

- 136% of the long-term historical median rainfall for this location
- 53% of the highest volume on record at the location.

Most rainfall fell in March 2022 (89 mm) and November 2021 (65 mm) (Figure 3 and Figure 4).

A spatial representation of rainfall in the reporting period compared to average rainfall conditions is provided in Figure 5 and Figure 6 indicating above average rainfall for the majority of the catchment with the exception the far western extent being below average.

Figure 3: Monthly rainfall data and historical median at Tumbarumba, Moulamein and Berrigan

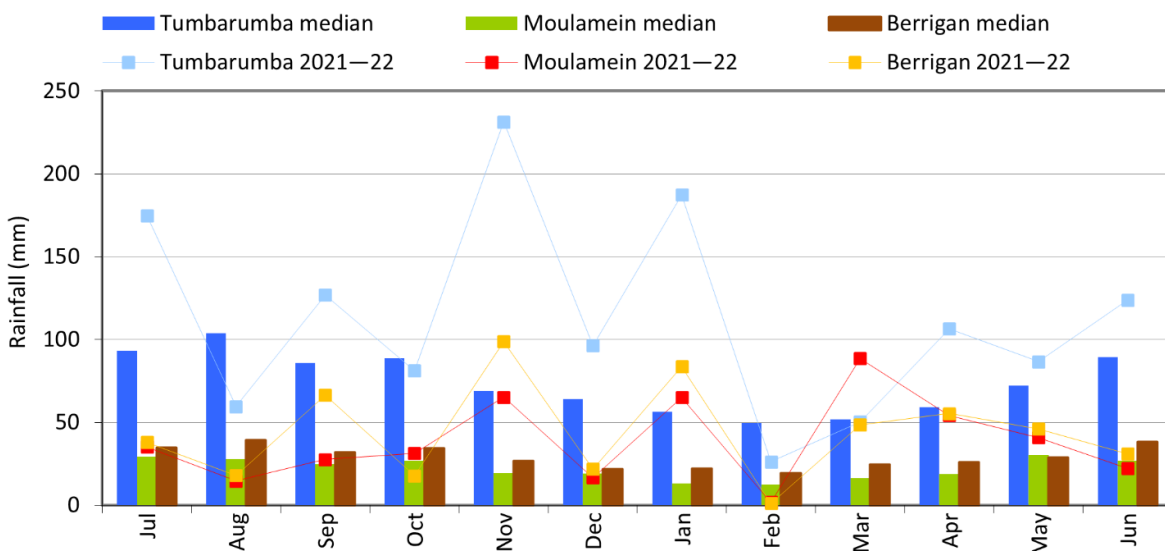


Figure 4: Monthly rainfall deviations from median at Tumbarumba, Moulamein and Berrigan

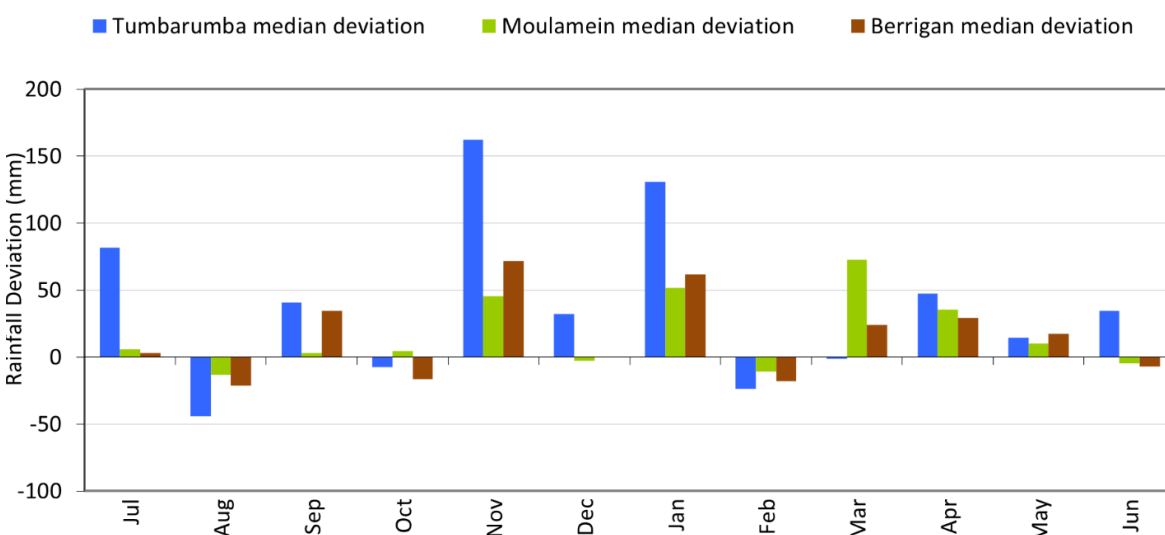


Table 1: 2021–22 monthly rainfall and historic monthly rainfall statistics at Tumbarumba1 – measurements in millimetres

Tumbarumba	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2021–22 rainfall	174.8	59.6	126.8	81.2	231.4	96.2	187.2	26.2	50.2	106.4	86.6	123.8	1350.4
Historical mean	104.6	105.9	89.9	94.9	76.3	71.0	63.8	54.6	66.5	66.3	82.7	102.4	976.1
Historical median	93.3	103.9	85.9	88.7	69.1	63.9	56.5	49.7	51.6	59.1	72.2	89.3	969.8
Historical low	14.2	8.6	9.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	6.0	523.6
Historical high	254.6	246.6	225.3	259.7	240.2	212.4	203.2	252.2	260.4	224.6	295.4	322.1	1663.2
Water year highest	1985-86	1938-39	1959-60	1975-76	2010-11	1918-19	1896-97	2010-11	1905-06	1973-74	1941-42	1922-23	1955-56

Table 2: 2021–22 monthly rainfall and historic monthly rainfall statistics at Berrigan1 – measurements in millimetres

Berrigan	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2021–22 rainfall	38.0	18.0	66.4	17.8	98.7	21.7	83.7	1.1	48.5	55.4	46.1	30.9	526.3
Historical mean	39.4	42.3	38.9	41.4	32.4	32.6	31.5	30.0	34.7	34.8	40.5	42.1	440.5
Historical median	34.8	39.2	32.0	34.2	26.8	21.7	21.9	19.2	24.6	26.0	28.7	38.1	426.4
Historical low	0.0	0.3	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	168.4
Historical high	108.4	124.2	133.6	155.0	154.7	247.9	264.0	159.0	181.3	159.3	162.1	115.3	932.4
Water year highest	1985-86	1888-89	2015-16	1974-75	1911-12	1929-30	1973-74	1968-69	1955-56	1938-39	1888-89	1930-31	1973-74

Table 3: 2021–22 monthly rainfall and historic monthly rainfall statistics at Moulamein¹ – measurements in millimetres

Moulamein	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2021–22 rainfall	35.2	14.6	27.6	31.2	65.2	16.5	65.0	1.8	88.6	54.2	40.8	22.2	462.9
Historical mean	31.0	33.6	31.2	33.3	28.5	30.7	23.6	23.8	26.3	25.9	34.2	33.3	355.1
Historical median	29.3	27.8	24.6	26.7	19.5	19.2	13.1	12.5	16.1	18.9	30.4	26.9	340.4
Historical low	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	151.6
Historical high	103.3	123.7	111.7	114.9	145.9	190.2	180.8	151.1	154.2	122.4	110.4	160.3	872.6
Water year highest	1935-36	1957-58	1905-06	1972-73	1888-89	1929-30	1973-74	1945-46	1905-06	1973-74	1905-06	1922-23	1973-74

¹ Long-term statistics are from the Bureau of Meteorology – climate data online, using the climatic stations ‘72043 – Tumbarumba post Office’, ‘74009 – Berrigan Post Office’ and ‘75046 – Moulamein Post Office’. Historic record statistics are 1886 to 2021 for Tumbarumba, 1875 to 2021 for Berrigan and 1888 to 2021 for Moulamein.

Figure 5: Murray catchment annual rainfall for 2021–22

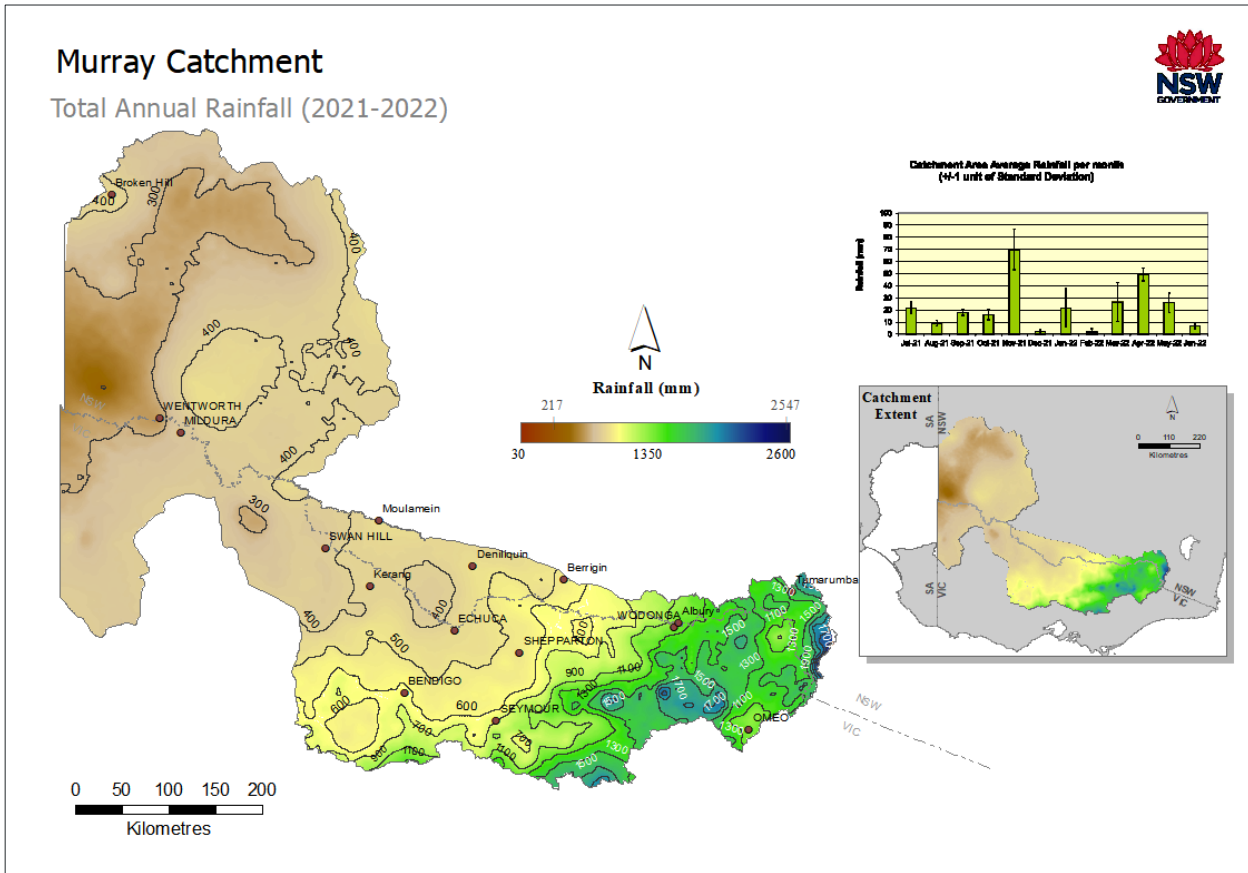
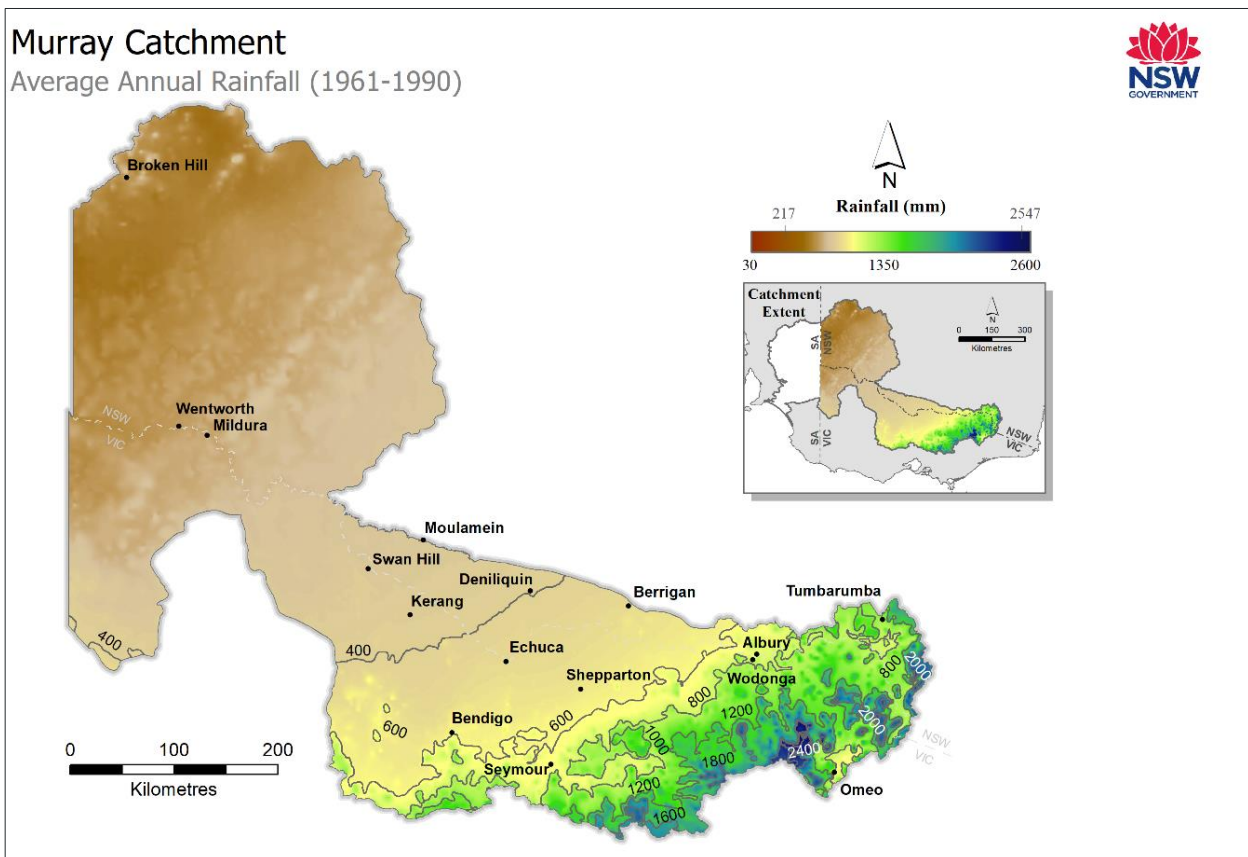


Figure 6: Average annual rainfall in the Murray catchment (1961–90)



Dam inflows and volume

Inflows

Historically, the long-term average annual inflow² at the Hume storage site has varied significantly, cycling through prolonged periods of wet and dry flow regimes. Broadly, the data (Figure 7) illustrates predominately:

- dry conditions from the late 1890s to around 1950, with a period of average conditions from 1920 to 1940
- wet conditions from around 1950 to the late 1990s, with a period of dry conditions through the 1960s and average conditions through the 1980s
- trend of continuing drier conditions from the late 1990s to present.

Dartmouth followed similar patterns with two notable exceptions: a wet period in the late 1910s and drying from mid-1970s to late 1980s (Figure 10).

Hume Dam inflow

For the reporting period natural inflows into Hume dam (excluding regulated contributions from the Snowy Hydro Scheme, and transfers from Dartmouth storage) were 3,910,918 megalitres (Figure 8), which is:

- 154% of the long-term average annual inflow (2,542,917 megalitres per year)
- very high relative to the historical record, exceeding 80% of years on record
- 1st year of above average inflow after the four consecutive years of below average inflow

The highest inflow (considering all sources of inflow) in the reporting period occurred 08 September 2021, with an inflow rate of 62,759 megalitres per day (Figure 9). Due to the regulating impact of Snowy Hydro transfers, there is not a strong relationship between storage inflow to Hume Dam and catchment rainfall, particularly in dry seasons.

Total storage inflow to Hume Dam including regulated transfers from upstream infrastructure was 5,153,317 megalitres for 2021–22.

Dartmouth inflow

Dartmouth inflows were 1,257,516 megalitres (Figure 11), which is:

- 142 % of the long-term average annual inflow (884,912 megalitres per year)
- very high relative to the historical record, exceeding 85% of years on record
- 1st year of above average inflows after four years of below average inflow.

The highest inflow occurred on 6 September 2021, with inflow rates around 21,301 megalitres per day (Figure 12).

² While the long-term annual historical unregulated storage inflows for Hume Dam were obtained from the Murray–Darling Basin Authority the 2011–12 to current unregulated inflows were derived by NSW Department of Primary Industries undertaking a back-calculated storage balance. See Note 11 in this GPWAR.

Menindee Lakes inflow

Flows at Wilcannia serve as an estimate of potential inflow available for the Menindee Lakes storage system. For the reporting period, the flow at Wilcannia totalled 5,528,640 megalitres (Figure 13), which is:

- 295% of the long-term average annual flow at this location (1,873,705 megalitres per year)
- very high relative to the historical record, exceeding 89% of years on record
- first year of above average flows after four years of below average inflow.

The highest inflow occurred on 22 February 2022, with a daily inflow of 30,978 megalitres per day (Figure 14).

Lake Victoria inflow

Lake Victoria is primarily utilised as a re-regulating storage for water supply. Inflow totalled 885,470 megalitres for the reporting period. Daily inflows and rainfall are illustrated in Figure 15. As the storage is primarily re-regulating flows there is not a strong relationship between inflow and local rainfall.

Figure 7: Long-term annual flow upstream of Hume Dam and cumulative deviation from mean

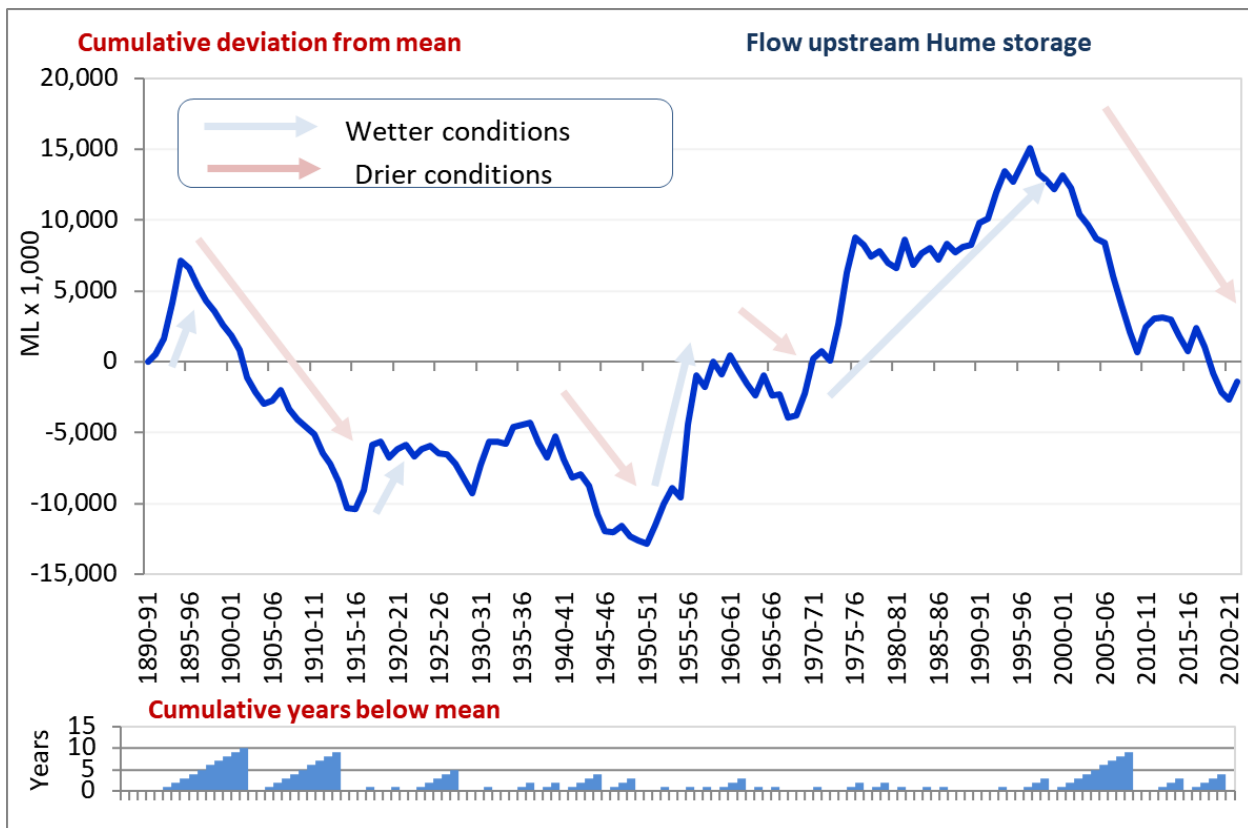


Figure 8: Long-term natural inflows to Hume Dam against mean and reporting year inflow

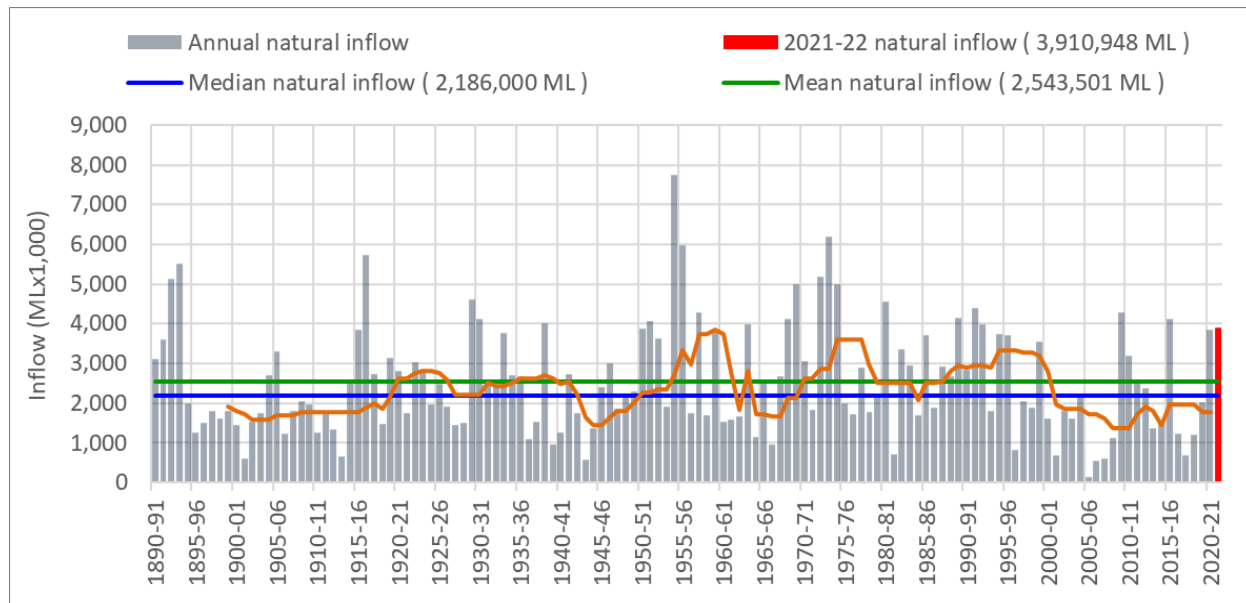


Figure 9: Daily inflows and rainfall at Hume Dam for the reporting period (natural and regulated)

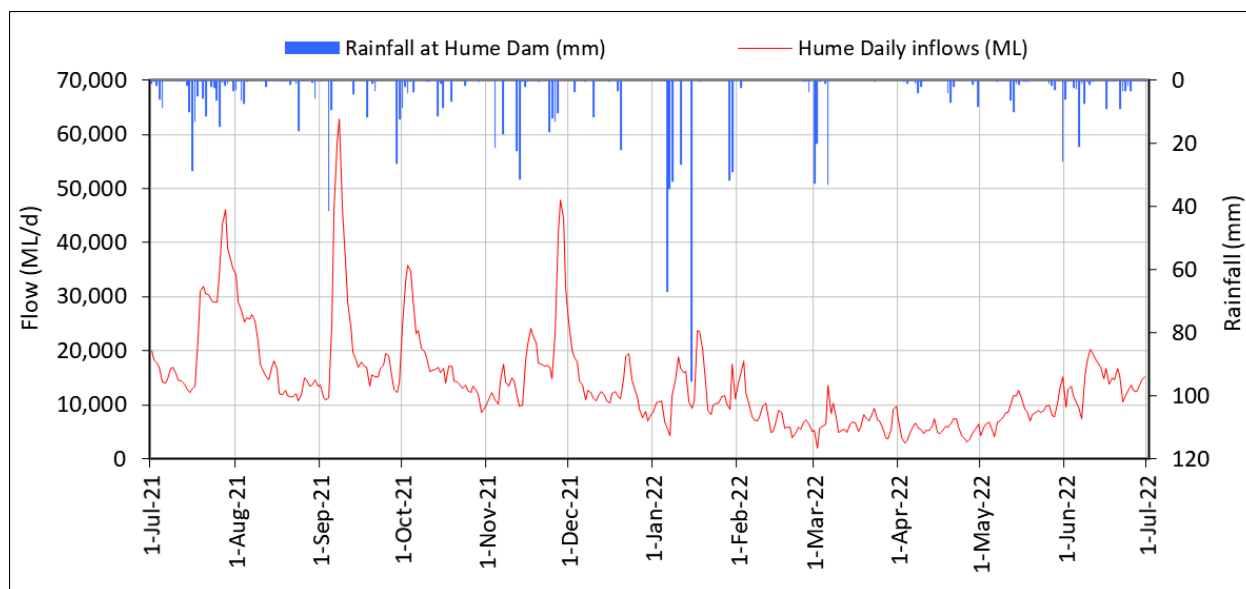


Figure 10: Long-term annual flow upstream of Dartmouth storage and cumulative deviation from mean

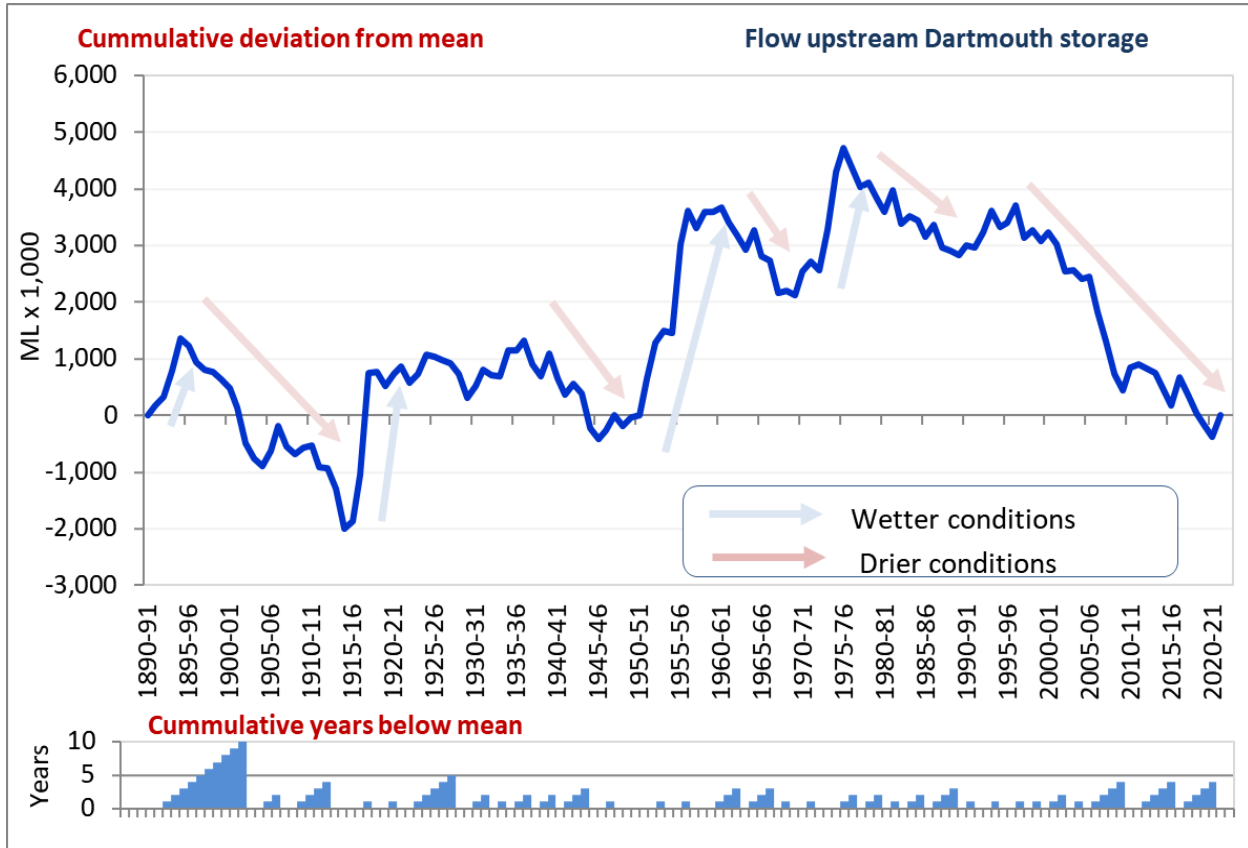


Figure 11: Long-term inflows to Dartmouth Dam against mean and reporting year inflow

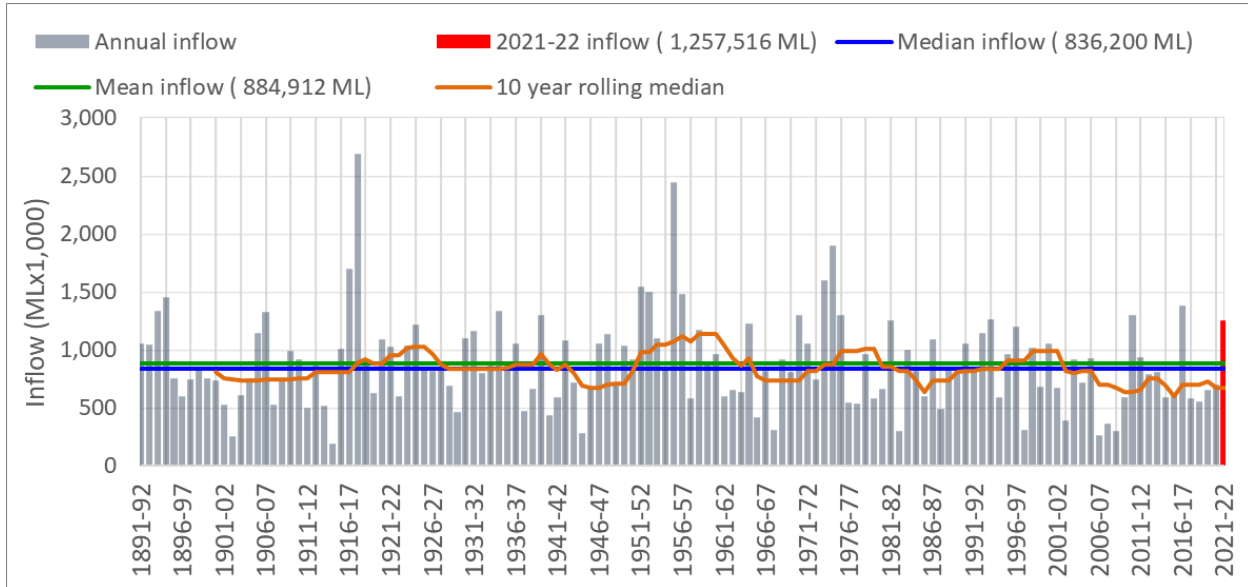


Figure 12: Daily inflows and rainfall at Dartmouth Dam for reporting period

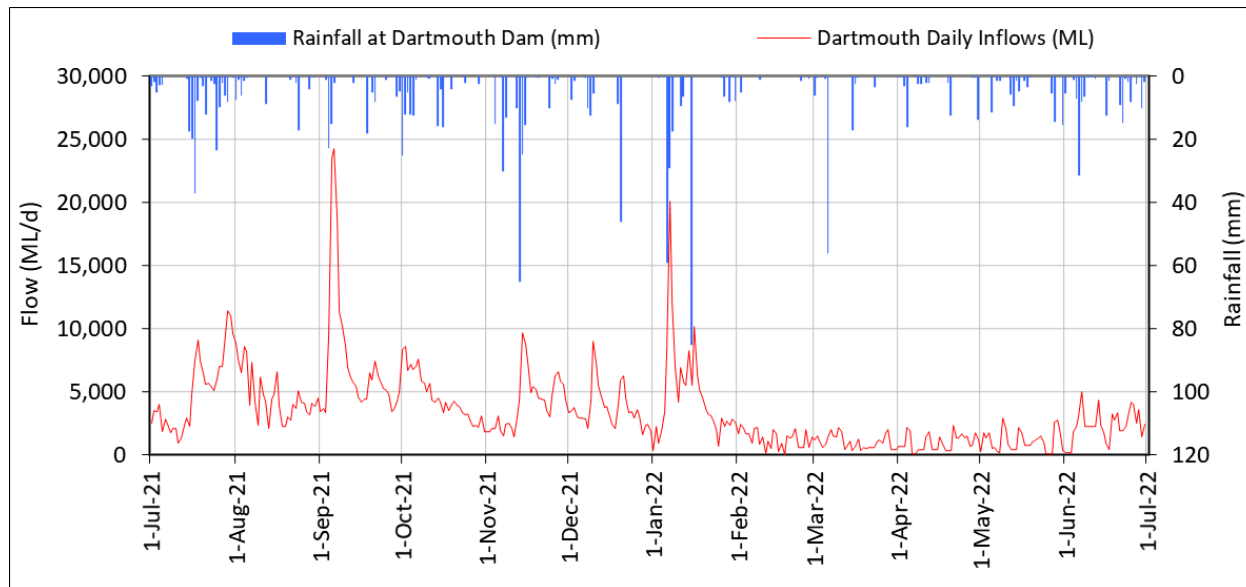


Figure 13: Long-term potential inflow to Menindee Lakes (flow at Wilcannia) against mean and reporting year inflow

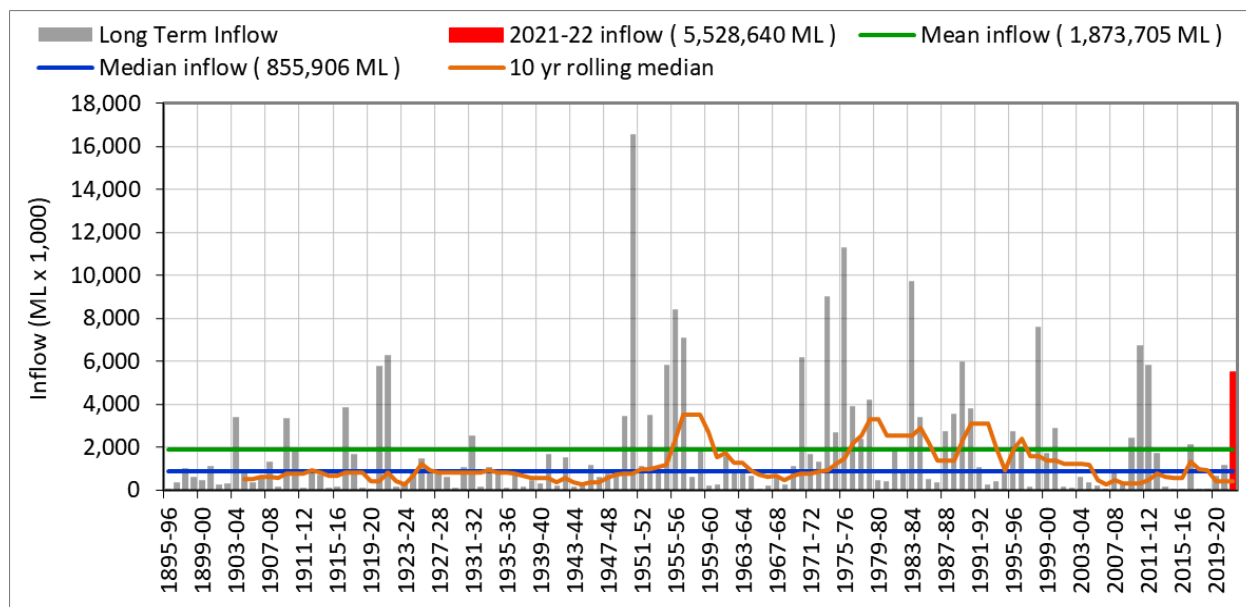


Figure 14: Daily flow at Wilcannia for reporting period

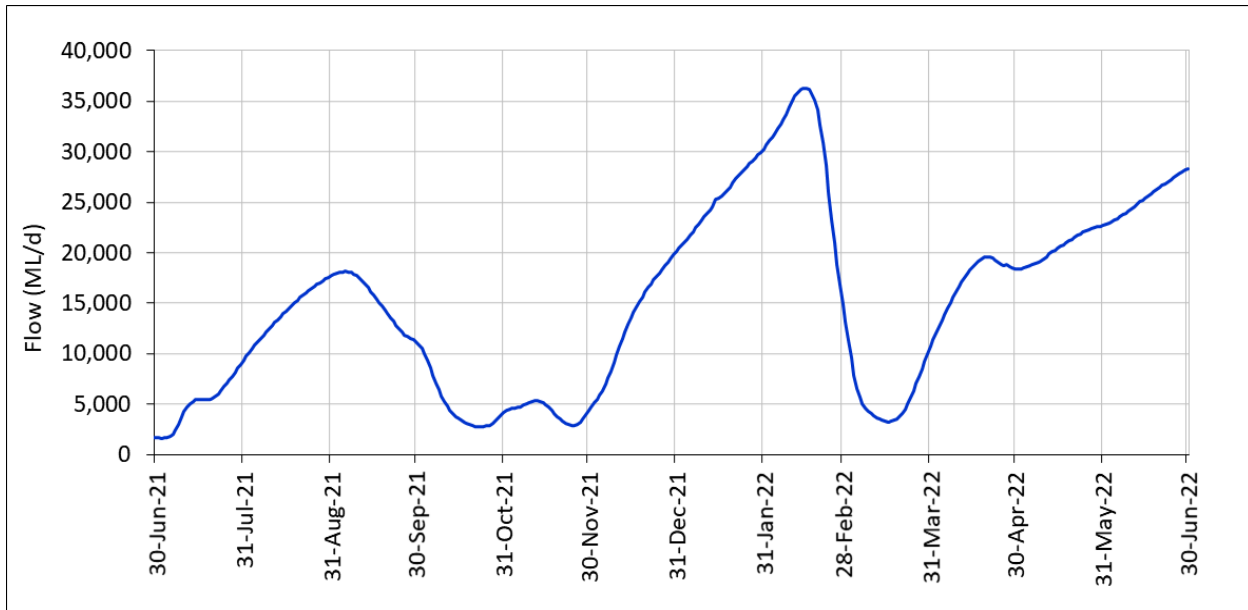
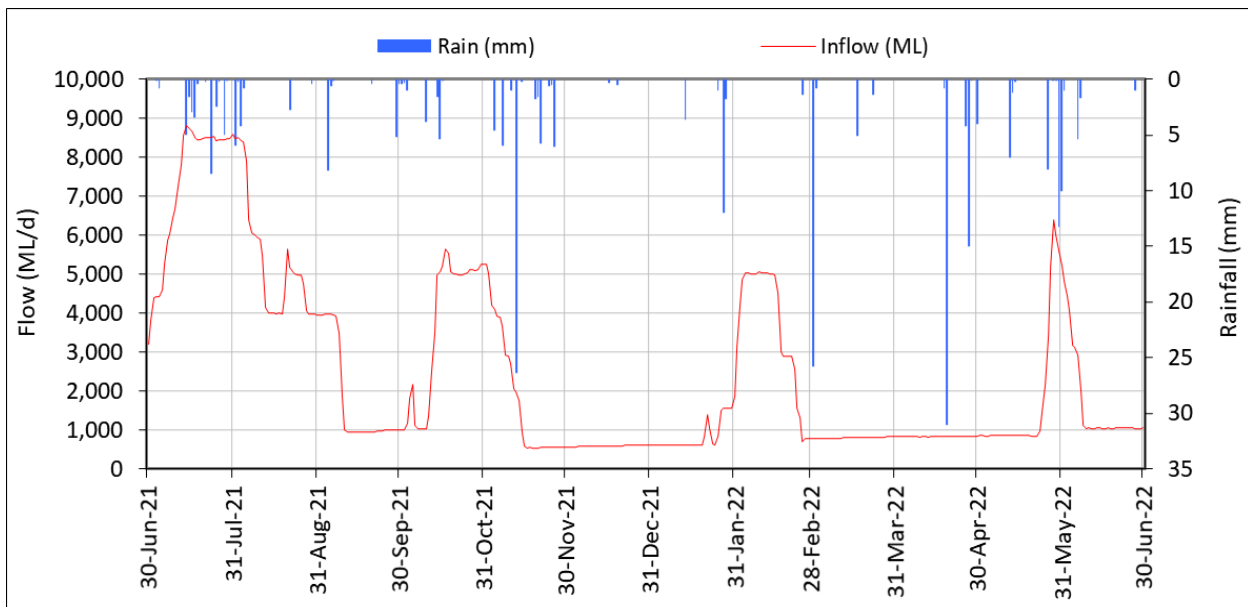


Figure 15: Daily inflows and rainfall at Lake Victoria for reporting period



Storage volume

Hume

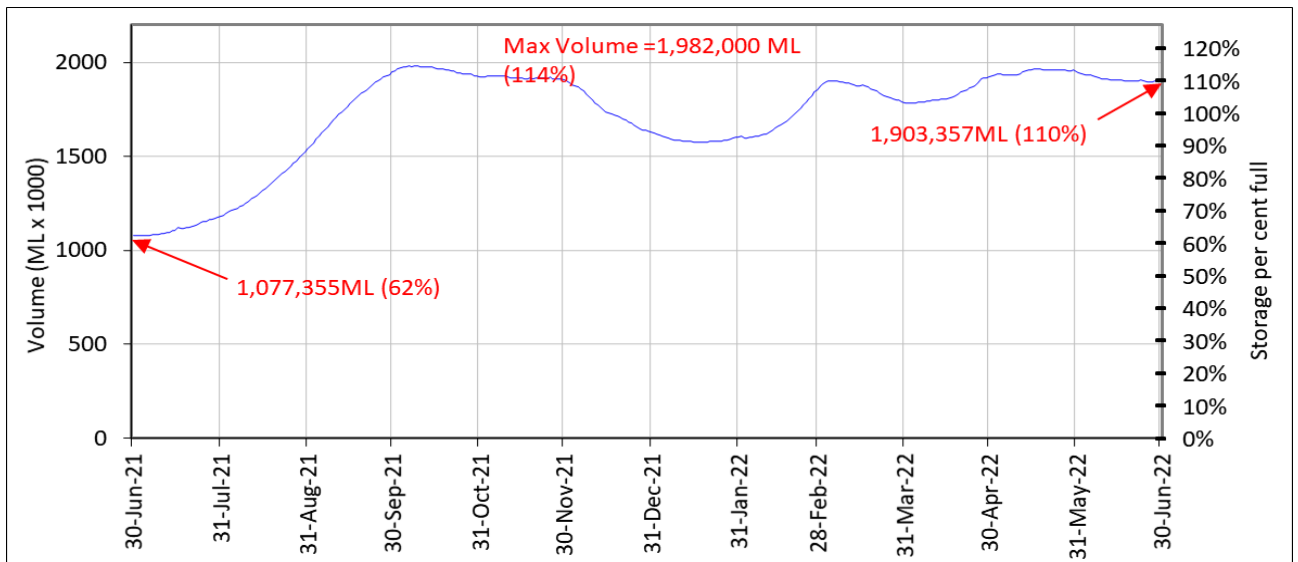
- At the commencement of the reporting period, the volume held in Hume dam was 1,717,273 megalitres or 56% of full supply capacity (Figure 16).
- At the end of the reporting period, the volume held in Hume dam was 2,822,047 megalitres or 92% of full supply capacity, an increase of 42% for the water year.
- The maximum volume held during the reporting period was 2,990,519 megalitres on 28 November 2021.
- Volume rose above Full supply volume twice and flood operation were carried out 4 times during the reporting period

Dartmouth

- At the commencement of the reporting period, the volume held in Dartmouth dam was 2,554,808 megalitres or 63% of full supply capacity (Figure 17).
- At the end of the reporting period, the volume held in Dartmouth dam was 3,663,752 megalitres or 90 % of full supply capacity, an increase of 27% for the water year.
- The maximum volume held during the reporting period was 3,663,752 megalitres on 29 June 2022.

Menindee Lakes

- At the commencement of the reporting period, the volume held in Menindee Lakes was 1,077,355 megalitres or 62% of full supply capacity (Figure 18: Combined Menindee Lakes volume and percentage of full supply volume



).

- At the end of the reporting period, the volume held in Menindee Lakes was 1,903,357 megalitres or 110% of full supply capacity an increase of 48% for the year.
- The maximum volume held in storage during the reporting period was 1,981,580 megalitres or 114% on 6 October 2021.
- The total combined storage volume in the Menindee Lakes System remained above 640,000 megalitres during the reporting period so the volume of water above 480,000 ML becomes part of the River Murray shared water resource.

Lake Victoria

- At the commencement of the reporting period, the volume held in Lake Victoria was 374,681 megalitres or 55% of full supply capacity (Figure 19).
- At the end of the reporting period, the volume held in Lake Victoria was 384,652 megalitres or 57% of full supply capacity.
- The maximum volume held during the reporting period was 670,016 megalitres on 11 November 2021

Figure 16: Hume Dam volume and percentage of full supply volume

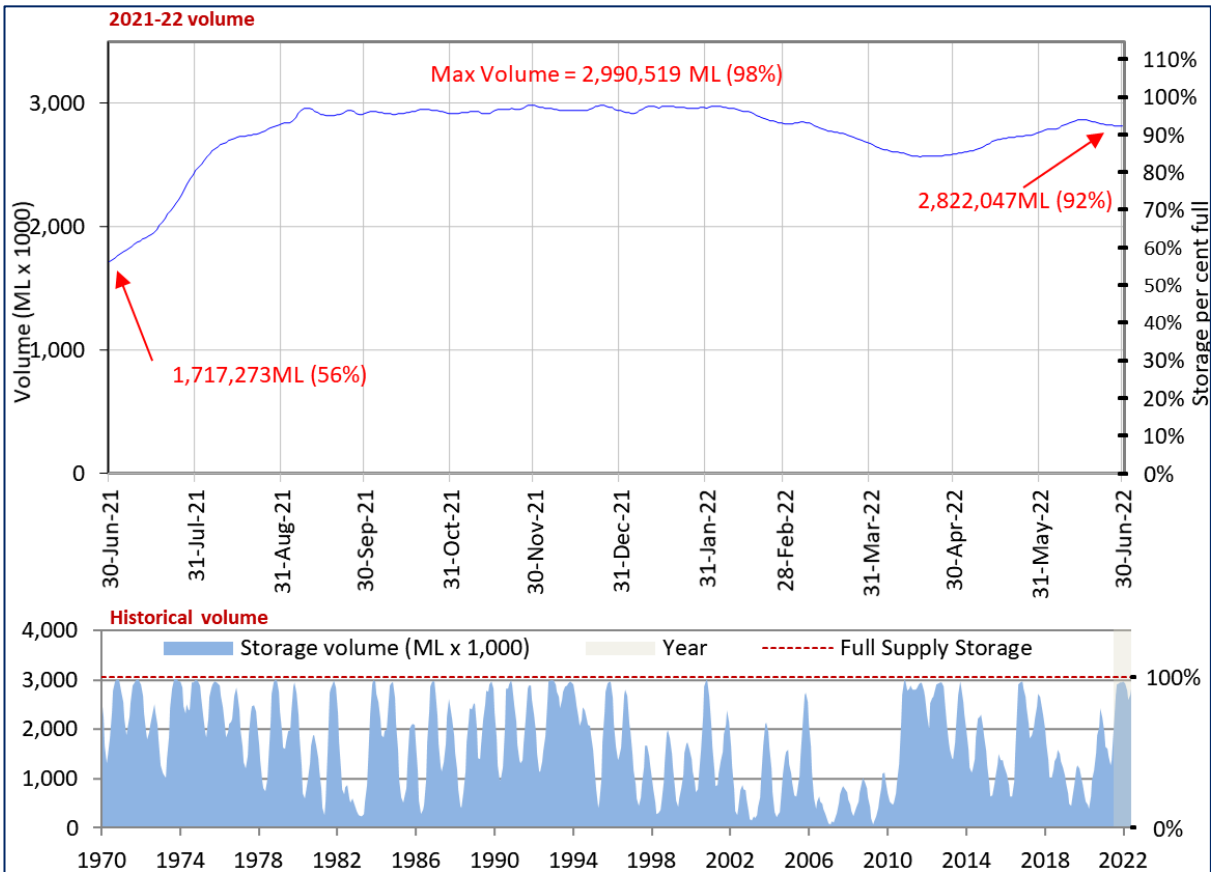


Figure 17: Dartmouth Dam volume and percentage of full supply volume

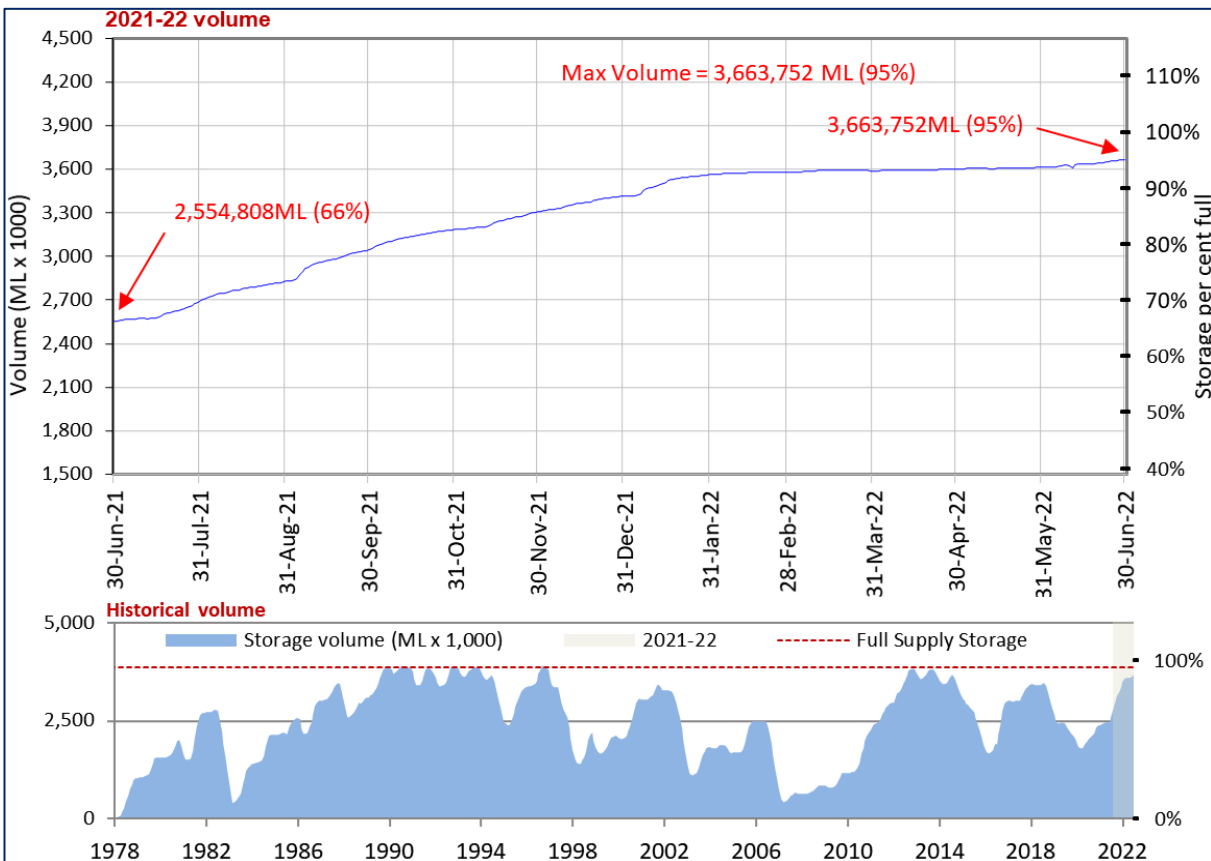


Figure 18: Combined Menindee Lakes volume and percentage of full supply volume

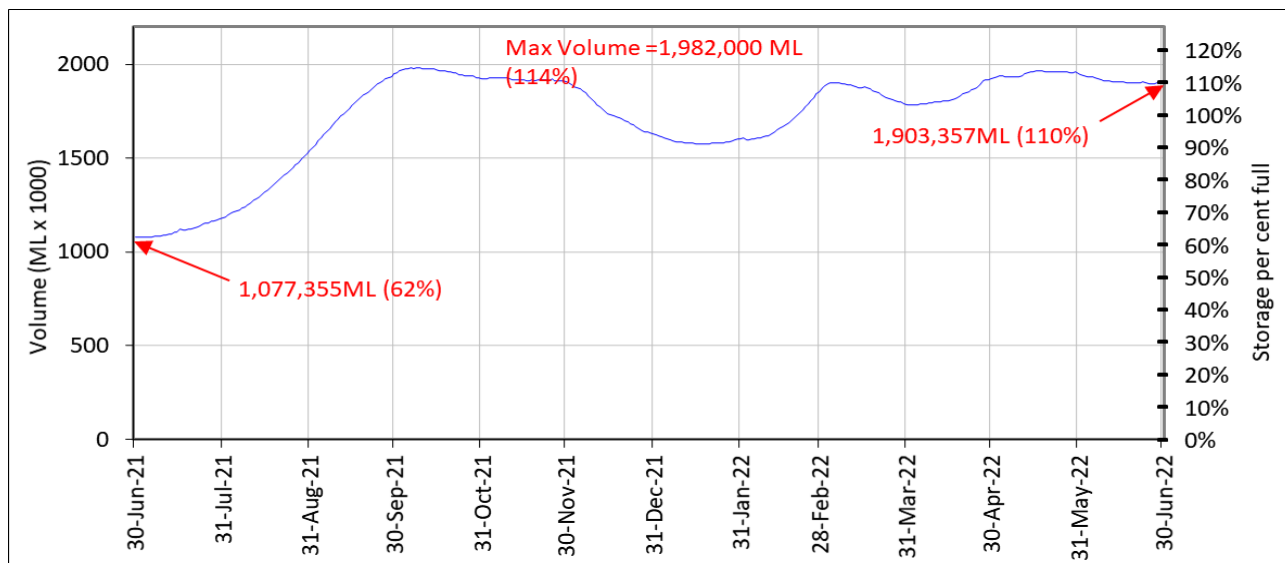
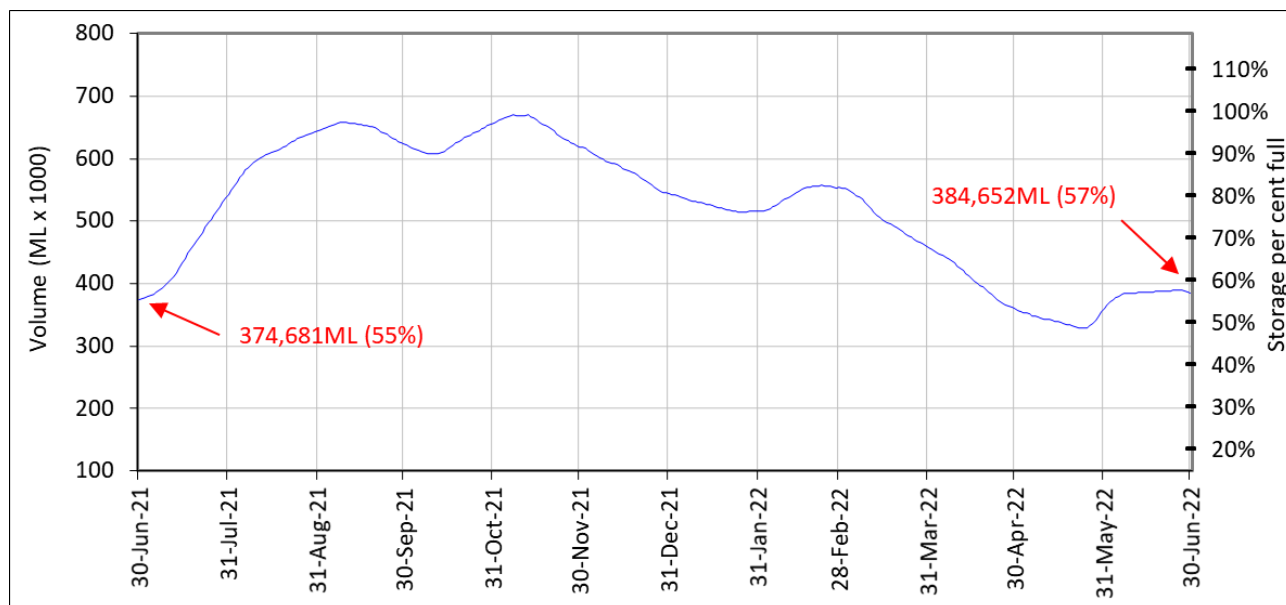


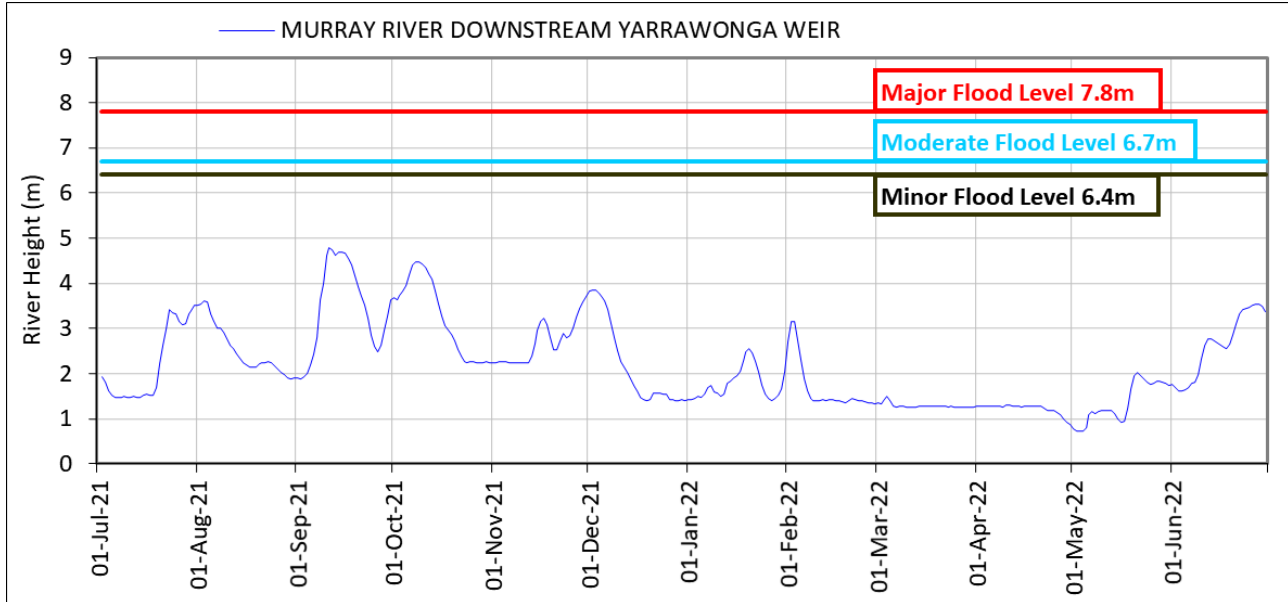
Figure 19: Lake Victoria volume and percentage of full supply volume



Major flow events

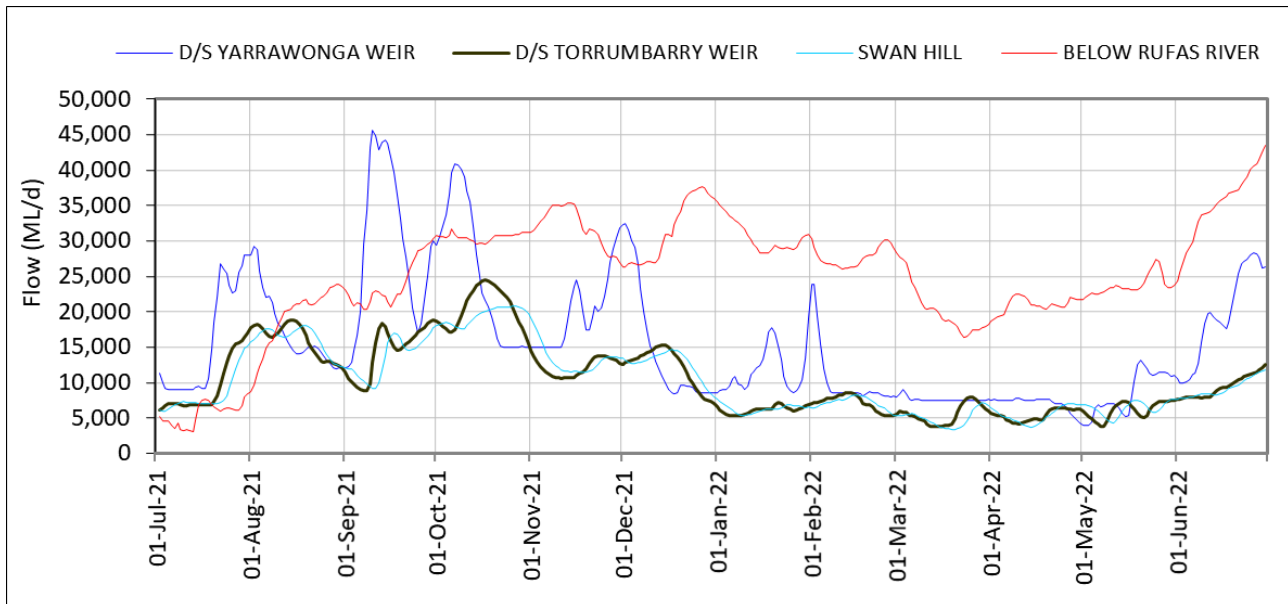
No major flow events occurred during the reporting period (Figure 20), river height recorded downstream of Yarrawonga remained below 5 metres during the reporting period.

Figure 20: River height of Murray River downstream of Yarrawonga Weir



A peak average daily flow rate of approximately 45,600 megalitres per day occurred in September 2021 downstream of Yarrawonga Weir on the Murray River (Figure 21).

Figure 21: Flows in the Murray River for the reporting period



Surface water resources and management

Legislation

The water source was managed under rules and requirements set out in the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016*. This water sharing plan commenced on 1 July 2016 and will remain active until 30 June 2026 or alternatively until a replacement plan is gazetted. The water sharing plan was produced to meet the water management principles outlined in the *Water Management Act 2000*.

Access rights

- Access licence share components decreased (net) by 48 in the reporting period. Changes were due to decrease in General Security by 50 and an increase in Domestic and Stock [Domestic] by 2 (Figure 22).
- Total issued share component on 30 June 2022 was 2,514,274, including 252,579 supplementary shares (Table 4).

Figure 22: Issued share component since the introduction of the water sharing plan

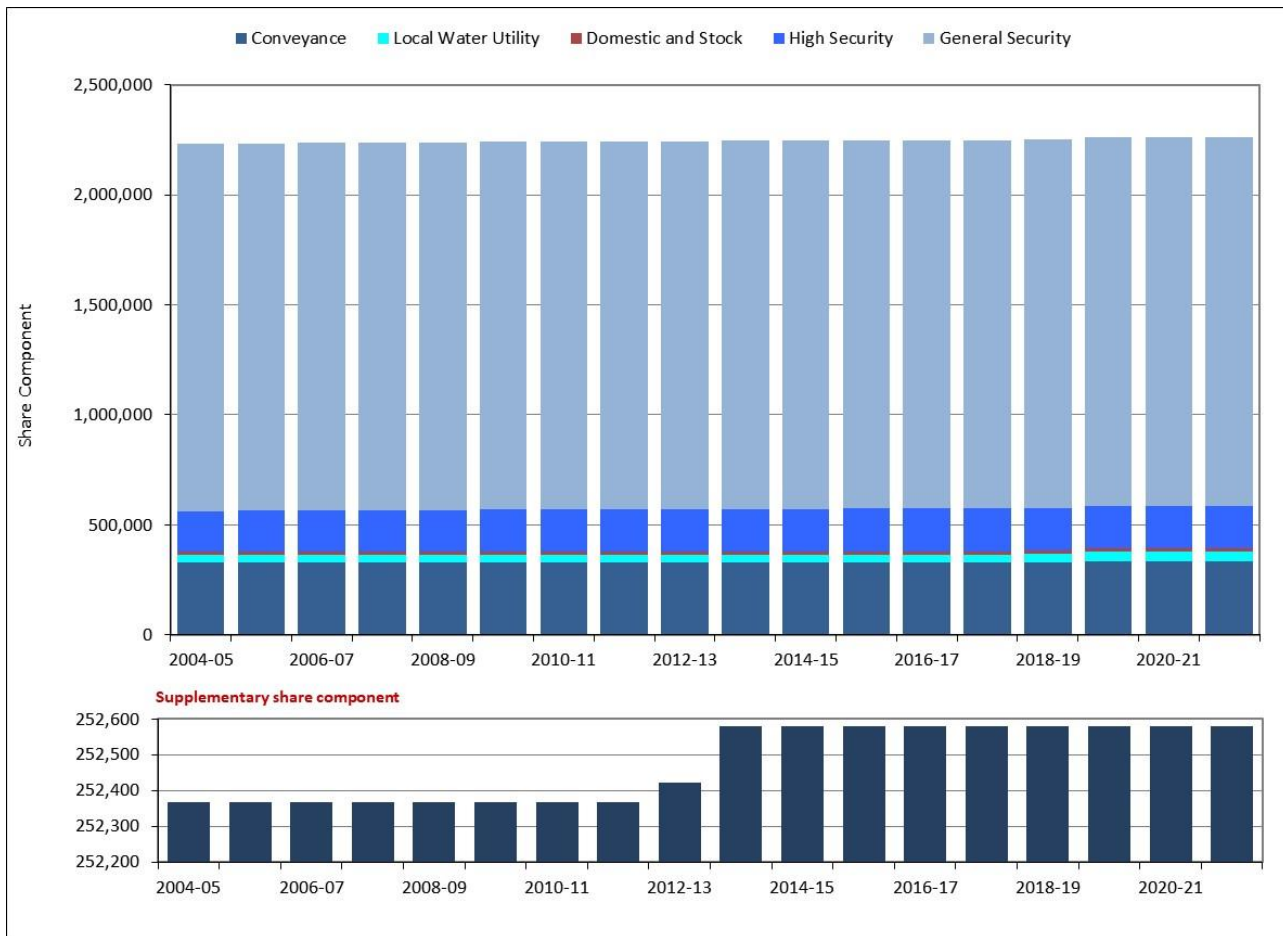


Table 4: Issued share component on 30 June 2022

Category	Issued share component
Domestic And Stock	13,700
Domestic And Stock (Domestic)	1,298
Domestic And Stock (Stock)	2,063
Local Water Utility[Domestic And Commercial]	8,694
Local Water Utility	33,497
Conveyance	330,000
General Security	1,674,046
High Security	189,704
High Security (Research)	1
High Security (Town Water Supply)	3,195
Regulated River (High Security) [Community and Education]	47
Eagle Creek (Temporary Conveyance)	800
Mathoura (Temporary Conveyance)	150
Moira (Temporary Conveyance)	1,500
West Corurgan (Temporary Conveyance)	3,000
Supplementary Water	252,579
Total	2,514,274

Allocation account summary

A summary illustration of the accounting for Conveyance, General Security and High Security access licence categories in the NSW Murray River is provide in Figure 23, Figure 24 and Figure 25 respectively. Detailed information on the water accounts for all categories of licence issued are provided in Note 1 of this report.

Figure 23: Annual water account summary NSW Murray Conveyance

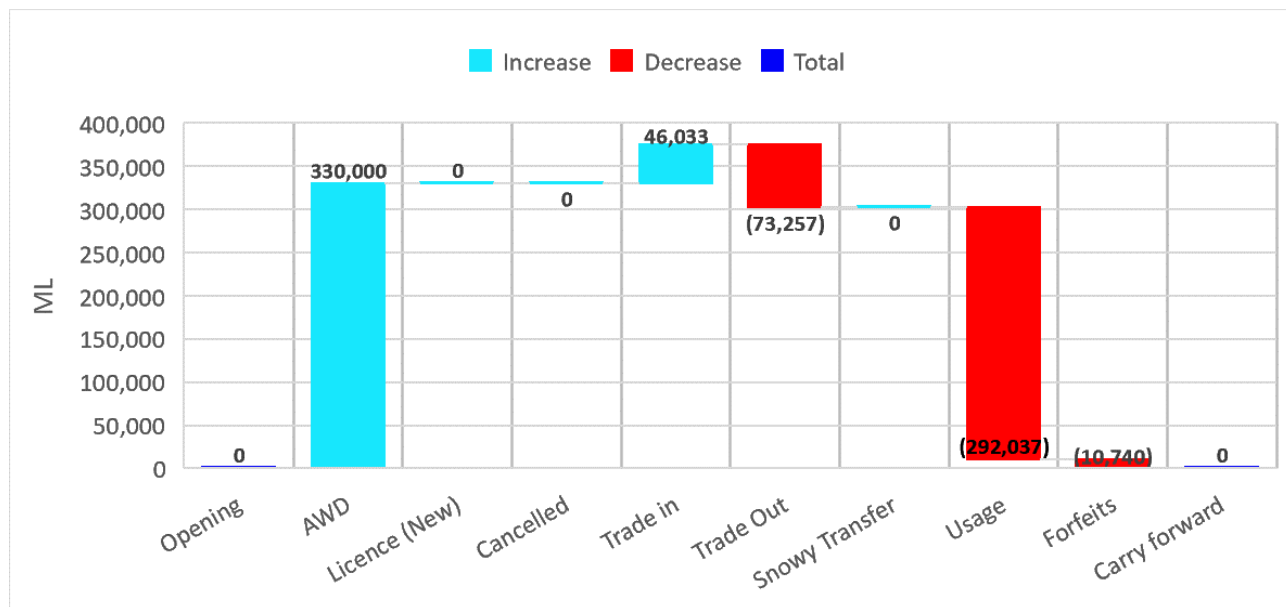


Figure 24: Annual water account summary NSW Murray General Security

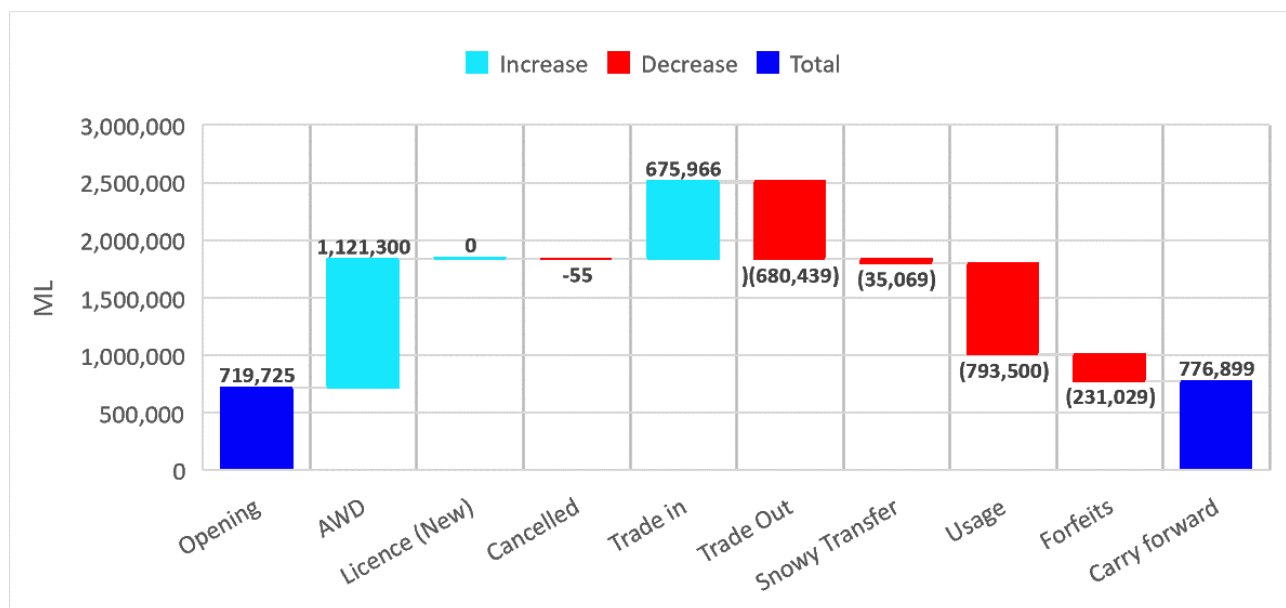
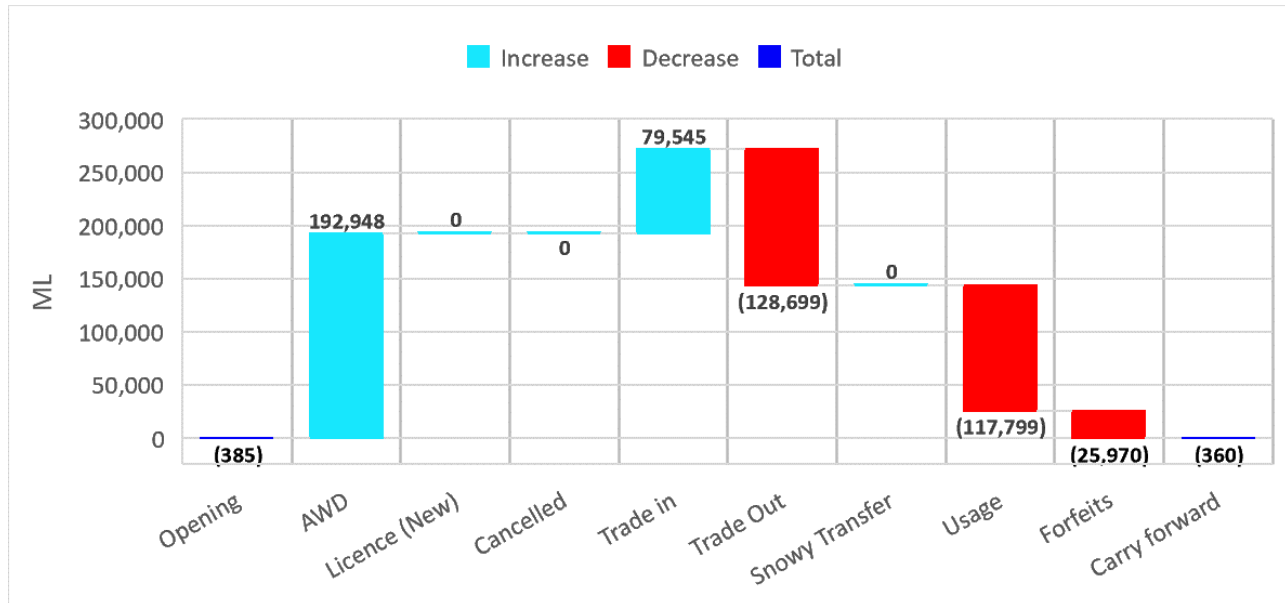


Figure 25: Annual water account summary NSW Murray High Security



Access licence account management

An annual accounting procedure is implemented in this water source to allow general-security licence holders to hold up to 1.1 megalitres per issued share and carryover up to 0.5 megalitres per issued share. All other categories have an account limit of 100% or one megalitre per share and cannot carryover water between water years. The access licence accounting rules are summarised in Table 5 and the rules for access to uncontrolled flow are summarised in

Table 6.

Table 5: Water allocation licence accounting rules for the reporting period

Licence category	Carryover limit	AWD limit	AWD plus carryover limit	Annual use limit
Domestic and Stock	0%	100%	N/A	N/A
Domestic and Stock [Domestic]	0%	100%	N/A	N/A
Domestic and Stock [Stock]	0%	100%	N/A	N/A
Local Water Utility	0%	100%	N/A	N/A
Conveyance	0 ML/share	1 ML/share	N/A	N/A
General Security	0.5 ML/share	1.1 ML/share	1.1 ML/share	N/A
High Security	0 ML/share	1 ML/share	N/A	N/A
High Security (Community and Education)	0 ML/share	1 ML/share	N/A	N/A
High Security (Research)	0 ML/share	1 ML/share	N/A	N/A
High Security (Town Water Supply)	0 ML/share	1 ML/share	N/A	N/A
Supplementary Water	0 ML/share	1 ML/share	N/A	N/A

Table 6: Uncontrolled flow access accounting rules for the reporting period

Licence category	AWD limit for uncontrolled flow access	AWD plus carryover plus uncontrolled usage limit
General Security	0.6 ML/share	1 ML/share

Extreme events stage and temporary water restrictions

The NSW Extreme Events Policy was released in October 2018 to provide a framework for managing extreme events in the major river systems of the NSW Murray–Darling Basin. This framework is based on a staged approach, providing a range of measures for water managers to implement as conditions deteriorate.

Temporary water restrictions are an example of the type of measures that can be implemented to manage a water shortage. These restrictions are issued under section 324 of the *Water Management Act 2000* and have been implemented in several river valleys in the current drought to preserve water for critical needs.

Table 7 outlines the conditions that may be associated with different stages of criticality for surface water quality. Further information is available at www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep

Table 7: Determination of stages of criticality for surface water quantity

Stage	Stage description	Stage evidence base
1	Normal management	Can deliver all account water under normal river operations practices.
2	Emerging drought	Unable to deliver 100% of high priority account water and maximum expected use of general security under normal river operations practices.
3	Severe drought	Only able to deliver restricted high priority demands and restricted remaining general security account water.
4	Critical drought	Only able to deliver restricted town water supply, stock and domestic and other restricted high priority demands.

Temporary water restrictions for the reporting period

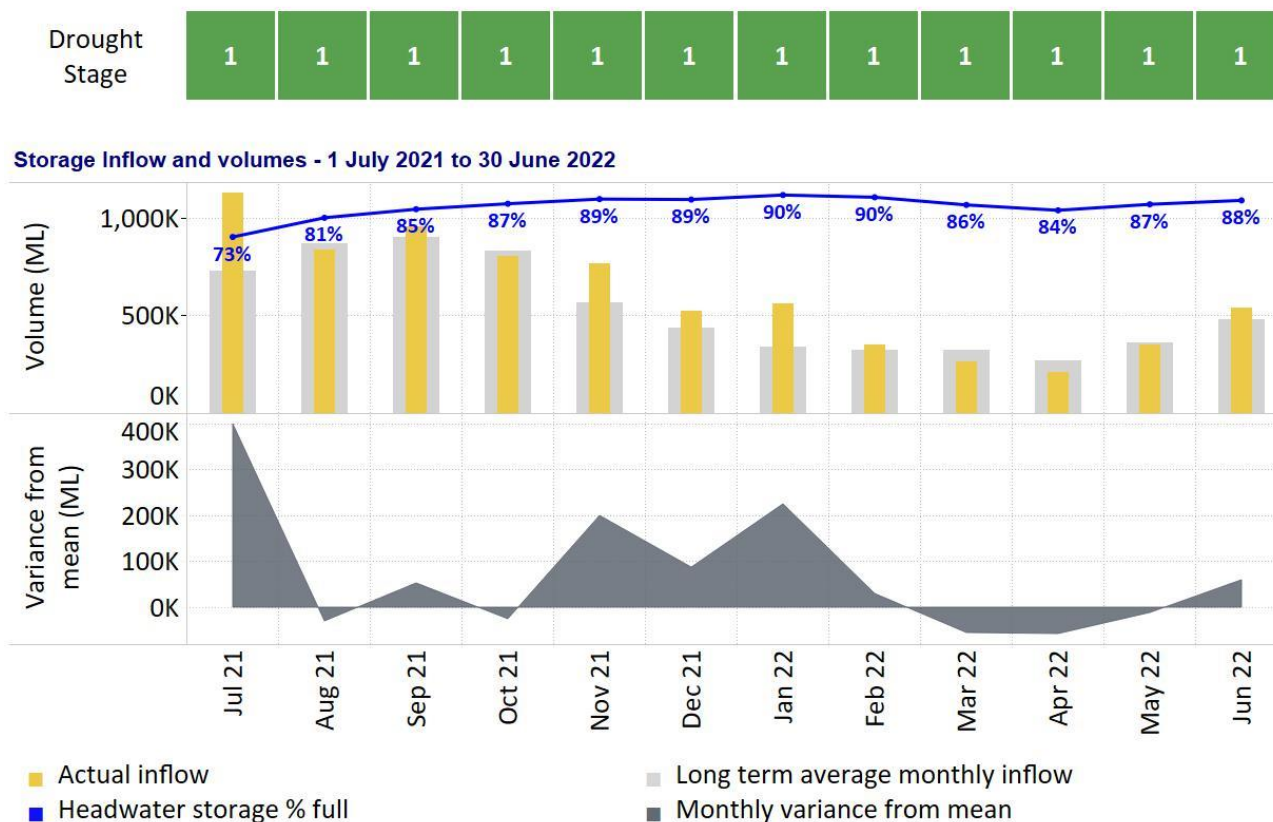
There were no temporary water restrictions in place during the reporting period for regulated river licence holders.

Extreme events stage

- The Murray catchment was classified as being in Stage 1 for the entirety of the reporting period.
- Major storage inflow (Hume natural³ plus Dartmouth) was typically at or exceeding long term monthly averages for the majority of the water year. (Figure 26).

³ Data excludes re-regulated inflow from the Snowy Hydro scheme to better gauge the climatic impact on system inflows

Figure 26: Drought stage for the reporting period referenced with monthly headwater storage inflows and monthly storage inflow variance from mean



Water availability

Detailed available water determinations are tabulated in Note 2 of this report.

In summary:

- ‘Domestic and Stock’, ‘Local Water Utility’ (including subcategory ‘Domestic and Commercial’) and ‘High Security’ subcategories ‘Community and Education’, ‘Research’ and ‘Town Water Supply’, received an opening available water determination (AWD) of 100%, the maximum allowable under the water sharing plan.
- ‘High Security’ access licences received an opening AWD of 0.97 megalitres per share, as per the requirements of the water sharing plan. An additional announcement of 0.03 ML was allocated to accounts on 15 October 2021, taking the category to the maximum allowable.
- General security carried over 734,802 megalitres from the prior water year⁴ (44% of issued share for this category) and additionally received 0.03 megalitres per share on 1 July 2021, taking the total effective opening allocation to 47%.
- A subsequent announcement of 0.07 megalitre per share occurred on 15 July 2020 (Figure 27) followed by multiple increases up to 15 October 2021, taking total general security effective allocation to maximum permitted levels for this category (110%).

⁴ Carryover figure is presented pre snowy transfer adjustments. See Note 1 – Allocation account summary for post adjusted carryovers.

- Total water availability for regulated supply licence categories under water sharing plan management conditions is presented in Figure 28. and shows the highest levels for General Security since 2016–17.
- In addition to regulated supply licences, supplementary access licence holders received an opening AWD of 1 megalitre per share, the maximum allowable under the water sharing plan. At water source level, access to supplementary allocation was available for 351 days during the reporting period (Figure 29).
- By volume more than half of the total measured tributary inflow of 9,728,468 megalitres to the regulated Murray downstream of the major storages was contributed by the Murrumbidgee (30%) and Darling Rivers (26%). Of the total tributary inflows 60% was contributed by New South Wales streams (Figure 30).

Figure 27: Incremental available water determination and carryover volumes for ‘General Security’ as a proportion of share component

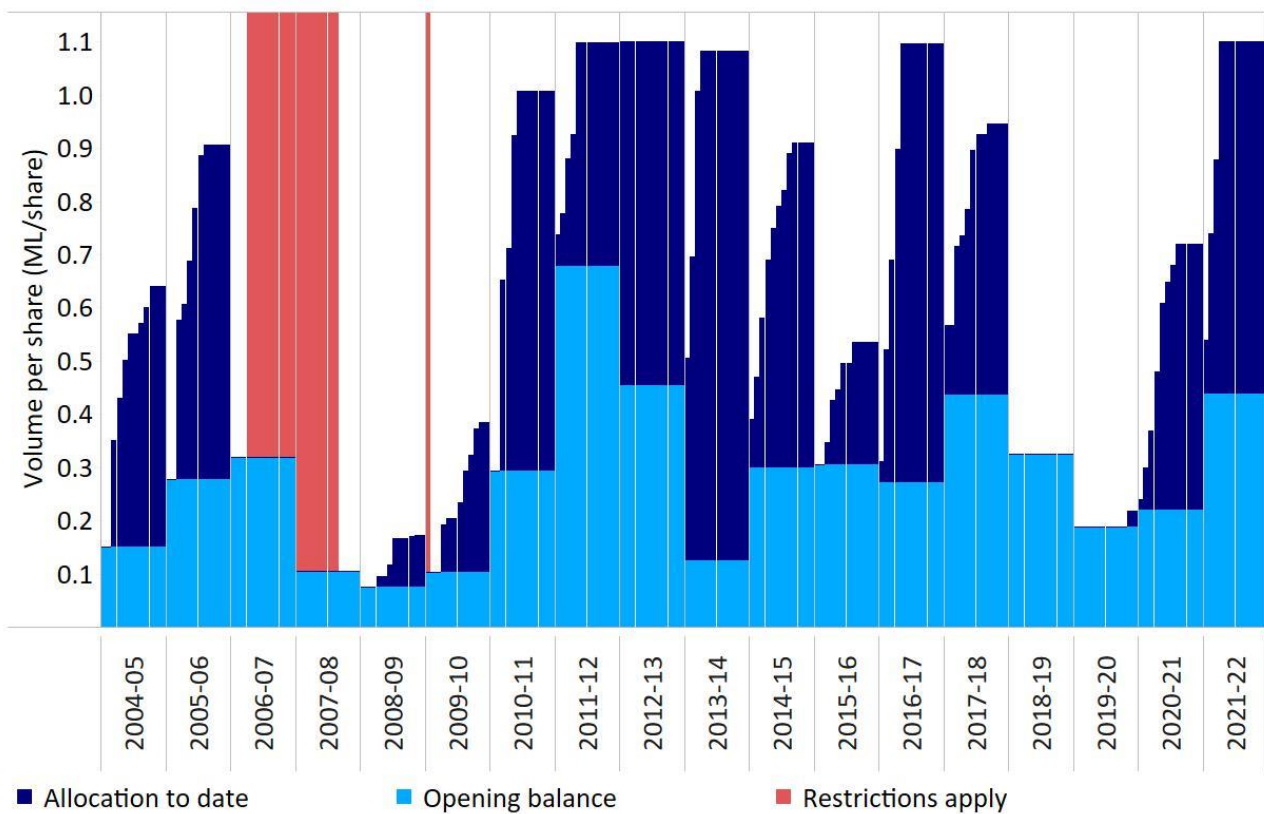


Figure 28: Water availability (carryover + available water determinations)

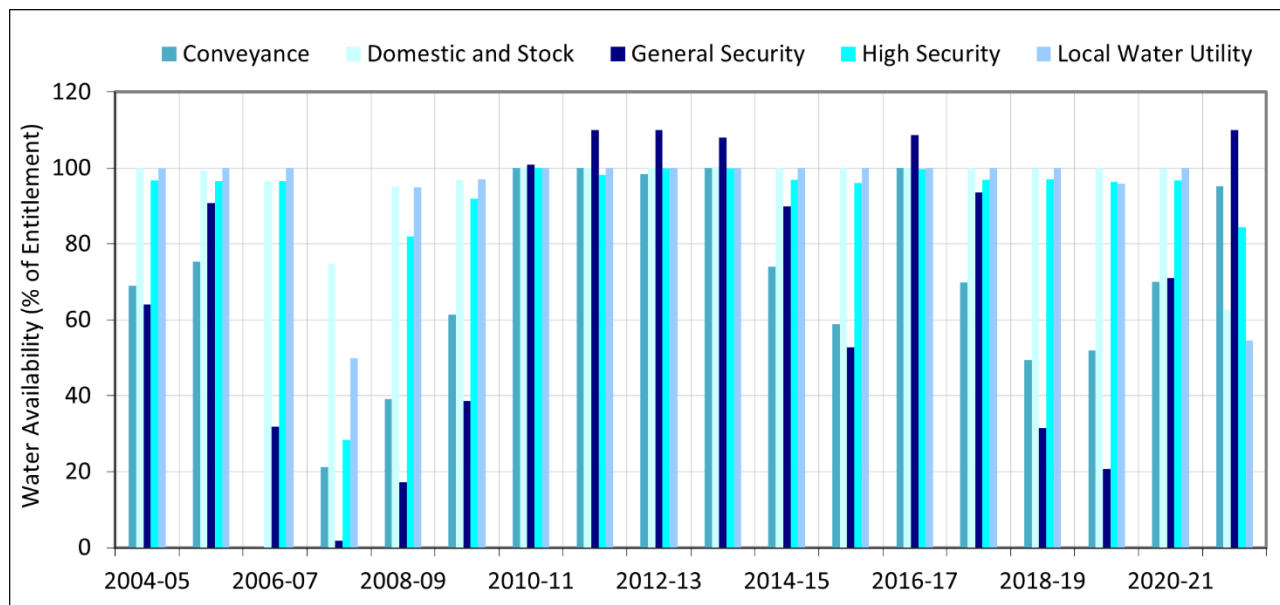


Figure 29: Supplement event access history

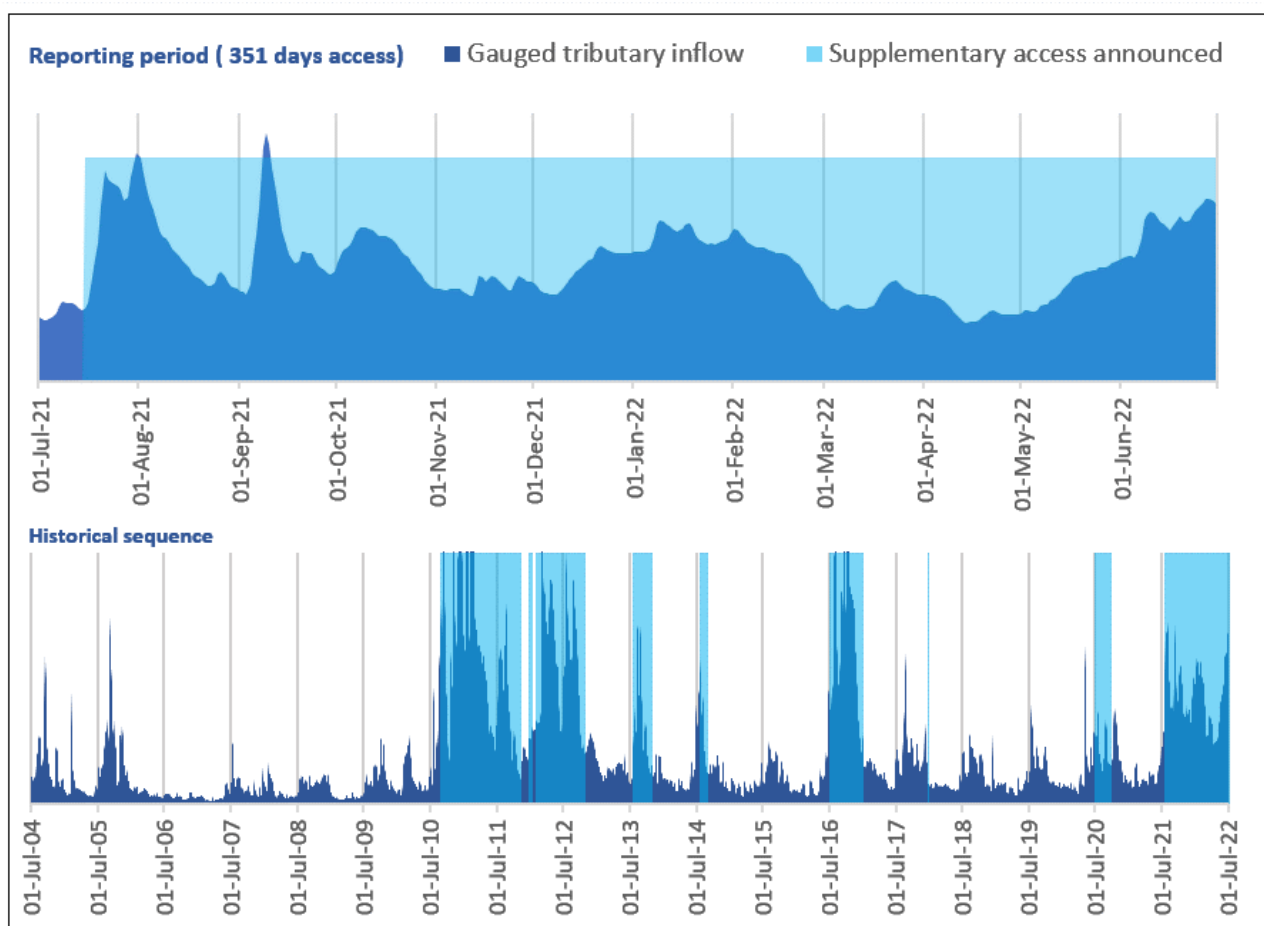
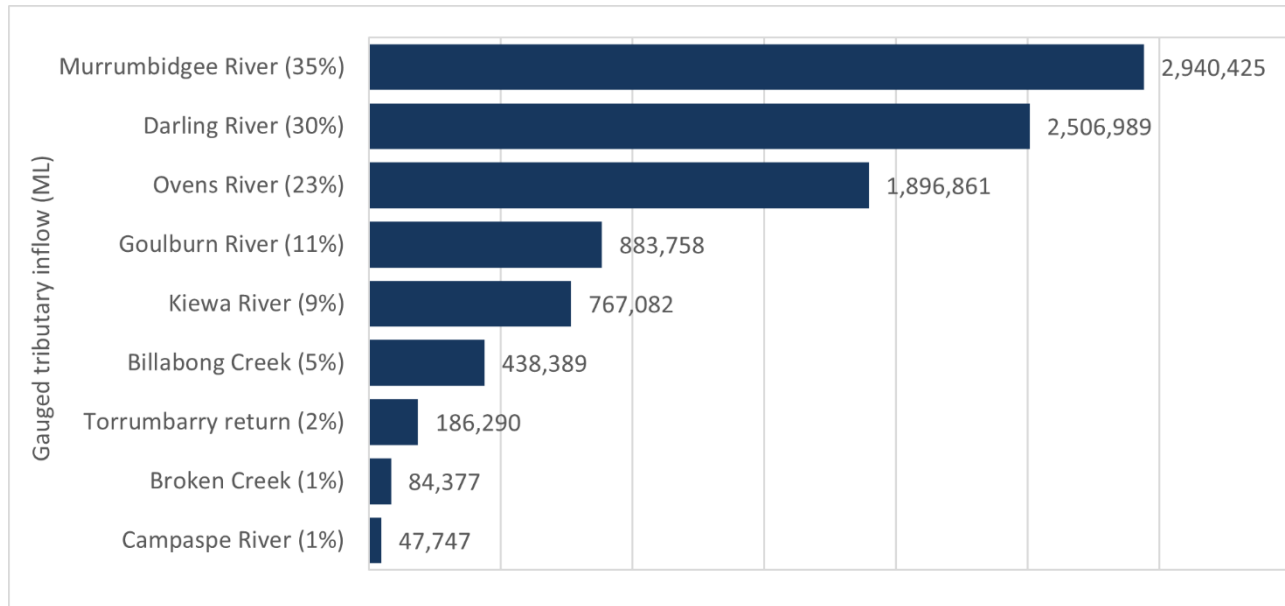


Figure 30: Measured tributary inflow contributions

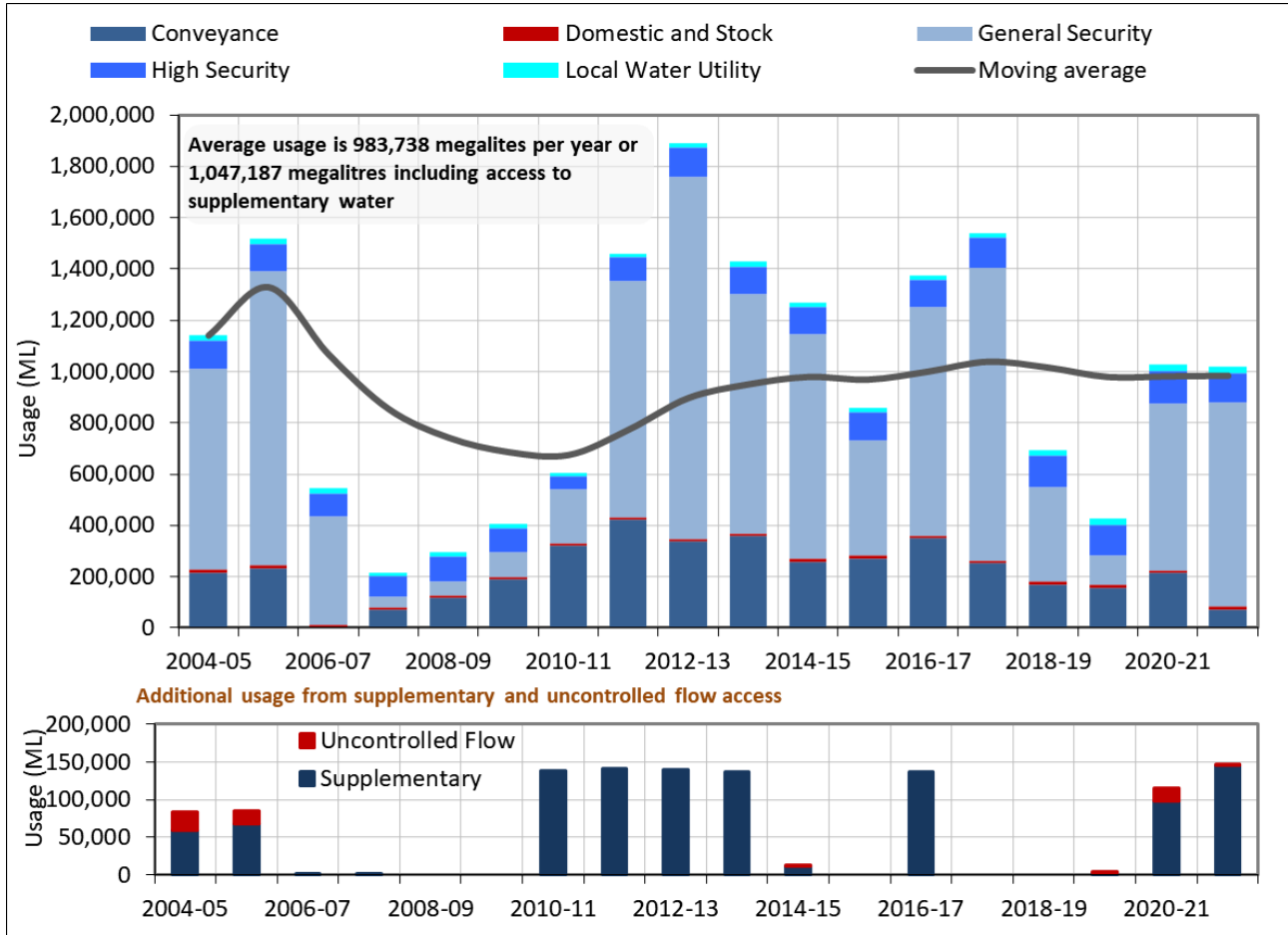


Account usage

Account usage refers to the total volume of water debited against an access licence.

- Account usage from the regulated supply totalled 1,017,713 megalitres for the reporting period (Figure 31), a similar usage volume to the prior reporting period.
- Additionally, 191,358 megalitres was accessed during uncontrolled flow events of which 145,650 megalitres was supplementary usage, 53,520 megalitres was General security usage and 88 megalitres was uncontrolled flow usage. This is a substantial increase on the prior reporting period.
- Considering both forms of usage, average annual usage under water sharing plan conditions (2004-05 to this reporting year) is 1,047,187 megalitres which is on par with the previous reporting period
- Refer to Note 3 in this GPWAR for further usage details.

Figure 31: Total usage since commencement of the water sharing plan



Utilisation and inactive share

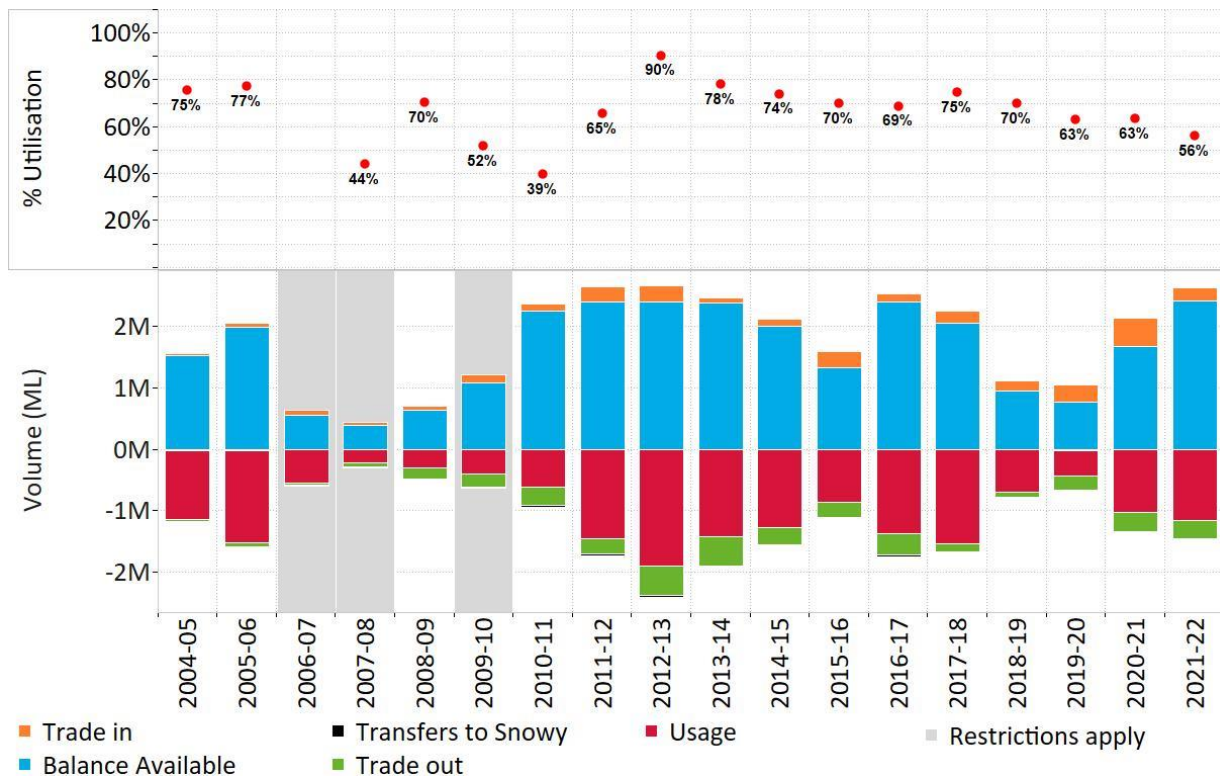
An access licence entitlement is considered to be inactive if the holding does not use water or access the temporary trade market for the reporting period. Utilisation reflects the amount of water used from regulated supplies (excludes supplementary water), relative to the maximum amount available for use.

- 3% of general-security share component was inactive for the reporting period, no change from the previous year (Table 8).
- Similarly considering all categories of access licence with regulated supply, 3% were inactive.
- 41% of supplementary water was inactive for the reporting period a decrease of 1 % from the previous period
- The utilisation of available water from regulated supplies (excludes supplementary) was 56%, 7% less than the prior reporting year and the lowest since 2010–11 (Figure 32).

Table 8: Inactive licence summary for the reporting period

Licence category	Inactive licences 5(number)	Inactive share component	Inactive share % of total share	Previous year comparison
Domestic and Stock	291	2,827	21%	19%
Domestic and Stock [Domestic]	105	616	30%	32%
Domestic and Stock [Stock]	115	290	22%	26%
Local Water Utility	0	0	0%	0%
Local Water Utility [Domestic and Commercial]	0	0	0%	0%
Regulated River (Conveyance)	0	0	0%	0%
Regulated River (General Security)	624	48,751	3%	3%
Regulated River (High Security)	286	7,792	4%	2%
Regulated River (High Security) [Community and Education]	1	19	40%	0%
Regulated River (High Security) [Research]	1	1	100%	100%
Regulated River (High Security) [Town Water Supply]	0	0	0%	0%
Total regulated supply	1,423	60,295	3%	2%
Supplementary Water	79	103,941	41	42

Figure 32: Access licence account utilisation



⁵ Licences are considered inactive when no usage or trade activity is associated with the holding for the water year

Temporary trading (allocation assignments)

Temporary trading is implemented in this water source under the clause 71 T and 71V (assignment of water allocations between access licences) of the *Water Management Act 2000*.

- 890,575 megalitres was traded out of NSW Murray access licences.
- 808,601 megalitres was traded into NSW Murray access licences (including internal).
- This trading results in a net trade out of 81,575 megalitres was traded out of the water source, ending a 4-year trend of net trade into the water source (Figure 33).
- There was a net movement of water in from the Murrumbidgee (66,614 megalitres), and net movement out to Victoria (102,843 megalitres), Lower Darling (4,847 megalitres) and South Australia (40,898 megalitres) (Figure 34).
- The majority of water moved out of the NSW Murray was to Victoria (59%) and Lower Darling (24%). The balance of the Murrumbidgee inter-valley trade account balance (IVT) was 127,569 megalitres on 30 June 2022 (volume owed to the Murray). Detailed information on the IVT account is provided in note 5 of this GPWAR.

Figure 33: Allocation assignments (trade) out of the NSW Murray

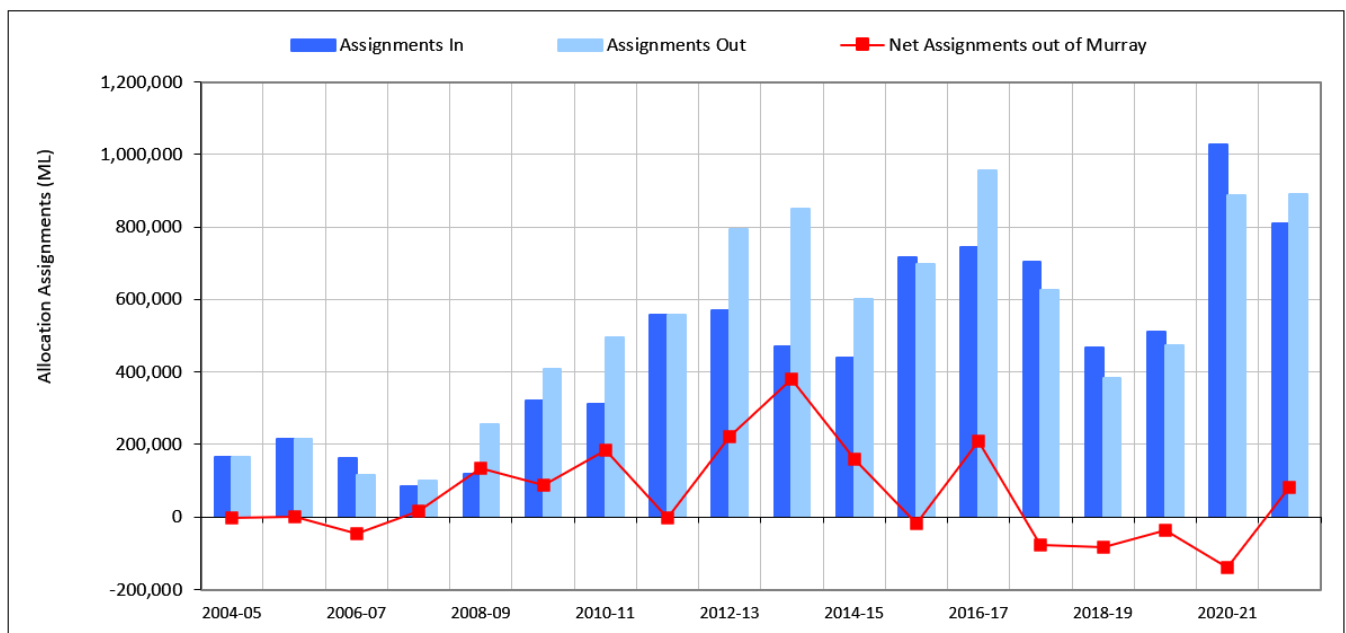
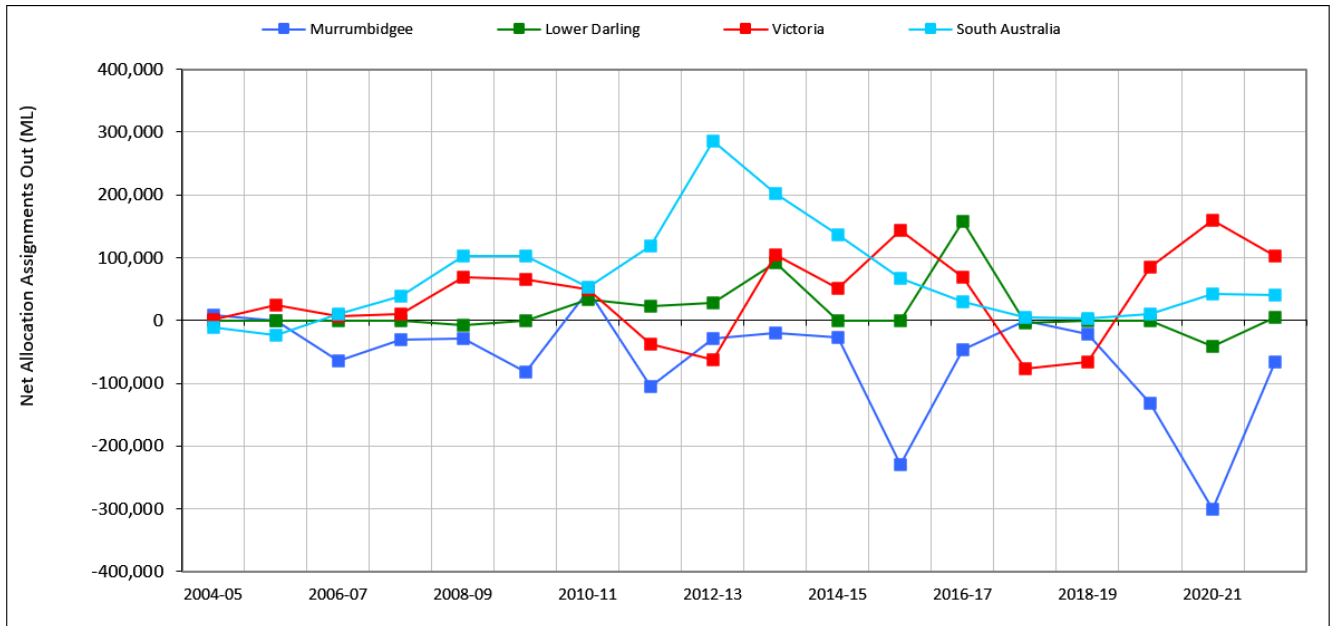


Figure 34: Net volume of allocation assignment (trade) out of NSW Murray by water source

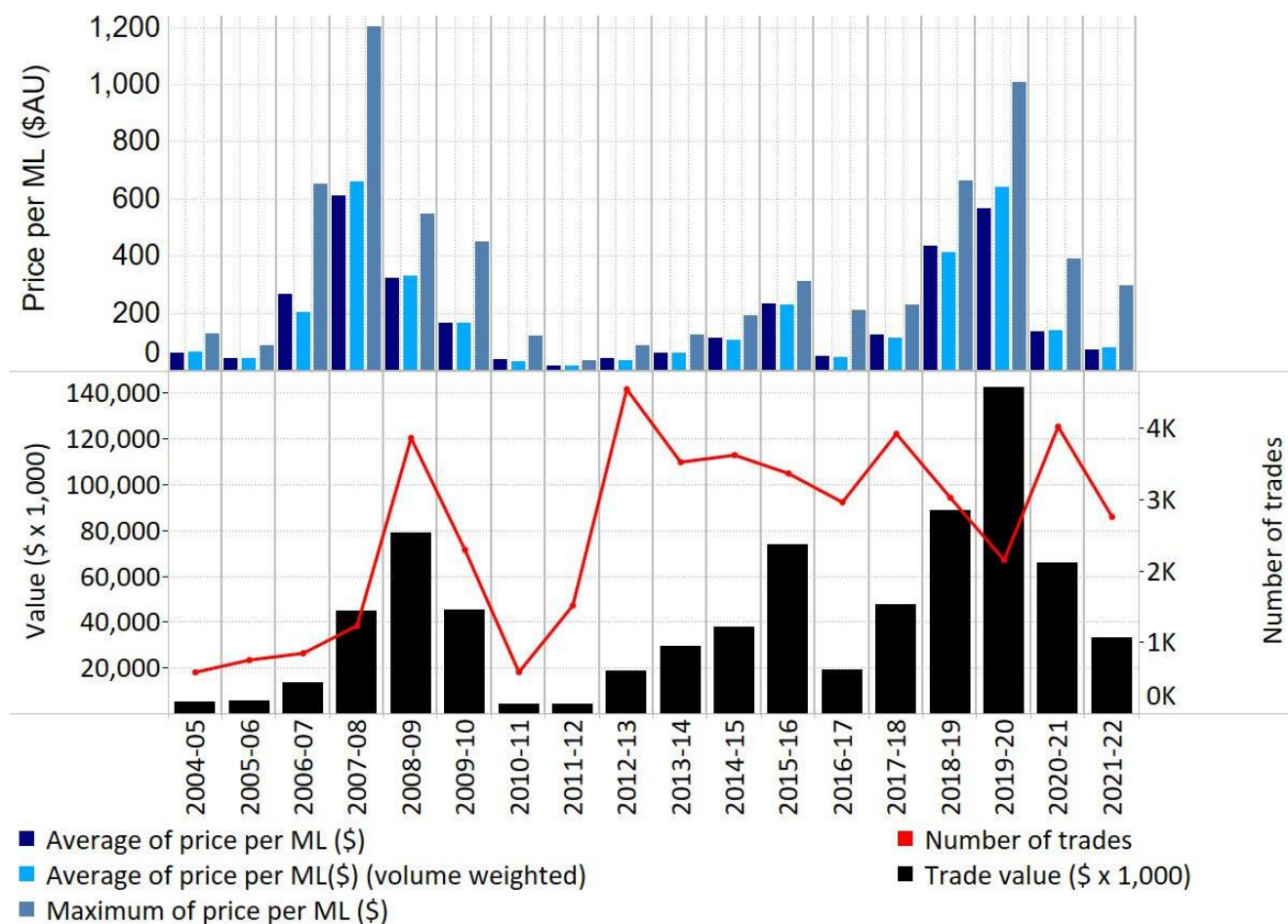


Commercial statistics

For the purposes of this section, trades are considered for commercial purposes if the consideration of the trade (assignment) exceeds \$1 per megalitre/share.

- There were 2,760 commercial transactions in the reporting period, a decrease on the prior reporting period (
- Figure 35), the total market value decreased by around 50% to \$33M.
- The average price was \$70 per megalitre (or volume weighted average \$78), a 48% decrease on the previous reporting period.
- The maximum price for temporary water was \$294 per megalitre.

Figure 35: NSW Murray allocation assignments summary statistics



Permanent trading (share assignments and licence transfers)

Division 4 (dealings with access licences) of the *Water Management Act 2000* allows for a range of dealing options that permanently effect the title of the water access licence. Two of the more common dealing practises under this division are assignments of rights under access licences (clause 71Q) and transfer of access licences (clause 71M). With consideration to these dealing types from a commercial⁶ perspective:

General Security share component

- There were 36 transactions processed with a total market value of \$19,087,230 which was a 52% change relative to the prior reporting period
- The average price per share was \$2001(volume weighted) for the reporting period which is the highest since the Water Sharing Plan commenced

⁶ A permanent trade is considered commercial if the consideration exceeds \$1 per share

- The Average Price has ranged from a low of \$662 to a high of \$2,001 (between 2004–05 and 2021–22). (Figure 36).
- The maximum price per share for the reporting period was \$3,625 which is the maximum recorded.
- The general security weighted average sale price within the NSW Murray relative to other NSW regulated river water sources selling share in the reporting period is provided in Figure 37.

High Security' share component

- A total of 48 high security commercial transactions worth \$16,344,000 which was a 0.2% change relative to the prior reporting period were processed during the prior reporting period.
- The average of price per share (volume weighted) for 'High Security' share component has ranged from \$1,315 to \$8,842 (2004–05 to 2021–2022). For the reporting period the volume weighted average price was \$8,842 which is the highest value recorded) (Figure 38). This was an increase of 8% on the prior reporting period.
- For the reporting period the maximum price per share was \$10,000, which is equal to the previous reporting period
- The high security weighted average sale price within the NSW Murray relative to other NSW regulated river water sources selling share in the reporting period is provided in Figure 39.

Conveyance share component

The volume weighted average price for Conveyance share component has ranged from \$1,120 per share to \$3,301, however no trades were processed in the reporting period for this category of licence.

Supplementary' share component

- The average price for 'Supplementary' share component was \$520 per share with a volume weighted average price of \$561 for the period which is the maximum recorded.
- The volume weighted average price ranged from \$100 per share to \$561 (2004–05 to 2021–22). 7 transactions were processed in 2021–22 reporting period.
- The Maximum price in the reporting period was \$600/share

Licence holder dealings (71M)

Commercial trade activity via a change of licence holder dealing (71M) increased in the reporting period relative to the prior year. 35 transactions were processed which moved a total number of 11,450⁷ shares to new holders (Figure 40). Price analysis for 71M has been excluded from this reporting. These dealings are more complex in nature, often subject to bundled land and water purchases or agreements to purchase multiple categories of licence for a nominated value.

⁷ Considers all categories of licence. Only transactions where the total consideration of the dealing exceeds \$1.

Figure 36: NSW Murray commercial share assignments – General Security share

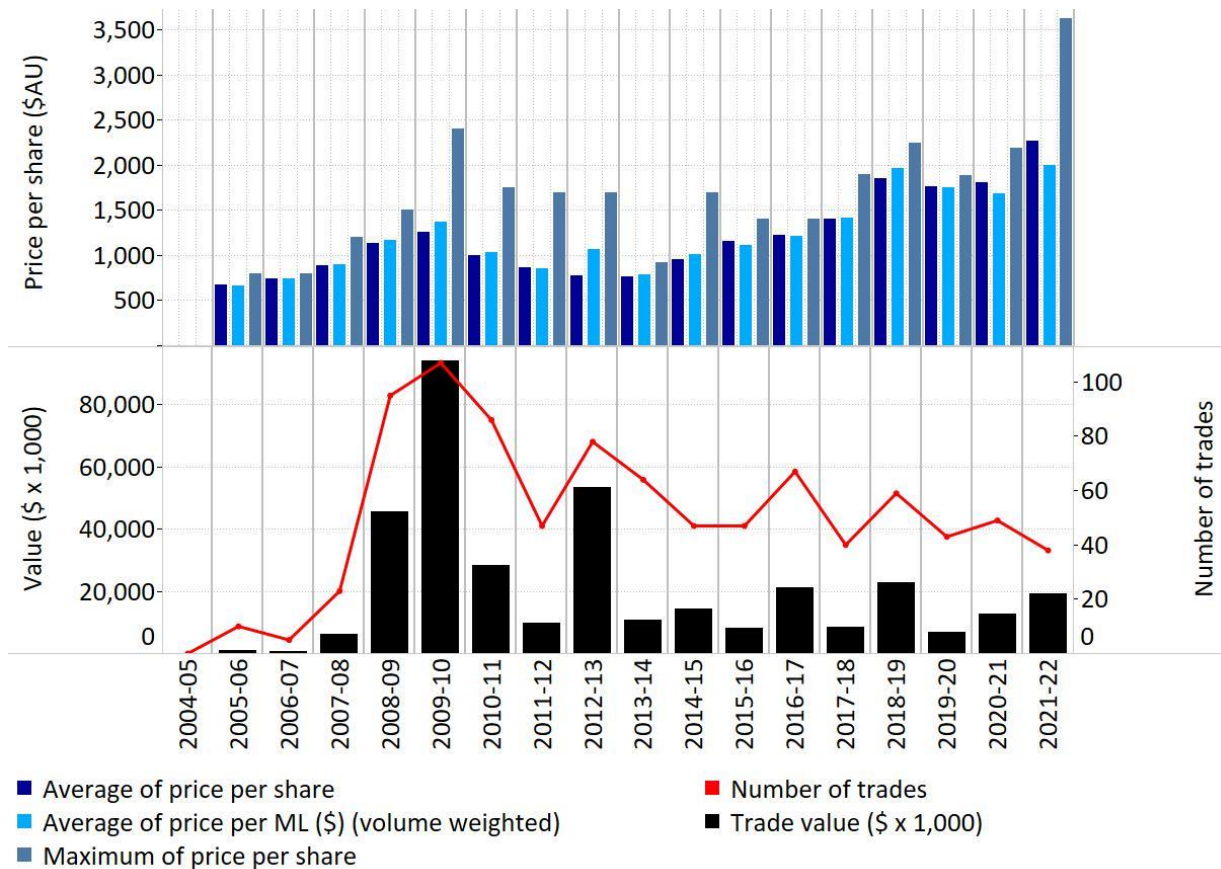


Figure 37: General Security average share price relative comparison for reporting period

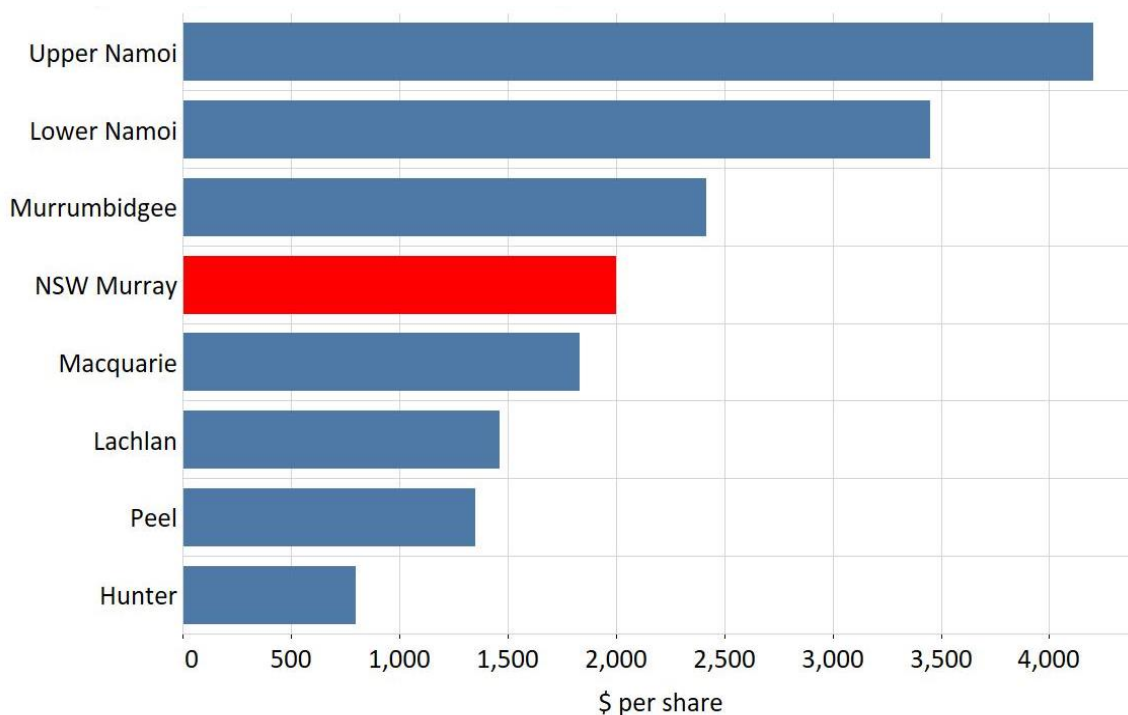


Figure 38: NSW Murray commercial share assignments – High Security share

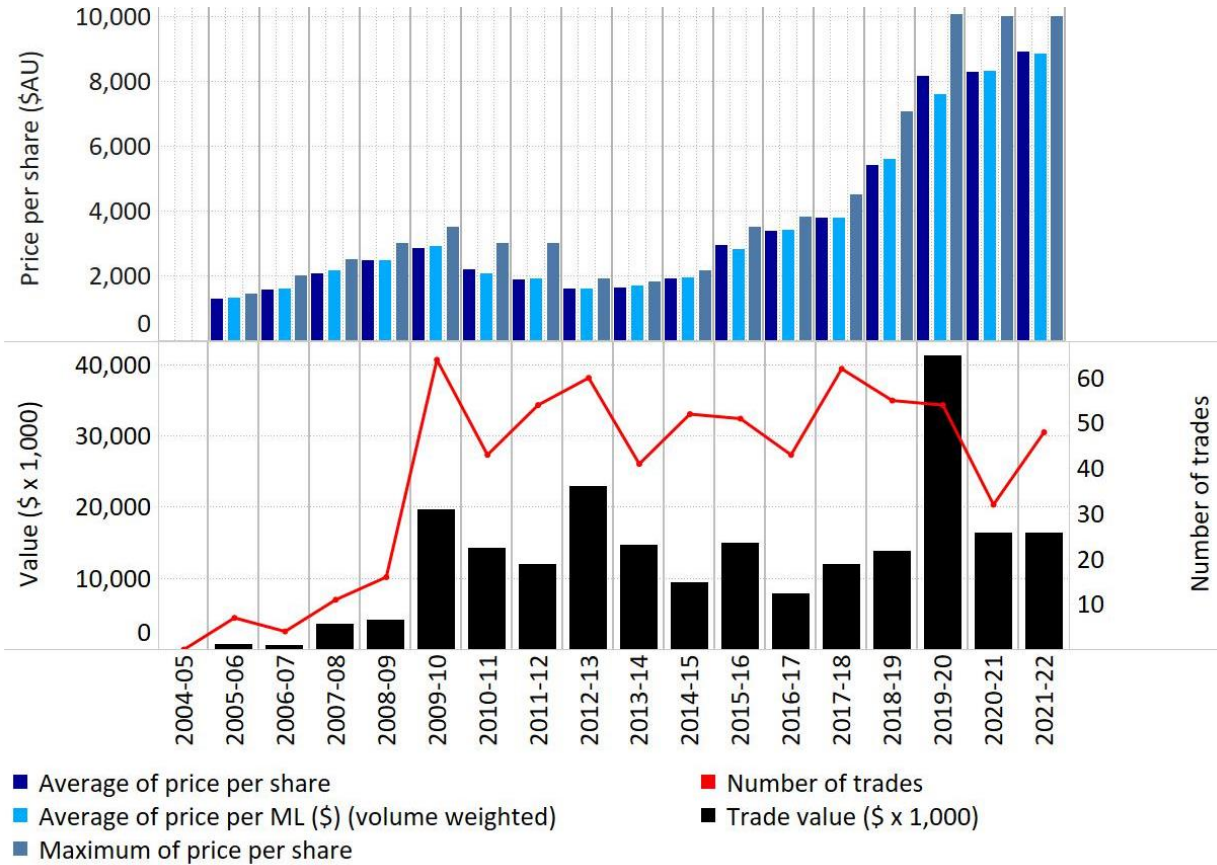


Figure 39: High Security average share price relative comparison for reporting period

Relative average share price 2021-2022 High Security

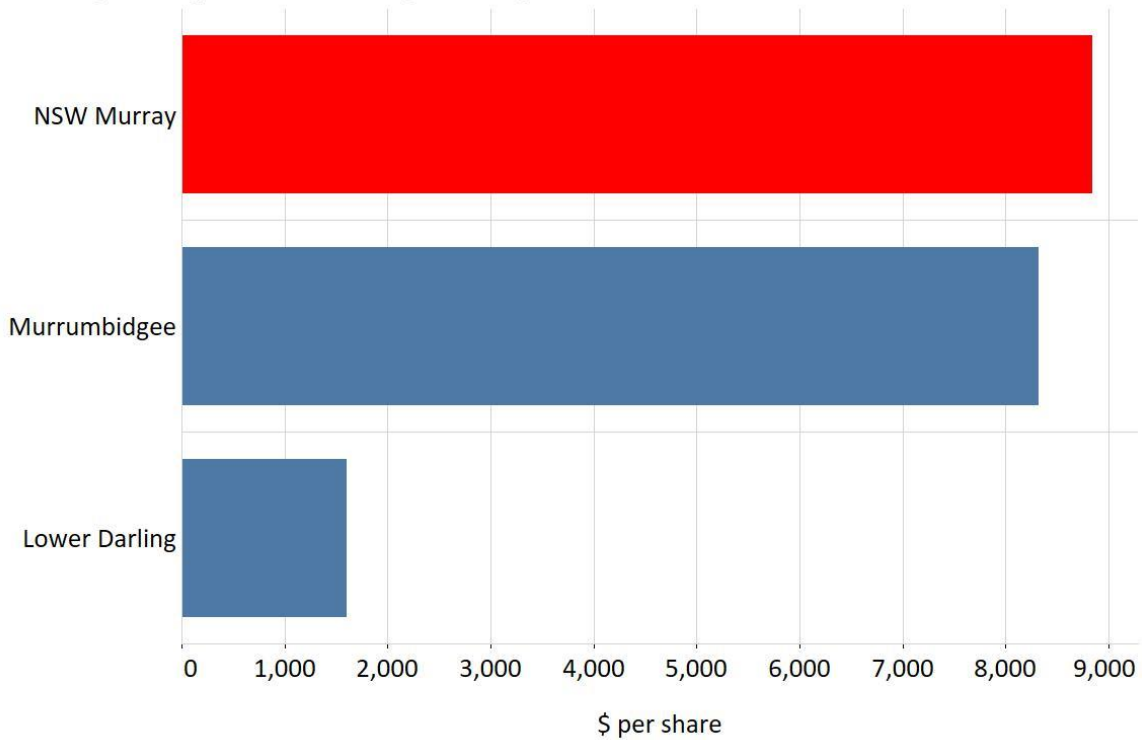
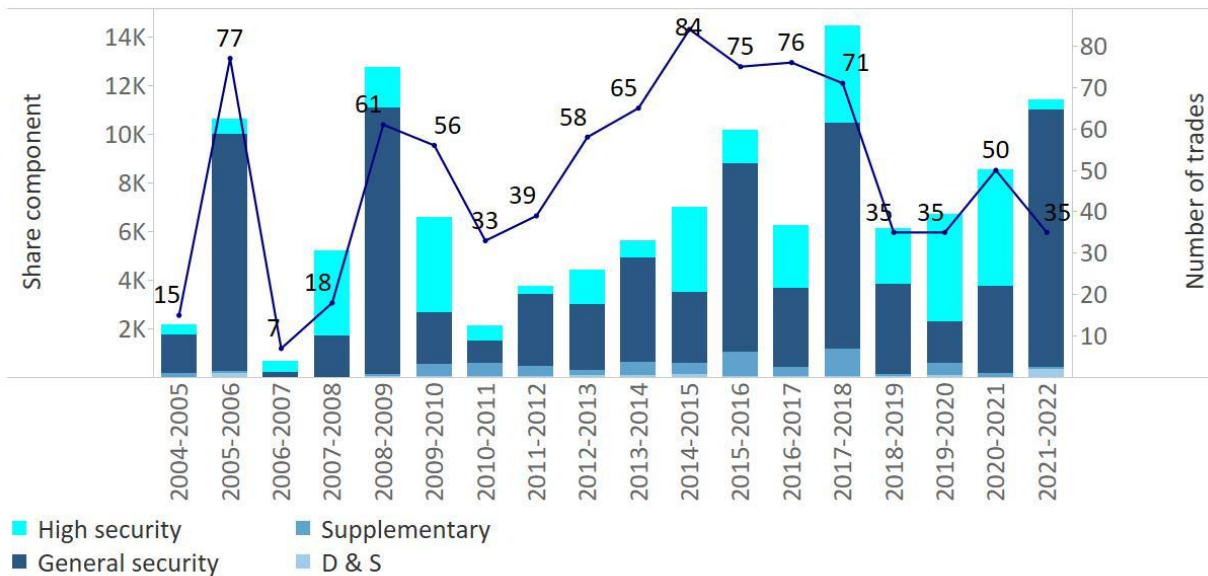


Figure 40: Transfer of licence (change of holder 71M dealing)



Environmental water

Held environmental water

Held environmental water refers to access licences that are managed for the purpose of sustaining and improving environmental outcomes within the system.

- Held environmental water, issued share was unchanged for the reporting period.
- As of 30 June 2022, the total held environmental water portfolio totalled 660,107 shares (Figure 41) consisting of:
 - 50,214 ‘Conveyance’
 - 484,673 ‘General Security’ (including 193,826 within the Murray Irrigation holding)
 - 25,009 ‘High Security’
 - 100,211 ‘Supplementary’.
- Total held environmental water account usage was 267,768 megalitres (Figure 42), the highest since 2017-18.
- Additionally, 35,069 megalitres of held environmental account water was transferred for release in the Snowy River and River Murray increased flow contributions (Figure 43).
- Held environmental utilisation⁸ was 65% for the reporting period, an increase on the previous reporting period. (Figure 44). This analysis excludes environmental water delivered via private landholders through internal trading mechanisms. Significant volumes of allocation was carried forward to the 2022–23 water year (225,367 megalitres)

⁸ Assumed as the amount of usage plus water traded out to external water sources or sold to consumptive holders plus water transferred for release to the Snowy River as a percentage of the effective allocation (carryover plus AWD), plus water traded in from external water sources, or internal consumptive users

- Additional information on held environmental water is available in Note 6 of this GPWAR.

Figure 41: Held environmental water share component in the NSW Murray catchment⁹

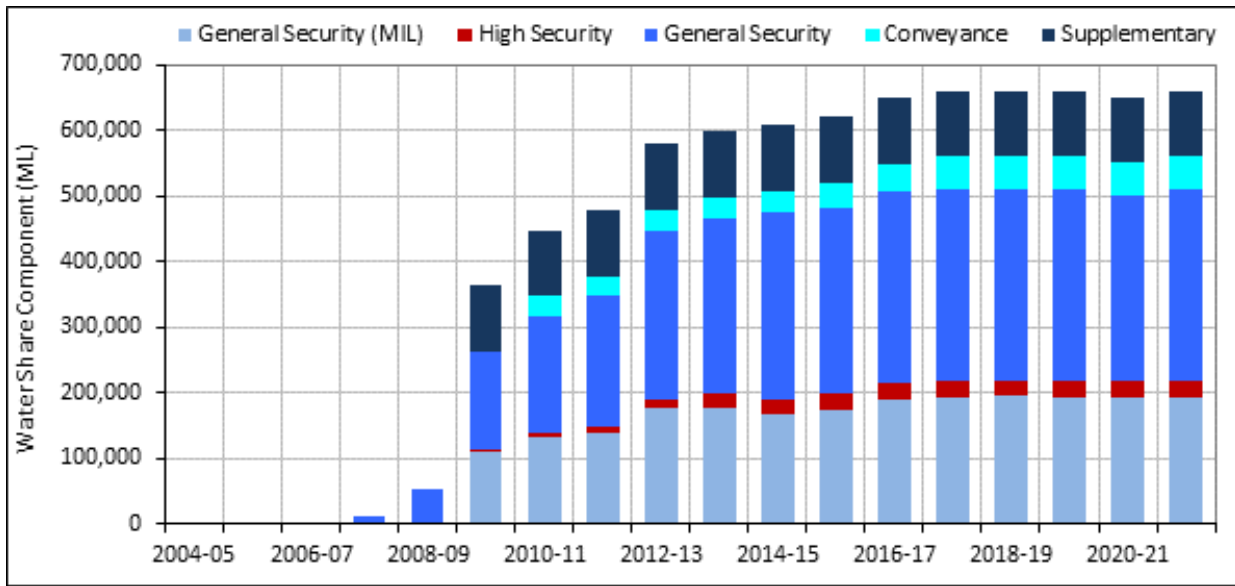
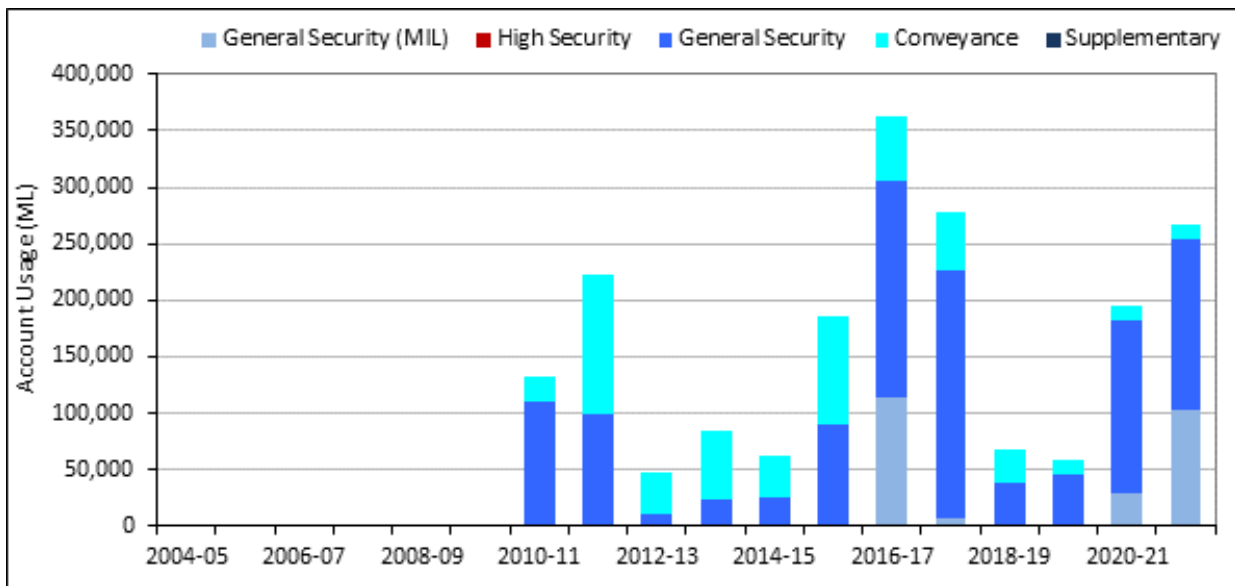


Figure 42: Held environmental usage by licence category since the commencement of the water sharing plan



⁹ General Security (MIL) refers to water held by the Commonwealth within Murray Irrigation Limited and hence is not a separate licence but form part of the MIL general security licence

Figure 43: Held environmental water transferred to the snowy savings program since the commencement of the water sharing plan

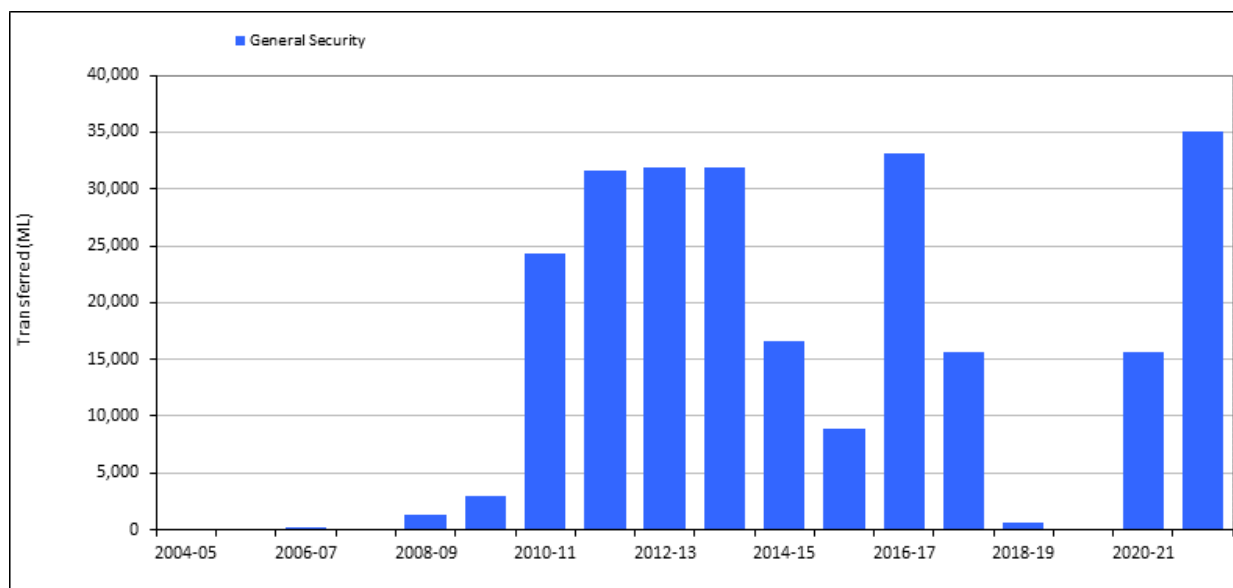
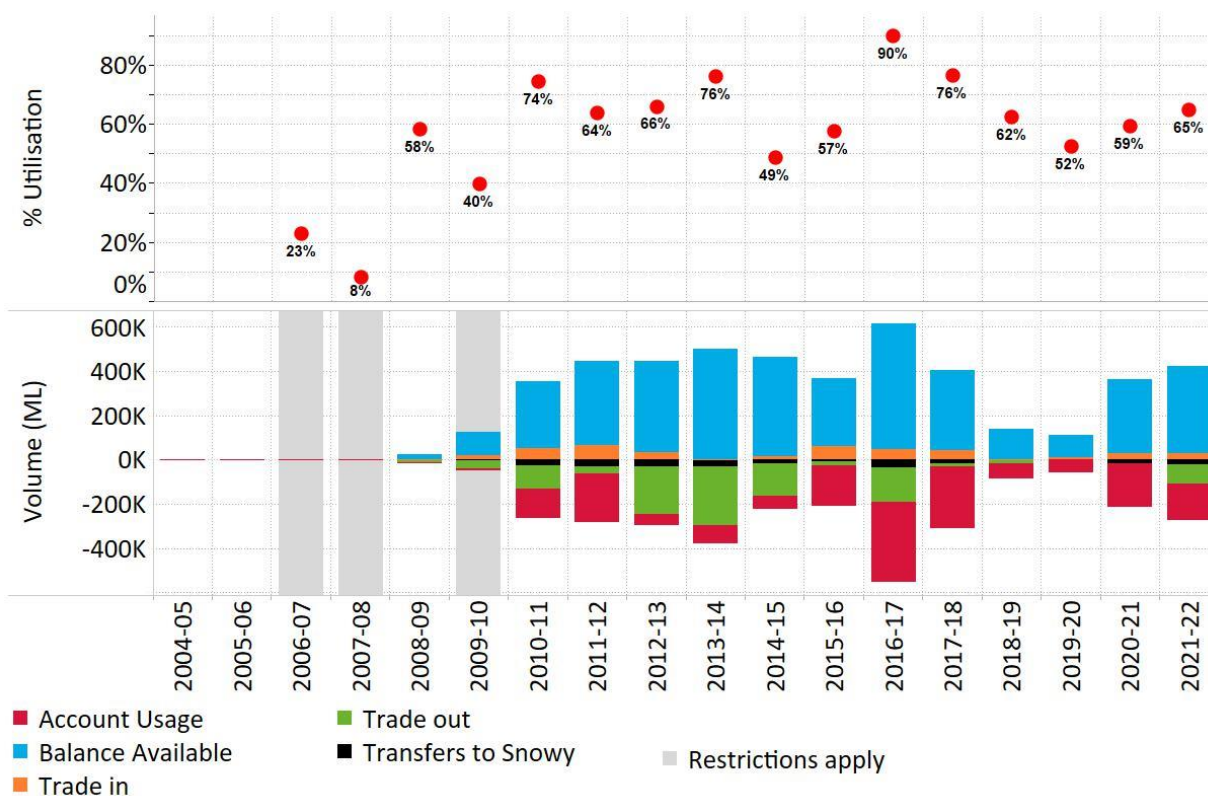


Figure 44: Held environmental utilisation of available water since the commencement of the water sharing plan¹⁰



River Murray Increased Flows

Water savings achieved through the water for rivers program provides up to 70,000 megalitres annually for environmental outcomes in the Murray River system. These annual savings are

¹⁰ Supplementary licences have been excluded. Trade to or from the held environmental water holding within Murray Irrigation between water sources was considered negligible and therefore excluded. Water availability is plotted as carryover volume plus available water determinations for held environmental licences/

collectively managed as 'River Murray Increased Flows' (RMIF). During the reporting period a total of 25,000 megalitres RMIF was released from Hume Dam, targeting multiple environmental outcomes for vegetation within the Barmah National Park, Murray Valley Regional Park and Gulpa Creek. The event was supplemented with both EWA and held environmental allocation.

Planned environmental water

Planned environmental water refers to a range of environmental allowances and provisions that are implemented under the water sharing plan to improve environmental outcomes. Details of these provisions are provided in Note 7 of this GPWAR.

Barmah–Millewa environmental water allowance

Accounting for the Barmah–Millewa environmental water allowance (B-M EWA) during the reporting period is summarised below.

- an opening balance (carryover) of 343,480 megalitres (available)
- credits (allocation) of 75,000 megalitres (withdrawn and moved to borrow account)
- Hume Dam spill forfeits of 168,980 megalitres
- evaporation forfeits of 3,770 megalitres.
- account usage of 47,890 megalitres
- carry-forward volume of 197,840 megalitres.

Access to the water allocated to the B-M EWA may be affected by B-M EWA borrow (see below).

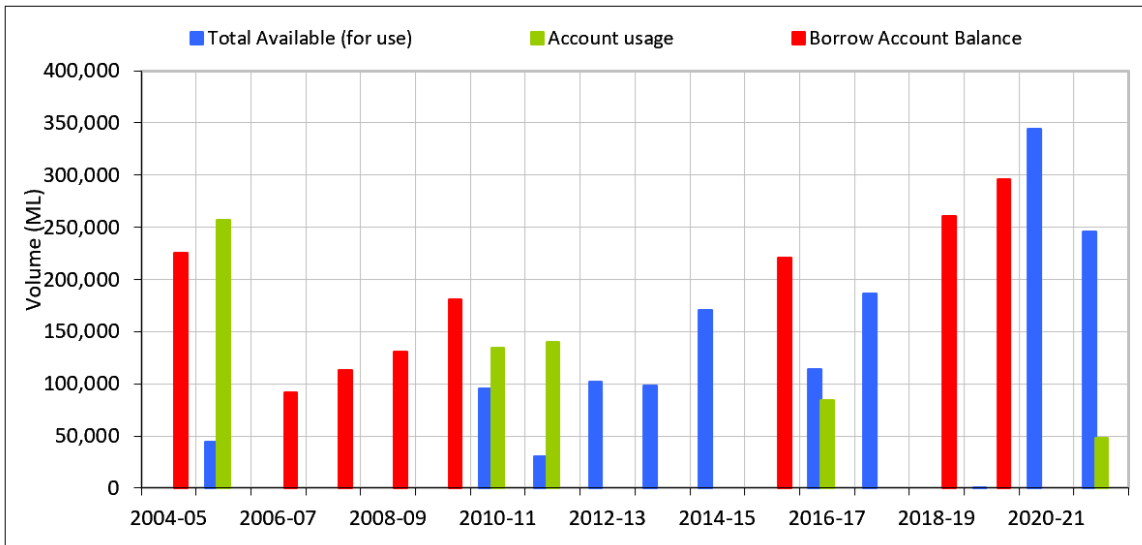
B-M EWA borrow

Provisions in the water sharing plan stipulate that water will be removed from the B-M EWA, when 'General Security' allocations have not reached a target threshold (0.3 megalitres per share or 0.5 megalitres per share) in the plan defined 'exceptional circumstances'. This water is tracked and is to be repaid (in full or progressively depending on the volume exceedance) once the targets are exceeded. As a result, the water available for use in the B-M EWA is dependent on the balance of water withdrawn. For the purposes of this GPWAR, the tracking of this water is referred to as 'borrow'.

- The B-M EWA borrow account commenced with a volume of zero megalitres.
- The B-M EWA borrow account received all B-M EWA account water resulting in a total account borrow of 350,00 megalitres in the reporting period.
- Repayments of 350,000 megalitres occurred in the reporting period with the balance of the borrow account reduced to zero megalitres.

Figure 45 provides a graphical representation of the behaviour of the B-M EWA since the commencement of the water sharing plan. Total water available (for use) is the maximum available throughout the year (may not have occurred until late in the water year). The borrow account balance is presented as of 30 June for each water year.

Figure 45: B-M EWA summary since commencement of the water sharing plan



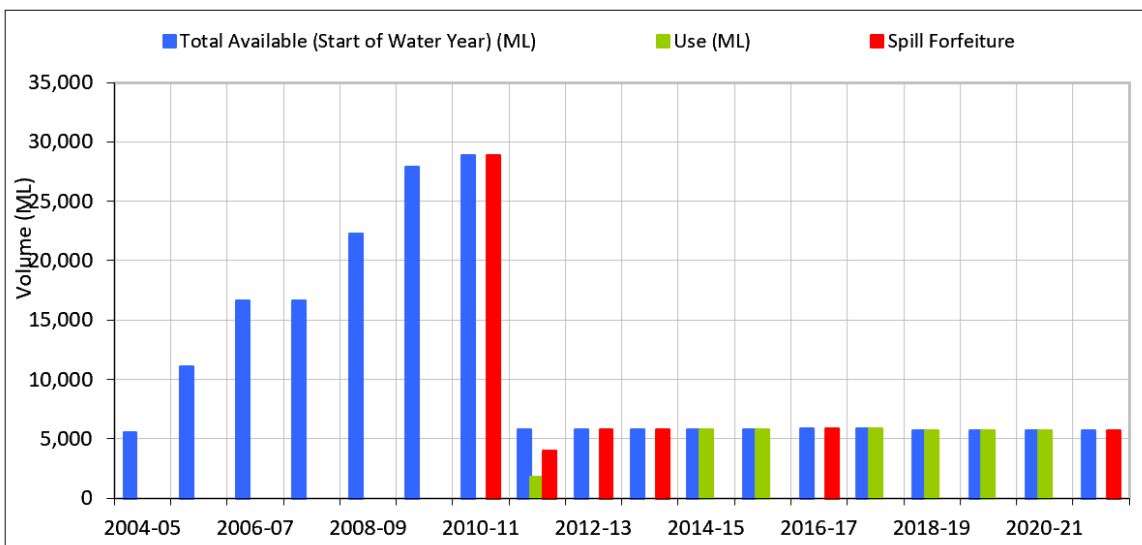
Murray additional allowance

Accounting for the Murray Additional Allowance (MAA) during the reporting period is summarised below.

- an opening balance (carryover) of zero megalitres
- credits (allocation) of 5,691 megalitres
- account usage of zero megalitres
- Hume Dam spill forfeits of 5,691 megalitres
- carry-forward volume of zero megalitres.

Figure 46 provides a graphical representation of the behaviour of the AEA since the commencement of the water sharing plan.

Figure 46: NSW Murray Additional Environmental Allowance summary since commencement of the water sharing plan



Barmah–Millewa overdraw

The Barmah–Millewa overdraw account prescribed under clause 28 of the water sharing plan has not been credited with any water since the commencement of water sharing plan management conditions.

Water accounting statements

Significant water accounting policies

We have prepared the water accounting statements in this GPWAR using an accrual basis of accounting. All figures are in megalitres (ML).

We have excluded the 'Statement of physical flows' for this GPWAR as we have presented all transactions in the statements 'Water assets and liabilities' and 'Changes in water assets and water liabilities'.

We have included a diagram representing the physical movements of water to provide a clearer depiction of the accounting processes associated with physical flow movement.

For a detailed explanation on how to interpret the NSW Department of Planning and Environment water accounting statements refer to *Interpreting New South Wales Office of Water General Purpose Water Accounting Reports*, which is available for download on from the NSW Department of Planning and Environment website (www.industry.nsw.gov.au/water).

Quantification of data

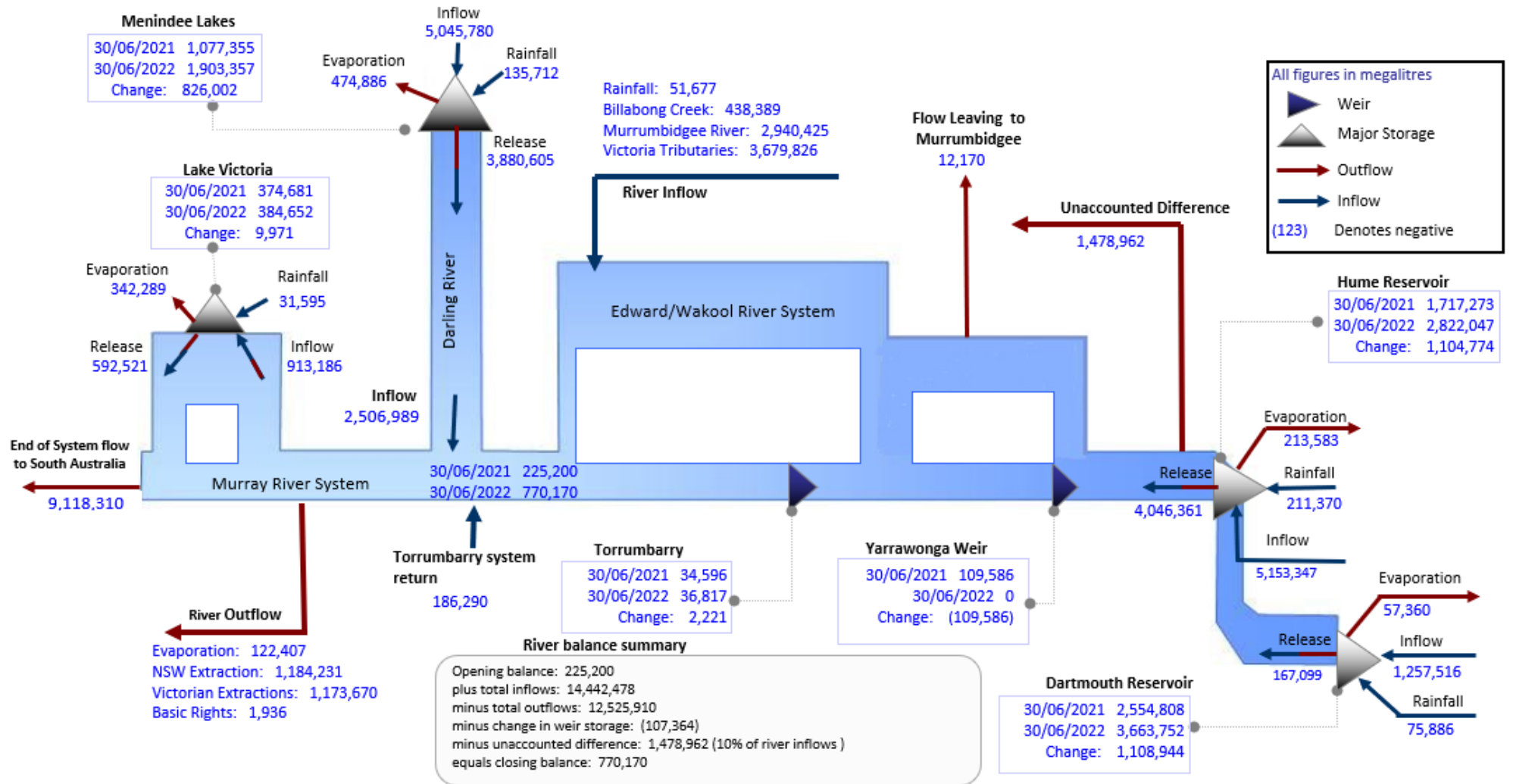
Data accuracy

We have gathered the data used to account for water movement and management from a variety of sources and systems. The data ranges from observed values, where a high accuracy would be anticipated, through to modelled results and estimates, where accuracy can be highly variable depending on a range of factors. To address the inconsistencies in accuracy and prevent misuse of the data in the accounts, we have added an assessment of accuracy to all figures in the water accounting statements (Table 9).

Table 9: Water account data accuracy estimates key

Accuracy	Description
A1	+/- 0% Data is determined rather than estimated or measured. Therefore, the number contains no inaccuracies.
A	+/- 10%
B	+/- 25%
C	+/- 50%
D	+/- 100%

2021-22 Physical flows mass balance diagram



Statement of water assets and liabilities

For the year ended 30 June 2022¹¹

In all tables (..) denotes a negative value.

Surface water assets

1.Surface Water Storage	Accuracy	Notes	30-06-2022	30-06-2021
Dartmouth	A	8	3,663,752	2,554,808
Hume	A	8	2,822,047	1,717,273
Menindee Lakes	A	8	1,901,914	1,075,912
Lake Victoria	A	8	384,652	374,681
Lake Mulwala (Yarrowonga Weir)	A	8	0	109,586
Torrumbarry Weir	A	8	36,817	34,596
Murray Regulated River	A	9	770,170	225,200
Total surface water storage (Asws)	-	-	9,579,352	6,092,055
Change in surface water storage	-	-	3,487,297	1,357,661

2.Claims to water	Accuracy	Notes	30-06-2022	30-06-2021
Intervalley trade account (IVT) (Water owed to the Murray)	A1	5	127,233	92,000
Change in Intervalley trade account	-	-	35,233	86,093

Surface water liabilities

3.Allocation account balances	Accuracy	Notes	30-06-2022	30-06-2021
Domestic And Stock	A1	1	(34)	(19)
Domestic And Stock (Domestic)	A1	1	(2)	(3)
General Security	A1	1	776,898	719,725
High Security	A1	1	(360)	(385)
High Security (Town Water Supply)	A1	1	(0)	0
Local Water Utility	A1	1	0	(0)
Conveyance	A1	1	(0)	0
Total allocation account balances (Lalloc)	-	-	776,502	719,318
Change in allocation accounts	-	-	57,184	368,174

4.Planned environmental water provisions	Accuracy	Notes	30-06-2022	30-06-2021
Additional Environmental Allowance	A1	7	0	0
Barmah Millewa environmental allowance	A1	7	197,840	343,480
Total PEW balances (LPEW)	-	-	197,840	343,480
Change in planned environmental water balances	-	-	(145,640)	49,830

Surface water net changes

5.Total Surface Water Net Changes	30-06-2022	30-06-2021
Net surface water assets (Asws+Aivt-Lalloc-LPEW)	8,732,243	5,121,257
Change in net surface water assets	3,610,985	1,025,751

¹¹ Prior year recalculated and restated since 2020-21 publication. Some minor variation is expected.

Statement of changes in water assets and liabilities

1 July 2021 to 30 June 2022

1. Changes in surface water storage (physical water balance)

Surface Water Storage Inflows	Accuracy	Notes	30-06-2022	30-06-2021
Dartmouth	-	-	-	-
Inflow	A	11	1,257,516	695,469
Rainfall	B	12	75,886	45,299
Hume	-	-	-	-
Inflow (refer to notes for contributing components)	A	10, 11	5,153,347	3,340,275
Rainfall	B	12	211,370	103,491
Menindee Lakes	-	-	-	-
Inflow	A	11	5,045,780	1,127,710
Rainfall	B	12	135,712	51,175
Lake Victoria	-	-	-	-
Inflow	A	12	913,186	1,140,636
Rainfall	B	11	31,595	25,632
River	-	-	-	-
Rainfall	C	13	51,677	32,986
Gauged inflow (including inflow from Lower Darling)	A	14	9,565,629	3,460,878
Inflow other (Torrumbarry system return)	A	14	186,290	185,530
Inflow from storage releases (Hume. Lake Victoria)	A	16	4,638,882	3,698,947
Total Surface Water Storage Increases (Isws)	-	-	27,266,871	13,908,028

Surface Water Storage Outflows	Accuracy	Notes	30-06-2022	30-06-2021
Dartmouth	-	-	-	-
Evaporation	B	12	57,360	52,715
Release (valve/spillway)	A	16	167,099	137,095
Hume	-	-	-	-
Evaporation	B	12	213,583	177,686
Release (valve/spillway)	A	16	4,046,361	2,697,324
Menindee Lakes	-	-	-	-
Evaporation	B	12	474,886	390,749
Release (valve/spillway)	A	1	3,880,605	191,324
Lake Victoria	-	-	-	-
Evaporation	B	16	342,289	392,646
Release (valve/spillway)	A	12	592,521	1,001,623
River	-	-	-	-
Evaporation	C	13	122,407	119,745
Flow leaving (Flow to South Australia)	A	17	9,118,310	3,084,800
Other outflow (Flow to Lake Victoria note 11, Finley Escape note 17)	A	11,17	925,356	1,165,770
Extractions: Access Licences	A	18,19	2,357,901	2,231,838
Extractions: Basic landholder rights	C	21	1,936	1,936
Total Surface Water Storage Decreases (Dsws)	-	-	22,300,612	11,645,251
Unaccounted difference (Outflow) (Usws)	D	23	1,478,962	905,116
Net Surface Water Storage Inflow (Isws-Dsws-Usws)	-	-	3,487,297	1,357,661

2. Changes to claims in water

Increases	Accuracy	Notes	30-06-2022	30-06-2021
Net outflow from Murray to Murrumbidgee (Finley Escape in/Darlot out)	A1	5	0	4,223
Water traded out of Murrumbidgee	A1	5	100,082	323,131
Total IVT account increases (Ipew)	-	-	100,082	327,354

Decreases	Accuracy	Notes	30-06-2022	30-06-2021
IVT clearances from Murrumbidgee (via Balranald or Snowy RAR transfer)	A1	5	0	249,108
Net tagged trade into Murrumbidgee	A1	5	(36,824)	(29,835)
Spill (IVT reset)	A1	5	95,637	0
Water traded into Murrumbidgee	A1	5	6,037	21,988
Total IVT account decrease (Divt)	-	-	64,850	241,260
Net IVT Increase (Ipew-Divt)	-	-	35,233	86,094

3. Changes in allocation accounts

Allocation Account Increases	Accuracy	Notes	30-06-2022	30-06-2021
Available water determination	-	-	-	-
Domestic And Stock	A1	2	13,700	13,736
Domestic And Stock (Domestic)	A1	2	1,299	1,271
Domestic And Stock (Stock)	A1	2	2,063	2,063
Eagle Creek (Temporary Conveyance)	A1	2	0	800
General Security	A1	2	1,121,300	837,050
High Security	A1	2	189,705	184,017
Local Water Utility[Domestic And Commercial]	A1	2	8,694	8,694
High Security (Research)	A1	2	1	1
High Security (Town Water Supply)	A1	2	3,195	3,195
Local Water Utility	A1	2	33,497	33,497
Mathoura (Temporary Conveyance)	A1	2	0	150
Moirra (Temporary Conveyance)	A1	2	0	1,500
Regulated River (High Security)[Community]	A1	2	47	47
Conveyance	A1	2	330,000	229,086
West Cororgan (Temporary Conveyance)	A1	2	0	3,000
Unregulated flow demand	-	-	-	-
Supplementary water	A	23	145,650	98,199
Uncontrolled flow (general security)	A	23	88	17,441
New licence	-	-	-	-
General Security	A1	1	0	0
Assignments in	A1	1, 4	801,544	1,025,736
Total Allocation Account Increases (Iaa)	-	-	2,650,782	2,459,482

3. Changes in allocation accounts (continued)

Allocation Account Decreases	Accuracy	Notes	30-06-2022	30-06-2021
Account usage	-	-	-	-
Domestic And Stock	A1	1,3	8,619	9,026
Domestic And Stock (Domestic)	A1	1,3	886	799
Domestic And Stock (Stock)	A1	1,3	1,255	1,287
Eagle Creek (Temporary Conveyance)	A1	1,3	0	800
General Security	A1	1,3	793,500	652,566
High Security	A1	1,3	114,590	122,290
Local Water Utility[Domestic And Commercial]	A1	1,3	5,817	5,724
High Security (Town Water Supply)	A1	1,3	3,195	3,195
Local Water Utility	A1	1,3	16,581	18,269
Mathoura (Temporary Conveyance)	A1	1,3	0	150
Moirra (Temporary Conveyance)	A1	1,3	0	1,619
Regulated River (High Security)[Community]	A1	1,3	14	24
Conveyance	A1	1,3	292,037	207,505
West Corurgan (Temporary Conveyance)	A1	1,3	0	3,000
Unregulated flow usage	-	-	-	-
Supplementary water	A1	22	145,650	98,199
Uncontrolled flow (general security)	A1	22	88	17,441
Account forfeits	-	-	-	-
Domestic And Stock	A1	1	5,095	4,675
Domestic And Stock (Domestic)	A1	1	410	471
Domestic And Stock (Stock)	A1	1	808	776
General Security	A1	1	231,084	19,548
High Security	A1	1	25,936	6,477
Local Water Utility[Domestic And Commercial]	A1	1	2,877	2,970
High Security (Research)	A1	1	1	1
High Security (Town Water Supply)	A1	1	0	0
Local Water Utility	A1	1	16,276	13,233
Mathoura (Temporary Conveyance)	A1	1	0	0
Regulated River (High Security)[Community]	A1	1	33	23
Conveyance	A1	1	10,740	636
Licence cancelled	-	-	-	-
Domestic And Stock	A1	1	0	36
Domestic And Stock (Domestic)	A1	1	3	2
General Security	A1	1	0	2
High Security	A1	1	0	0
Snowy transfer	-	-	-	-
General Security	A1	1,20	35,069	15,622
Assignments out	A1	1,4	883,035	884,941
Total Allocation Account Decreases (Daa)	-	-	2,593,598	2,091,308
Net Allocation Account Balance Increases (Iaa-Daa)	-	-	57,184	368,174

4. Changes in environmental provisions (see notes for detailed changes)

Increases	Accuracy	Notes	30-06-2022	30-06-2021
Account increases	A1	7	80,691	55,691
Total PEW account increases (lpew)	-	-	80,691	55,691
Decreases	Accuracy	Notes	30-06-2022	30-06-2021
Account usage	A1	7	47,890	5,691
Other account decreases	A1	7	178,441	170
Total PEW account decreases (Dpew)	-	-	226,331	5,861
Net Environmental Contingency Allowance increase (lpew - Dpew)	-	-	(145,640)	49,830

5. Overall changes

5.Total Surface Water Changes	30-06-2022	30-06-2021
Change in Net Surface Water Assets (lsws-Dsws-Usws+livt-Divt-laa+Daa-lpew+Dpew)	3,610,985	1,025,751

Note disclosures

Reconciliation and future prospect descriptions

Reconciliation of change in net water asset to net change in physical water storage ¹²	2021–2022 ML	2020–2021 ML
Change in net surface water assets	3,610,985	1,025,751
Non-physical adjustments	-	-
Net change in allocation accounts (water liability)	57,184	368,174
Net change in environmental provisions (water liability)	(145,640)	49,830
Net change in claims for water: inter-valley (water asset)	(35,233)	(86,093)
Net change in physical surface water storage	3,487,297	1,357,661

Reconciliation of closing water storage to total surface water assets	30 June 2022 ML	30 June 2021 ML
Closing water storage	-	-
Surface water storage	-	-
Hume Dam	2,822,047	1,717,273
Dartmouth Dam	3,663,752	2,554,808
Menindee Lakes	1,901,914	1,075,912
Lake Victoria	384,652	374,681
Less Victorian storage share	(4,481,190)	(2,811,380)
Less South Australian storage share	(336,200)	(386,600)
Total surface water assets (NSW)	3,954,975	2,524,694

¹² Prior year recalculated and restated since 2020-21 publication. Some minor variation is expected.

Water assets available to settle water liabilities and future commitments within 12 months of reporting date

Final datasets for reporting in the GPWAR, including meter readings by field staff, were not available in time to produce an informative 12-month forecast for report users.

In lieu of this, the links below give the latest water availability information for the NSW Murray Regulated River Water Source. This includes carryovers and available water determinations at the time of reporting, along with probability information about the reliability of the Murray River system.

Latest water availability

You can find the latest information on water availability, including water allocation statements, water allocations summaries and the latest available water determinations, on the NSW Department of Planning and Environment webpage at www.industry.nsw.gov.au/water/allocations-availability/allocations

You can also subscribe to receive the latest updates.

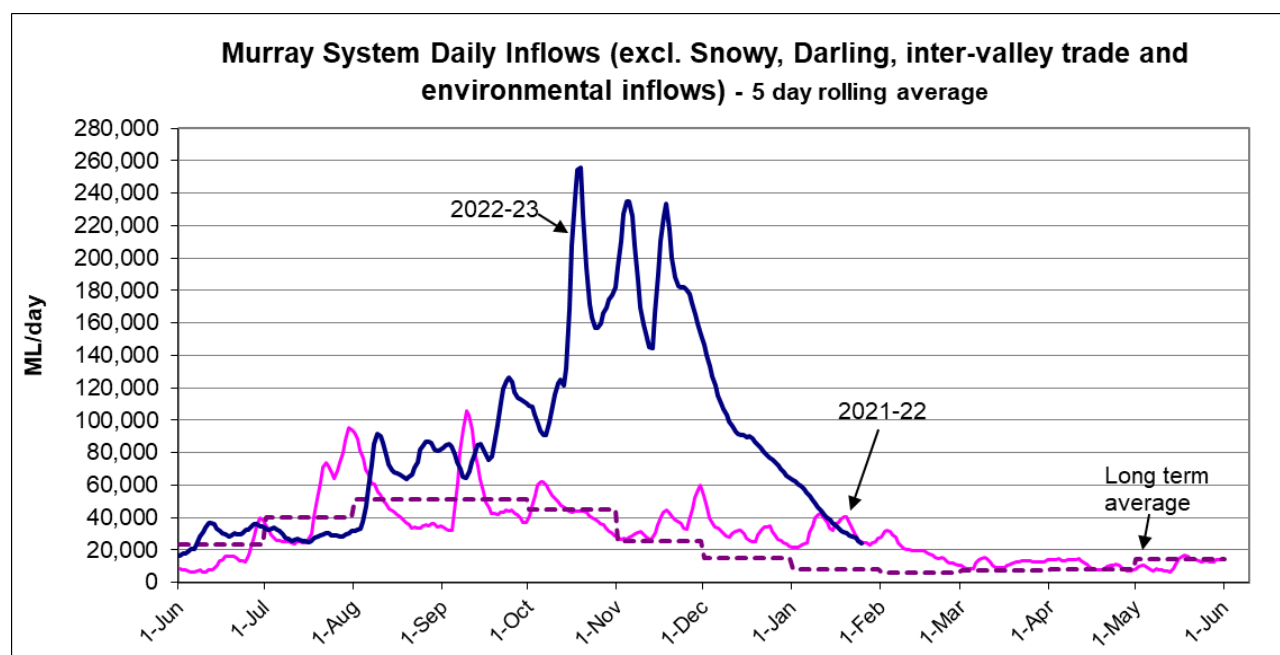
Latest storage volumes

See real-time information on storage volumes for the NSW Murray at realtimedata.waternsw.com.au

Significant events since 2020–21

Since August 2021, Murray System inflows have increased relative to the prior reporting period and have been above long-term average inflows for most months (Figure 47).

Figure 47: Murray system inflows, week ending Wednesday 16 February 2022. Source: River Murray weekly Report for week ending 25th January 2022



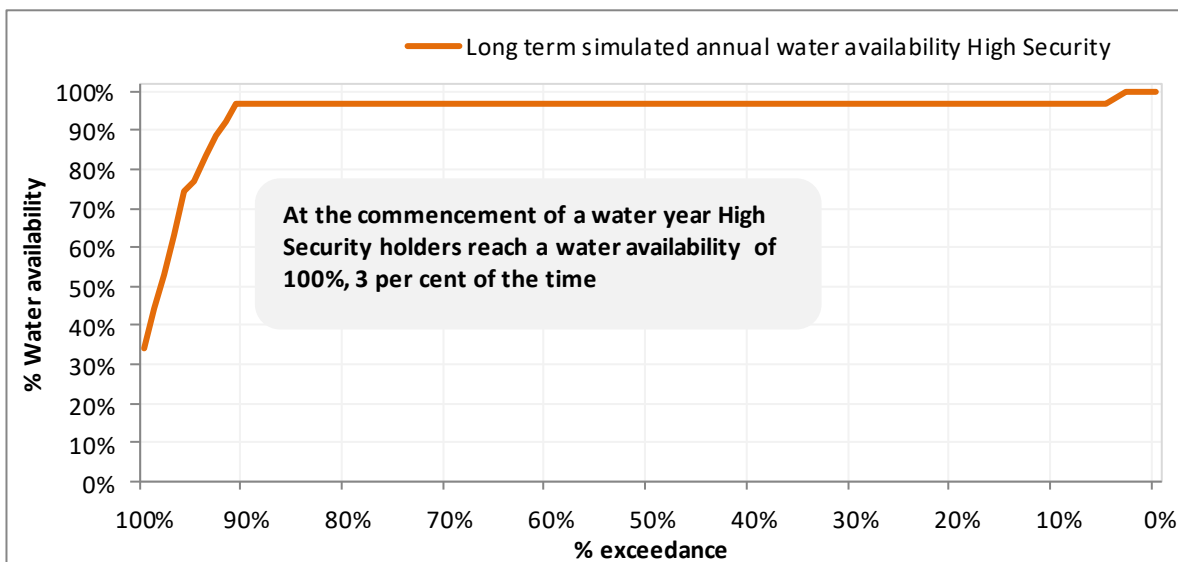
System reliability¹³

The MDBA’s long-term planning model (BIGMOD) reflects water sharing plan management conditions in the NSW Murray. It provides indicative system reliability information for the commencement and closure of a watering season.

In a given year, the simulation indicates high-security entitlements are likely to have full start of year (1 July) allocation of 100% for 3% of the time (and equal or exceed 97% for 90% of the time) (Figure 48). By the end of the water year, effective allocation improves to 97% or greater for 100% of the time, and 100% for 69% of the time (Figure 49).

For general-security holders, long-term opening allocations reach 100% effective allocation just 4% of the time (Figure 50). However, by the end of the water year this significantly increases with 100% of effective allocation achieved 71% of the time (Figure 51).

Figure 48: Start of water year simulated availability for ‘High Security’ licences



¹³ Models used by MDBA and state water agencies are subject to continuous improvements and updates. The reliability described in this report represents the information available when the report was compiled and may vary from reliability computed in the latest version of the models.

Figure 49: End of water year simulated availability for 'High Security' licences

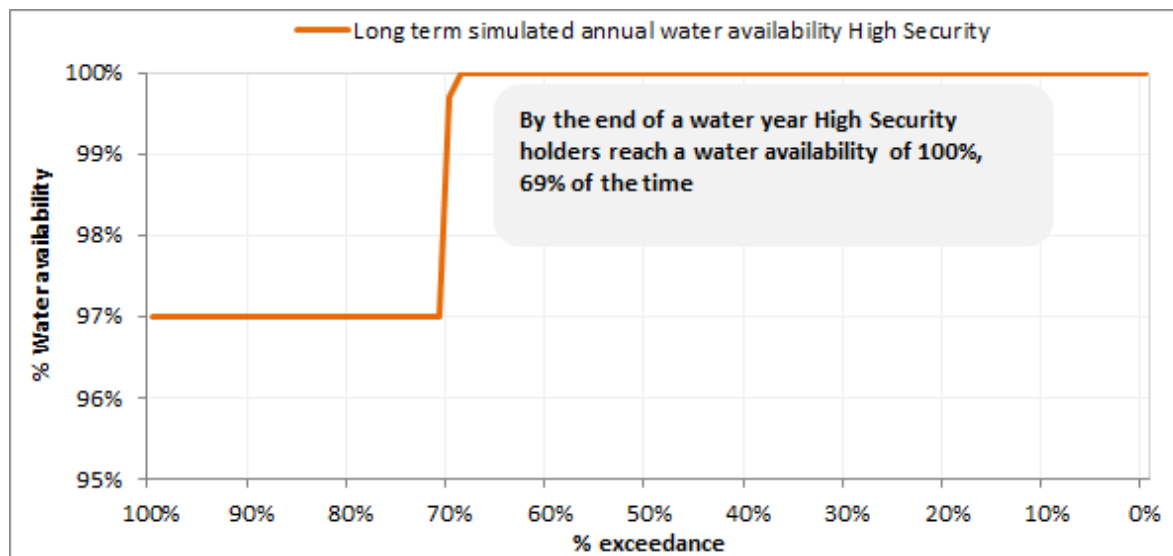


Figure 50: Start of water year availability for 'General Security' licences

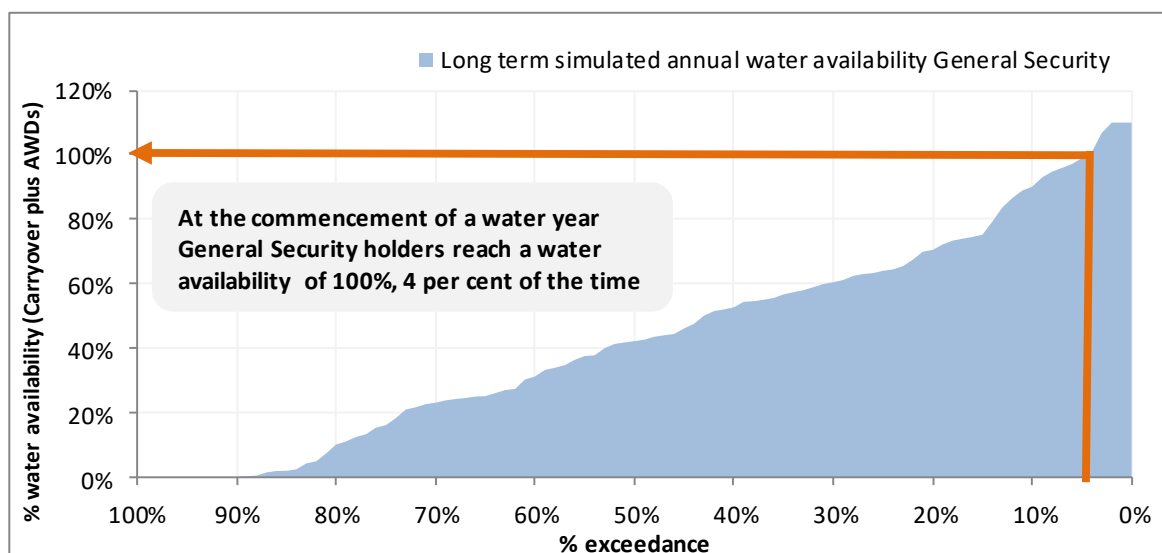
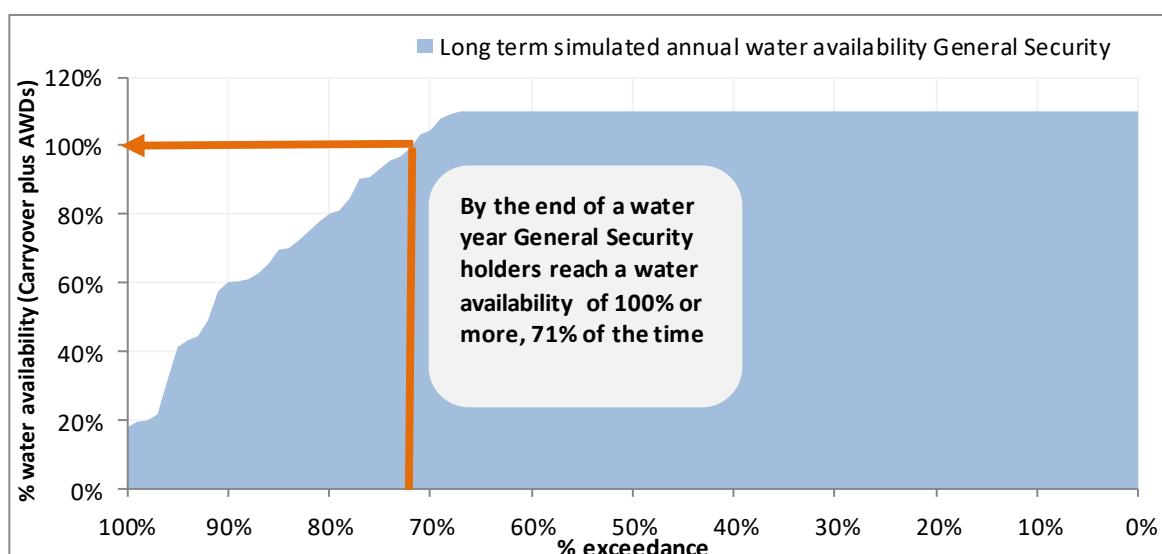


Figure 51: Full year water year availability for 'General Security' licences



Future carryovers and available water determinations 2022–23

Table 10. Carryovers and available water determinations 2022–23 (as of 22 February 2023)

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Avail (ML)	Balance Not Avail (ML)	Balance Total (ML)	Balance Available (%)	Balance Total (%)
Domestic and Stock											
Open	-	13,700	-	-	-	-	-21	0	-21	-0.10%	-0.10%
1-Jul-22	AWD 100.0%	13,700	13,700	13,700	100.00%	100.00%	13,680	0	13,680	99.90%	99.90%
Domestic and Stock [Domestic]											
Open	-	1,298	-	-	-	-	-2	0	-2	-0.20%	-0.20%
1-Jul-22	AWD 100.0%	1,298	1,298	1,298	100.00%	100.00%	1,296	0	1,296	99.80%	99.80%
Domestic and Stock [Stock]											
Open	-	2,063	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	2,063	2,063	2,063	100.00%	100.00%	2,063	0	2,063	100.00%	100.00%
Eagle Creek Temporary Critical Conveyance [Critical Conveyance]											
Open	-	0	-	-	-	-	0	0	0	-	-
Local Water Utility											
Open	-	33,497	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	33,497	33,497	33,497	100.00%	100.00%	33,497	0	33,497	100.00%	100.00%
Local Water Utility [Domestic and Commercial]											
Open	-	8,694	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	8,694	8,694	8,694	100.00%	100.00%	8,694	0	8,694	100.00%	100.00%
Mathoura Temporary Critical Conveyance [Critical Conveyance]											
Open	-	0	-	-	-	-	0	0	0	-	-
Moira Temporary Critical Conveyance [Critical Conveyance]											
Open	-	0	-	-	-	-	0	0	0	-	-
Regulated River (Conveyance)											
Open	-	330,000	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD0.667 ML per Share	330,000	220,110	220,110	66.70%	66.70%	220,110	0	220,110	66.70%	66.70%
15-Jul-22	AWD0.0233 ML per Share	330,000	7,689	227,799	2.30%	69.00%	227,799	0	227,799	69.00%	69.00%
1-Aug-22	AWD0.0077 ML per Share	330,000	2,541	230,340	0.80%	69.80%	230,340	0	230,340	69.80%	69.80%
15-Aug-22	AWD0.302 ML per Share	330,000	99,660	330,000	30.20%	100.00%	330,000	0	330,000	100.00%	100.00%

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Avail (ML)	Balance Not Avail (ML)	Balance Total (ML)	Balance Available (%)	Balance Total (%)
Regulated River (General Security)											
Open	-	1,674,096	-	-	-	-	793,380	0	793,380	47.40%	47.40%
1-Jul-22	AWD 0.43 ML per Share	1,674,096	719,870	719,870	43.00%	43.00%	1,513,250	0	1,513,250	90.40%	90.40%
15-Jul-22	AWD 0.06 ML per Share	1,674,096	100,443	820,313	6.00%	49.00%	1,613,693	0	1,613,693	96.40%	96.40%
1-Aug-22	AWD 0.02 ML per Share	1,674,096	33,482	853,795	2.00%	51.00%	1,647,175	0	1,647,175	98.40%	98.40%
15-Aug-22	AWD 0.59 ML per Share	1,674,096	194,699	1,048,494	11.60%	62.60%	1,841,874	0	1,841,874	110.00%	110.00%
Regulated River (High Security)											
Open	-	189,704	-	-	-	-	5,581	0	5,581	2.90%	2.90%
1-Jul-22	AWD 0.97 ML per Share	189,704	184,017	184,017	97.00%	97.00%	189,598	0	189,598	99.90%	99.90%
15-Aug-22	AWD 0.03 ML per Share	189,704	5,688	189,705	3.00%	100.00%	195,285	0	195,285	102.90%	102.90%
Regulated River (High Security) [Community and Education]											
Open	-	47	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	47	47	47	100.00%	100.00%	47	0	47	100.00%	100.00%
Regulated River (High Security) [Research]											
Open	-	1	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	1	1	1	100.00%	100.00%	1	0	1	100.00%	100.00%
Regulated River (High Security) [Town Water Supply]											
Open	-	3,195	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	3,195	3,195	3,195	100.00%	100.00%	3,195	0	3,195	100.00%	100.00%
Supplementary Water											
Open	-	252,579	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 1.0 ML per Share	252,579	252,579	252,579	100.00%	100.00%	252,579	0	252,579	100.00%	100.00%
20-Oct-22	AWD 0.1 ML per Share	252,579	25,258	277,837	10.00%	110.00%	277,837	0	277,837	110.00%	110.00%
West Corugan Temporary Critical Conveyance [Critical Conveyance]											
Open	-	-	-	-	-	-	0	0	0	-	-

Note 1 – Allocation accounts

This note is reference for the volume held in the allocation accounts at the time of reporting and is also relevant for the various processes that occur to either increase or decrease an allocation account throughout the water year.

The volume of water that is in the licence allocation accounts at the time of reporting is a net balance for the relevant licence category and represents that water that can be carried forward to the next water year as dictated by the carryover rules in place for that year or required under the water sharing plan.

A negative number for the carryover figure indicates that more usage has occurred than has been allocated to the account, and the deficit must be carried forward to the next season.

Water that is in the accounts at the end of a water year but is not permitted to be carried over is forfeited and has been represented as a decrease in water liability.

The accounting presented is relevant to licence category and is therefore inclusive of licences held by environmental holders (these are also detailed separately in Note 6).

Data type

Derived from measured and administration data

Policy

Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016

Available on the [NSW Department of Planning and Environment](#) website

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning and Environment)

Methodology

The carryover volume of water in the allocation account for each licence category is determined once all transactions and end of year forfeit rules have been applied. This is a list of typical transactions that can apply to an allocation account:

- available water determination (AWD) (detailed in Note 2)
- allocation account usage (detailed in Note 3)
- forfeiture due to:
 - no or limited carryover being permitted (end of year forfeit)
 - account limit breaches

- evaporation reductions on carryover
- cancellation of licence
- trade of allocation water between accounts (detailed in Note 4)
- determined carryover volume
- transfer Snowy water savings (detailed in Note 20).

Additional information

Table 12 provides a balanced summary of the water allocation accounts for each category of access licence. Table 11 provides a description of each of the table components.

Table 11: Explanatory information for allocation and environmental account summaries in Table 12 and Table 20.

Heading	Description
Share	The total volume of entitlement in the specific licence category on the specified date
Opening balance	Volume of water that has been carried forward from previous years allocation account
AWD	Available water determination: The total annual volume of water added to the allocation account as a result of allocation assessments This figure includes additional AWD made as a result of a storage spill reset as defined in the water sharing plan.
Lic New	Licences – New: Increase in account water as a result of the issuing of a new licence
Lic Can	Licences – Cancelled: Decrease in account water as a result of a license cancellation where account balance has not been traded to another license
Asn In	Assignments – In: Increase in account water as a result of temporary trade in
Asn Out	Assignments – Out: Decrease in account water as a result of temporary trade out
Transfer Snowy	Transfer Snowy water savings: An adjustment to account water as a result of Snowy water savings projects, with all water held in assigned Snowy environmental licences on 31 January transferred to Snowy Hydro to be used in planning
Usage	Account usage: Volume of water that is extracted or diverted from the river and is accountable against the access license allocation
UCF	Uncontrolled extractions: Volume of water that is extracted under high-flow conditions that is not accountable against the licence This differs from Supplementary water in that it becomes accountable once specific allocation levels are exceeded.
During year forfeit	Account water forfeited throughout the year as a result of the accounting rules specified in the water sharing plan Forfeited water may occur due to account limits being reached, conversions between license categories and various types of other license dealings. It also includes any reductions on carryover volumes due to storage evaporation as required by the water sharing plan.
EoY forfeit	End of year forfeit: Account water that is forfeited at the end of the water year as a result of carryover rules that restrict the carry forward volume
EoY Avail	End of year balance – Available: Account balance that is available to be taken at the conclusion of the water year
EoY NA	End of year balance – Available – Not available: Account balance that is not available to be taken at the conclusion of the water year
Carry fwd	Carry forward: Represents the account water that is permitted to be carried forward into the next water year as determined by the carryover rules
()	Negative figures are shown in red brackets

Table 12: Allocation account balance summary for the NSW Murray regulated river 2021–22. See Table 11 for explanation of headings.

Licence category	Share 30 June 2022	Opening Balance	AWD	Lic New	Lic Can	Asn In	Asn Out	Snowy savings	Usage	UCF	During year forfeit	EoY Avail	EoY NA	EoY forfeit	Carry fwd
Domestic And Stock	13,700	(19)	13,700	0	0	0	0	0	8,619	0	0	5,062	0	5,095	(34)
Domestic And Stock (Domestic)	1,298	(3)	1,299	0	3	0	0	0	886	0	0	407	0	410	(2)
Domestic And Stock (Stock)	2,063	0	2,063	0	0	0	0	0	1,255	0	0	808	0	808	0
Local Water Utility [Domestic and Commercial]	8,694	0	8,694	0	0	0	0	0	5,817	0	0	2,877	0	2,877	0
Local Water Utility	33,497	0	33,497	0	0	0	640	0	16,581	0	0	16,276	0	16,276	0
Conveyance	330,000	0	330,000	-	-	46,033	73,257	0	292,037	0	0	10,740	0	10,740	0
General Security	1,674,046	734,390	1,106,634	391	446	675,966	680,439	35,069	793,500	88	0	1,042,997	0	231,029	776,899
High Security	189,704	(385)	189,705	-	-	79,545	128,699	0	114,590	0	0	25,576	0	25,936	(360)
High Security (Research)	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0
High Security (Town Water Supply)	3,195	0	3,195	0	0	0	0	0	3,195	0	0	(0)	0	0	(0)
Regulated River (High Security) [Community]	47	0	47	0	0	0	0	0	14	0	0	33	0	33	0
Eagle Creek (Temporary Conveyance)	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mathoura (Temporary Conveyance)	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moira (Temporary Conveyance)	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Corugan (Temporary Conveyance)	3,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Supplementary Water	252,579	0	252,579	0	0	7,057	7,540	0	0	145,650	0	106,446	0	106,446	0

Note 2 – Available water determination (allocation announcement)

This is the process by which the regulated surface water asset available for use within the regulated system is determined and shared. It calculates the volume of water added to an individual's licence allocation account. Announcements of allocations are made on a seasonal basis – usually corresponding with the financial year – and are updated on a regular basis or following significant inflow events. Under the *Water Management Act 2000* the announcements are termed 'available water determinations' (AWD).

Data type

Derived from measured data

Policy

- *Water Management Act 2000* (NSW)
 - Chapter 3 – Part 2 Access Licences
 - Clause 59 – Available Water Determinations
- Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016
 - Part 7 – Limits to the availability of water
 - Division 2 – Available Water Determinations.

Available on the NSW Department of Planning and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Methodology

The AWD procedure itself is generally divided into two sections: the available water asset; and system commitments. Once we have allowed for the required system commitments, the remaining water asset is available for distribution to the access licence categories in order of priority (Table 13).

Announcements are expressed as either a percentage of the share component for all access licences, where share components are specified as megalitres per year, or megalitres per unit share for all regulated river (high security) access licences, regulated river (general security) access licences and supplementary water access licences.

Table 13: Priority of access licence categories

Licence category	AWD priority
General Security	Low
High Security	High
Conveyance	Low
Domestic and Stock ¹⁴	Very high
Local Water Utility	Very high

Available water asset: This is calculated by summing the water currently available in storage, future (minimum) inflows to the system, and additional volumes due to recessions of inflows from the current levels to the minimum inflow levels. Also taken into consideration is the reduction of the total inflows to the system for those that arrive too late in the season to be useful.

System Commitments: This is an assessment of the existing commitments that have to be delivered from the available water asset in either the current or future years. Key components include:

- **essential supplies** such as town water supplies, stock and domestic requirements, industrial use and permanent plantings (e.g. orchards, vineyards) and environmental allowances
- **undelivered account water**, which is water already allocated to accounts but yet to be provided
- **end-of-system flow requirement**, which is an estimate of the flow that passes through the system as a result of its operation
- **losses**, which are estimated as the amount of water that will be lost by the system either through evaporation or in the process of delivering the water via transmission losses.

Available water determinations are limited to an equivalent volume of 100% of share component (entitlement) for all categories other than general security. The sum of available water determinations for general-security holders cannot exceed 1.1 megalitres per share.

Additional information

Table 15 presents the allocation summary report for the reporting period. Table 14 describes the terms used in the allocation summary report.

¹⁴ Domestic and Stock is further broken down into three sub-categories: Domestic and Stock, Domestic and Stock (Domestic) and Domestic and Stock (Stock). For the purposes of this report and the general-purpose water account, they were all treated as Domestic and Stock.

Table 14: Allocation summary report notes

Report heading	Description
Opening	Remaining allocation account balances at the conclusion of the previous season that is allowed to be carried forward to this season
Individual announcement	Actual announcement made to each licence category
Share component (Entitlement)	Sum of the licensed volume of water within the licence category on the announcement date
Allocation announced volume	Volume of water credited to accounts within a licence category as a result of the announcement made
Allocation cumulative announced volume	Cumulative total of the announced volumes for the water year and licence category
Allocation announced volume % of share	This is the announced volume expressed as a percentage of the entitlement applicable on the particular date
Allocation cumulative announced volume % of share	This is the cumulative total percent (of total entitlement) that has been issued on the announcement date (inclusive)
Account balance available	Sum of water available in allocation accounts that has been made available to be taken during the season
Account balance not available	Water allocated that is not accessible at this point in time
Account balance total	Total balance of accounts (available plus not available)
Account balance available % of share	Account balance available expressed as a percentage of share component
Account balance total % of share	Account balance expressed as a percentage of share component
Supplementary water	Water that is not a stored source of water and is only made available if an uncontrolled flow event occurs

Table 15: Allocation announcements in the reporting period for the NSW Murray regulated river water source

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Avail (ML)	Balance Not Avail (ML)	Balance Total (ML)	Balance Avail (%)	Balance Total (%)
Domestic and Stock											
Open	-	13,700	-	-	-	-	-21	0	-21	-0.10%	-0.10%
1-Jul-22	AWD 100.0%	13,700	13,700	13,700	100.00%	100.00%	13,680	0	13,680	99.90%	99.90%
Domestic and Stock [Domestic]											
Open	-	1,298	-	-	-	-	-2	0	-2	-0.20%	-0.20%
1-Jul-22	AWD 100.0%	1,298	1,298	1,298	100.00%	100.00%	1,296	0	1,296	99.80%	99.80%
Domestic and Stock [Stock]											
Open	-	2,063	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	2,063	2,063	2,063	100.00%	100.00%	2,063	0	2,063	100.00%	100.00%
Eagle Creek Temporary Critical Conveyance [Critical Conveyance]											
Open	-	0	-	-	-	-	0	0	0	-	-
Local Water Utility											
Open	-	33,497	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	33,497	33,497	33,497	100.00%	100.00%	33,497	0	33,497	100.00%	100.00%
Local Water Utility [Domestic and Commercial]											
Open	-	8,694	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	8,694	8,694	8,694	100.00%	100.00%	8,694	0	8,694	100.00%	100.00%
Mathoura Temporary Critical Conveyance [Critical Conveyance]											
Open	-	0	-	-	-	-	0	0	0	-	-
Moira Temporary Critical Conveyance [Critical Conveyance]											
Open	-	0	-	-	-	-	0	0	0	-	-
Regulated River (Conveyance)											
Open	-	-	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 0.667 ML per Share	330,000	220,110	220,110	66.70%	66.70%	220,110	0	220,110	66.70%	66.70%
15-Jul-22	AWD 0.0233 ML per Share	330,000	7,689	227,799	2.30%	69.00%	227,799	0	227,799	69.00%	69.00%
1-Aug-22	AWD 0.0077 ML per Share	330,000	2,541	230,340	0.80%	69.80%	230,340	0	230,340	69.80%	69.80%
15-Aug-22	AWD 0.302 ML per Share	330,000	99,660	330,000	30.20%	100.00%	330,000	0	330,000	100.00%	100.00%

Date	Individual Announcement	Share Component	Allocation Volume (ML)	Cumulative Volume (ML)	Allocation Volume (%)	Cumulative Volume (%)	Balance Avail (ML)	Balance Not Avail (ML)	Balance Total (ML)	Balance Avail (%)	Balance Total (%)
Regulated River (General Security)											
Open	-	1,674,096	-	-	-	-	793,380	0	793,380	47.40%	47.40%
1-Jul-22	AWD 0.43 ML per Share	1,674,096	719,870	719,870	43.00%	43.00%	1,513,250	0	1,513,250	90.40%	90.40%
15-Jul-22	AWD 0.06 ML per Share	1,674,096	100,443	820,313	6.00%	49.00%	1,613,693	0	1,613,693	96.40%	96.40%
1-Aug-22	AWD 0.02 ML per Share	1,674,096	33,482	853,795	2.00%	51.00%	1,647,175	0	1,647,175	98.40%	98.40%
15-Aug-22	AWD 0.59 ML per Share	1,674,096	194,699	1,048,494	11.60%	62.60%	1,841,874	0	1,841,874	110.00%	110.00%
Regulated River (High Security)											
Open	-	189,704	-	-	-	-	5,581	0	5,581	2.90%	2.90%
1-Jul-22	AWD 0.97 ML per Share	189,704	184,017	184,017	97.00%	97.00%	189,598	0	189,598	99.90%	99.90%
15-Aug-22	AWD 0.03 ML per Share	189,704	5,688	189,705	3.00%	100.00%	195,285	0	195,285	102.90%	102.90%
Regulated River (High Security) [Community and Education]											
Open	-	47	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	47	47	47	100.00%	100.00%	47	0	47	100.00%	100.00%
Regulated River (High Security) [Research]											
Open	-	1	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	1	1	1	100.00%	100.00%	1	0	1	100.00%	100.00%
Regulated River (High Security) [Town Water Supply]											
Open	-	3,195	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 100.0%	3,195	3,195	3,195	100.00%	100.00%	3,195	0	3,195	100.00%	100.00%
Supplementary Water											
Open	-	252,579	-	-	-	-	0	0	0	0.00%	0.00%
1-Jul-22	AWD 1.0 ML per Share	252,579	252,579	252,579	100.00%	100.00%	252,579	0	252,579	100.00%	100.00%
20-Oct-22	AWD 0.1 ML per Share	252,579	25,258	277,837	10.00%	110.00%	277,837	0	277,837	110.00%	110.00%
West Corugan Temporary Critical Conveyance [Critical Conveyance]											
Open	-	0	-	-	-	-	0	0	0	-	-

Note 3 – Allocation account usage

This is the volume of water that is extracted, diverted or measured as usage and is accountable against an access licence issued under the water sharing plan.

Data type

Measured/administration data

Policy

Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment, MDBA

Data source

- Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning and Environment)
- MDBA: Murray MDBA Monthly Report

Methodology

Usage information is determined by either on-farm meters that measure extraction, gauges on diversion works or orders/releases when the volume cannot be effectively metered, such as an environmental watering event.

Meter readings are collected for individual licence holders at intervals during the year and converted via a calibration factor to a volume of water extracted. Water diverted from the river is measured by recording the height at either the gauge or weir with the volume diverted being derived by passing these heights through a rating table. With potentially multiple categories of access licences being extracted through the same pumps, additional information and methodologies are required to separate use under the various licence categories. This includes:

- usage based on periods of announcement – during periods of supplementary water announcements extractions can be debited against the supplementary water licences
- usage based on water orders – users place orders for water against an access licence and usages are debited against accounts in proportion to the orders placed
- licence category apportionment – if no water orders are available, water extracted is apportioned against categories of access licence in order of priority are presented in Table 16. The prioritising is based on the nature of and rules around each of the licence categories.

Victorian account usage is obtained from the MDBA monthly reports.

Table 16: Licence category metered usage apportionment table

Priority	Surface water
1	Supplementary
2	Uncontrolled Flow
3	Domestic and Stock
4	Regulated River High Security
5	Regulated River General Security
6	Conveyance
7	Local Water Utility
8	Major Water Utility

Additional information

A summary of account usage for the reporting period is presented in Table 17.

Table 17: Account usage summary

Licence category	Account usage NSW Murray by licence category (ML)	Total account usage Victoria (ML)
Domestic and Stock	8,619	not applicable
Domestic and Stock [Domestic]	886	not applicable
Domestic and Stock [Stock]	1,255	not applicable
Eagle Creek Temporary Critical Conveyance [Critical Conveyance]	0	not applicable
Local Water Utility	16,276	not applicable
Local Water Utility (Domestic and Commercial)	2,877	not applicable
Mathoura Temporary Critical Conveyance [Critical Conveyance]	0	not applicable
Moira Temporary Critical Conveyance [Critical Conveyance]	0	not applicable
West Corugan Temporary Critical Conveyance [Critical Conveyance]	3,000	not applicable
Conveyance	292,037	not applicable
General Security ¹⁵	652,566	not applicable
High Security	122,290	not applicable
High Security (Community and Education)	14	not applicable
High Security (Research)	0	not applicable
High Security (Town Water Supply)	3,195	not applicable
Supplementary Water	145,650	not applicable
Total Usage	1,382,231	1,173,670

¹⁵ Excludes uncontrolled flow extractions as are not debited against an account

Note 4 – Account water trading (allocation assignments)

This represents the temporary trading (allocation assignments) of water between allocation accounts within the regulated NSW Murray water source and between the NSW Murray licence holders and holders in external water sources.

Data type

Administration

Policy

- Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016
 - Part 10 Access licence dealing rules
 - Clause 58 Assignment of rights dealings
 - Clause 61 Assignment of water allocation dealings
 - Clause 62 Interstate access licence transfer and assignment of water allocation

Available on the NSW Department of Planning and Environment website
www.industry.nsw.gov.au/water

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning and Environment)

Methodology

Trading is permitted between certain categories of access licences and between certain water sources. This is detailed in the water sharing plan or stipulated under the licence holder's conditions.

The net internal trade for each licence category is zero for a water year. As such, trades occur as both a water liability decrease (sellers of water) and a water liability increase (buyers of water).

Trade between water sources will either increase the committed liability for the year (trade into the Murray) or decrease the committed liability for the year (trade out of the NSW Murray). The imbalance created from trading to and from the Murray water source is monitored and managed with the inter-valley trade account (see Note 5).

Additional information

Table 18 presents the internal and external trading figures between licence categories and water sources. All figures represent a volume in megalitres.

Table 18: NSW Murray catchment allocation assignment summary

From Water Source – Licence Category	To Murrumbidgee General security	To NSW Murray General security	To NSW Murray High security	To NSW Murray RR conveyance	To NSW Murray Supplementary	To Lower Darling General security	To Lower Darling High security	To S.A Interstate licence	To Victoria Interstate licence	Total
Murrumbidgee – General security	-	59,453	-	-	-	-	-	-	-	59,453
Murrumbidgee – High security	-	10,000	3073	-	-	-	-	-	-	13,073
NSW Murray – General security	5,912	426,593	30,854	27,984	-	33,512	-	27,582	128,003	680,440
NSW Murray – High security	-	39,211	22,645	17,322	-	-	113	14,616	34,792	128,699
NSW Murray – Local Water Utility	-	440	200	-	-	-	-	-	-	640
NSW Murray – RR conveyance	-	30,277	350	-	-	34,550	-	2160	5,920	73,257
NSW Murray – Supplementary	-	-	-	-	7,057	-	-	-	483	7,540
Lower Darling - General security	-	61,923	241	727	-	-	-	-	-	62,891
Lower Darling – High security	-	87	350	-	-	-	-	-	-	437
S.A – Interstate licence	-	1160	2300	-	-	-	-	-	-	3,460
Victoria – Interstate licence	-	46,823	19,531	-	-	-	-	-	-	66,354
Total – Licence Category	5,912	675,967	79,544	46,033	7,057	68,062	113	44,358	169,198	
Murray Total – Internal trade	602,933			Trade out	287,643			Trade in	205,668	

Note 5 – Inter-valley trade account

The inter-valley trade (IVT) account provides an ongoing balance of valley debts and claims for water due to the temporary trading of account water between the southern connected valleys of the Murray–Darling Basin.

For the NSW Murray this is presented in the accounting statements as an asset account whereby a positive balance is indicative of a claim to water (NSW Murray owed water), and a negative balance indicative of a future obligation (NSW Murray owes water).

Data type

Derived from measured data

Policy

- *Water Act 2007* (Cwlth)
 - The Murray–Darling Basin Agreement (Schedule 1) – Transferring Water Entitlements and Allocations (Schedule D)
- *Water Management Act 2000* (NSW)
 - Dealings with access licences (Division 4)
 - 71T Assignment of water allocations between access licences
 - 71V Interstate assignment of water allocations
- Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016
 - Part 10 Access licence dealing rules
 - Clause 61 Assignment of water allocation dealings
 - Clause 62 Interstate access licence transfer and assignment of water allocation

Available on NSW Department of Planning and Environment website
(www.industry.nsw.gov.au/water)

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

WaterNSW

Data Sources

- Provided spreadsheet
- Water Accounting System

- HYDSTRA

Methodology

The balance of the IVT account is calculated by adjusting the carried forward balance of the IVT account from the previous year and applying a series of transactions (described in the additional information section below). A positive balance indicates that the Murrumbidgee owes water to the Murray System while a negative balance indicates that Murray system owes water to the Murrumbidgee System.

Additional information

The IVT trade balance summary table presented in Table 19 provides information compiled from the best information available at the time of publication. These figures may change in the future as updated information becomes available. All figures are in megalitres.

Notes on Table 19 – IVT accounting descriptions

- (1) The volume of water traded into the Murrumbidgee Valley from the NSW Murray, NSW Lower Darling, Victoria or South Australia will result in the Murray IVT being decreased.
- (2) The volume of water traded out of the Murrumbidgee Valley to the NSW Murray, NSW Lower Darling, Victoria or South Australia will result in the Murray IVT being increased.
- (3) The MDBA requests that NSW deliver a proportion of the water that was traded to users outside of the Murrumbidgee. NSW supplies the requested volume and accounts for it by calculating the resulting additional volume of water passing the Murrumbidgee River at Balranald. The accounted volume supplied is agreed between WaterNSW and MDBA, and the Murray IVT account is decreased accordingly.
- (4) On occasion, Snowy Hydro Limited may be requested to transfer a portion of either the Murrumbidgee or Murray required annual release (RAR) to assist with the settlement of the IVT account when it gets too far out of balance (although there is no legal obligation on it to perform such releases). These are often referred to as 'notional' releases. The following points illustrate this process:
 - Excessive Trade from Murrumbidgee to Murray creates a need to transfer Murrumbidgee RAR via the Murray development thus decreasing the Murray IVT account (reducing Murrumbidgee debt to Murray).
 - Excessive trade from Murray to Murrumbidgee creates a need to transfer Murray RAR via the Murrumbidgee development thus increasing the Murray IVT account (reducing Murray debt to Murrumbidgee).
- (5) Tagged trading is a dealing that occurs when a licence holder within a valley nominates to extract their allocation for that licence from a different water source. Any water delivered to a point of extraction within the Murrumbidgee to meet allocation associated with another water source results in a decrease to the Murray IVT.
- (6) During periods of high summer demand, transfers of water can occur from the Murray to the Murrumbidgee via Murray Irrigation Limited (MIL) infrastructure to bypass delivery constraints that can occur in the Yanco Creek System and the Coleambally Irrigation channel

network. Water passed into the Murrumbidgee via MIL, subject to MIL ability to deliver via their channel system, can help to meet the demands in Billabong Creek. The net change in the IVT as a result is calculated by assessing the difference between the flow diverted from MIL to Billabong Creek (via Finley escape) and the water that leaves the Murrumbidgee via the Billabong Creek at Darlot for the corresponding period (i.e. estimating volume extracted by users on Billabong Creek). This figure is presented as 'Finley borrow' in Table 19.

- When a spill occurs from a Murrumbidgee storage it could be seen as a spill of the IVT or of Murrumbidgee water. The decision as to which spills is currently discretionary. Water managers base this decision on relative water availability in the NSW Murray or Murrumbidgee: if Murrumbidgee had greater availability, it would be deemed more appropriate for the Murrumbidgee water to spill meaning a loss of resource to Murrumbidgee water users; conversely if the Murray had greater availability then a decision to spill the IVT would be made which could result in a loss of resource for the NSW Murray.

Table 19: Murray- Murrumbidgee inter-valley trade account summary

Water year ending 30 June	Starting balance	1. Inter-valley trade – Into Murrumbidgee (1)	2. Inter-valley trade – Out of Murrumbidgee (2)	Inter-valley trade – Net Into Murray	Murrumbidgee IVT acc adj Decreases via Snowy (4)	Murrumbidgee IVT acc adj Via Balranald (3)	Murrumbidgee IVT acc adj Net tagged trade (5)	Murrumbidgee IVT acc adj IVT Spill	Murrumbidgee IVT acc adj Increases Finley borrow (6)	IVT Closing balance
2004-05	0	11,805	3,779	(8,026)	0	4,185	0	0	12,211	0
2005-06	0	16,646	21,748	5,102	0	20,282	0	0	10,162	(5,018)
2006-07	(5,018)	1,209	97,195	95,986	20,000	70,968	0	0	0	0
2007-08	0	2,729	141,825	139,096	0	63,500	0	0	728	76,324
2008-09	76,324	17,223	406,976	389,753	200,000	44,981	0	0	6,245	227,341
2009-10	227,341	55,659	166,443	110,784	200,000	119,567	0	0	5,318	23,876
2010-11	23,876	130,929	180,031	49,102	0	57,751	0	0	12,766	27,993
2011-12	27,993	85,062	151,880	66,818	78,000	12,083	0	0	965	5,693
2012-13	5,693	179,426	234,574	55,148	(39,000)	87,542	200	0	5,049	17,148
2013-14	17,148	59,917	180,850	120,933	0	40,282	0	0	1,389	99,188
2014-15	98,188	94,248	139,893	45,645	0	148,299	(4,605)	0	9,882	11,021
2015-16	11,021	14,059	275,373	261,314	0	202,431	(23,081)	0	3,654	96,638
2016-17	96,638	14,564	48,414	33,850	0	80,000	(37,792)	0	0	88,280
2017-18	88,280	151,138	74,221	(76,917)	0	0	25,151	0	0	(13,788)
2018-19	(13,788)	18,091	54,985	36,894	0	0	5,281	0	583	18,408
2019-20	18,745 ¹⁶	63,386	197,072	133,686	0	156,726	(7,976)	0	2,563	6,244
2020-21	6,244	21,988	323,131	301,143	0	249,108	(29,835)	0	4,223	92,337
2021-22	92,338	6,037	100,082	94,045	0	0	(36,824)	95,637	0	127,570

¹⁶ Adjusting entry applied

Note 6 – Held environmental water

This represents environmental water that is held as part of a licensed volumetric entitlement. These licences are either purchased on the market by environmental agencies or issued as a result of water savings achieved through investment by those relevant agencies.

These licences are held within the same licence categories as all other water access licences hence are subject to the same operating rules. Therefore, they are subject to the following key rules:

- available water determinations (AWD) for their share of the entitlement to be added to accounts
- carryover rules, hence the forfeiting of unused water that cannot be carried over
- provide water orders prior to use.

These licences are used to provide environmental benefit and outcomes to the catchment by either providing water to, or supplementing water requirements of, a specific environmental events or incidents.

Data Type

Measured

Policy

- *Water Management Act 2000*
 - Dealings with access licences (Division 4)
 - 71T Assignment of water allocations between access licences
- Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016

Available on NSW Department of Planning and Environment website (www.industry.nsw.gov.au/water)

Data accuracy

A1 – Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment

Data source

NSW Department of Planning and Environment environmental water portal

Methodology

The water held for the environment represents a volume of water in corresponding allocation accounts. This allocation account represents the sum of the remaining volume of held environmental water at the conclusion of the water year once all transactions and forfeit rules have been applied to the accounts. These environmental balances are at the licence category level and represent the water that can be carried forward for use in the next year. Typical transactions that can apply to an environmental allocation account include:

- AWD (including pro rata of AWD for new licences)
- licensed extractions
- forfeiture due to:
 - carryover rules
 - account spillage as a result of AWD
 - licence conversions
 - excess orders (where water order debiting is in place)
- trade of allocation water between accounts.

In addition, the trade and purchase of environmental water is tracked to capture the movement of environmental entitlement both in number of entitlements and volume.

Additional information

Table 20 provides a summary of held environmental water for the reporting period. Table 11 provides an explanation for each component in the summary report. Table 21 defines change for held environmental water between the current and previous reporting periods.

Table 22 summarises the movement between held environmental water licences and consumptive licences via temporary trading (allocation assignments).

Table 20: NSW Murray regulated water source 2021–22 environmental account balance summary. See Table 11 for explanation of headings.

Category	Share	Opening balance	AWD	Lic New	Lic Can	Ass In	Ass Out	Transfer Snowy	Acc. usage	During year forfeit	EoY Avail	EoY NA	EoY forfeit	Carry fwd
Conveyance	50,214	0	50,214	0	0	46,033	73,257	0	12,251	0	0	10,740	0	10,740
General Security	484,673	165,054	368,086	0	0	493,576	480,986	35,069	254,403	0	256,258	0	29,892	226,367
High Security	25,009	0	25,009	0	0	170	22,222	0	115	0	0	2,843	0	2,843
Supplementary	100,211	0	100,211	0	0	0	0	0	0	0	0	100,211	0	100,211

Table 21: NSW Murray regulated water source environmental holding summary

Category	Volume 30 June 2021	Volume 30 June 2022	Volume diff	No. licences 30 June 2020	No. licences 30 June 2021	No. licence difference
Regulated River (Conveyance)	50,214	50,214	0	2	2	0
Regulated River (General Security)	484,673	484,673	0	18	18	0
Regulated River (General Security) – In Murray Irrigation or part held licences	193,826	193,826	0	1	1	0
Regulated River (High Security)	25,009	25,009	0	12	12	0
Supplementary Water	100,211	100,211	0	5	5	0

Table 22: Temporary water movement by licence type (held environmental water allocation assignments)

From Type – Water source	To Environ NSW Murray	To Environ Murrumbidgee	To Environ Lower Darling	To Environ Victoria	To Consumptive NSW Murray	To Consumptive Murrumbidgee	To Consumptive Lower Darling	To Consumptive South Australia	To Consumptive Victoria	Total
Environmental – NSW Murray	465,424	5,490	67,862	5,000	14,609	-	-	2,160	15,920	576,464
Environmental – Murrumbidgee	5,000	-	-	-	-	-	-	-	-	5,000
Environmental – Lower Darling	60,619	-	-	-	-	-	-	-	-	60,619
Environmental – Victoria	850	-	-	-	-	-	-	-	-	850
Consumptive – NSW Murray	6,476	-	-	-	261,675	422	313	42,198	148,277	459,362
Consumptive – Murrumbidgee	-	-	-	-	67,526	-	-	-	-	67,526
Consumptive – Lower Darling	-	-	-	-	2,709	-	-	-	-	2,709
Consumptive – South Australia	-	-	-	-	3,460	-	-	-	-	3,460
Consumptive – Victoria	1,410	-	-	-	64,094	-	-	-	-	65,504
Total	539,779	5,000	67,862	5,000	414,074	422	313	44,358	164,197	1,241,494

Consumptive to environmental = 7,886 ML

Environmental to consumptive = 32,689 ML

Environmental to environmental = 610,245 ML

Note 7 – Environmental provisions

There a number of planned environmental provisions allowed for within the regulated NSW Murray water source, implemented under the water sharing plan, with the aim of enhancing environmental benefits.

A long-term extraction limit

A long-term extraction limit is set in place that ensures the growth in diversions is contained and the requirements set out under schedule F of the Murray–Darling Basin Agreement are maintained. If long-term average annual diversions exceed this limit, provisions are in place to implement a reduction in the available water determinations until the average diversions are bought back under the required limit.

Barmah–Millewa environmental water allowance (B-M EWA) and overdraw

An environmental water allowance and overdraw availability has been established for environmental watering in the Barmah–Millewa forest and other wetlands, and to increase the frequency of high flows during spring and early summer in the Murray River. These rules are designed to complement those applied by Victoria.

The B-M EWA provides a volume of up to 75,000 megalitres each year to build up a reserve of planned environmental water, up to a maximum of 350,000 megalitres, for the maintenance of the Barmah–Millewa forest. In addition, under certain conditions water in the B-M EWA account can be borrowed by regulated Murray water source access licence holders, with the borrow being paid back when sufficient water becomes available.

The Barmah–Millewa overdraw is an additional account that provides a volume of up to 50,000 megalitres per water year to provide water to Barmah–Millewa forest provided that sufficient water reserves are available to NSW so as not to constrain available water determinations to any of the licence categories under the plan.

Water in either of the B-M EWA or overdraw accounts is made available from Hume Dam to provide environmentally beneficial outcomes for the Barmah–Millewa forest, in accordance with any relevant inter-state agreements.

For details on rules relating to the management of these accounts in relation to crediting of water, carryover and forfeit rules, refer to water sharing plan.

Murray additional environmental allowance (AEA)

Releases from the Murray AEA may be made for any environmental purpose consistent with objectives as set out in the water sharing plan. The allowance may be credited annually with up to 0.03 megalitres, while accumulating a maximum of up to 0.15 megalitres per share of high-security entitlement. For details on rules relating to the management of this account, refer to water sharing plan.

Adaptive environmental water access licences

Two access licences with a total share component of 32,027-unit shares were established as consequence of the Murray Irrigation Limited privatisation arrangements (30,000 megalitres conveyance licence) and water savings resulting from works installed to regulate inflows to Moira Lake (2,027 megalitres high security licence). These licences form part of the held environmental entitlement described in Note 6.

Data type

Measured/Administration

Policy

- Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016
 - Part 4 Planned Environmental Water Provisions

Available on the NSW Department of Planning and Environment website (www.industry.nsw.gov.au/water)

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Data source

- Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning and Environment)
- WaterNSW annual compliance report (internal document)

Additional information

Account balance summaries for the B-M EWA and the additional environmental allowance are presented in Table 23 and Table 24 respectively. The Barmah–Millewa overdraw account has not yet been credited under water sharing plan management conditions.

Table 23: Barmah–Millewa environmental allowance

Water year	Account carryover	Credits	Spill	Evaporation forfeit	Use	Account balance	Available for Use	Borrow carryover	Borrow	Borrow repay	Borrow account
2004–05	175,000	50,000	0	0	0	225,000	0	175,000	50,000	0	225,000
2005–06	225,000	75,000	0	0	256,450	43,550	43,550	225,000	50,000	275,000	0
2006–07	43,550	47,500	0	0	0	91,050	0	0	91,050	0	91,050
2007–08	91,050	21,500	0	0	0	112,550	0	91,050	21,500	0	112,550
2008–09	112,550	17,500	0	0	0	130,050	0	112,550	17,500	0	130,050
2009–10	130,050	50,000	0	0	0	180,050	0	130,050	50,000	0	180,050
2010–11	180,050	50,000	0	720	134,500	94,830	94,830	180,050	48,500	228,550	0
2011–12	94,830	75,000	0	0	139,800	30,030	30,030	0	0	0	0
2012–13	30,030	75,000	2,440	850	0	101,740	101,740	0	0	0	0
2013–14	101,740	75,000	76,730	2,460	0	97,550	97,550	0	0	0	0
2014–15	97,550	75,000	0	2,420	0	170,130	170,130	0	0	0	0
2015–16	170,130	50,000	0	0	0	220,130	0	0	220,130	0	220,130
2016–17	220,130	75,000	94,510	3,370	84,030	113,220	113,220	220,130	25,590	245,720	0
2017–18	113,220	75,000	0	2,570	0	185,650	185,650	0	187,280	187,280	0
2018–19	185,650	75,000	0	0	0	260,650	0	0	260,650	0	260,650
2019–20	260,650	33,000	0	0	0	293,650	-2,440	260,650	35,440	0	296,090
2020–21	293,650	50,000	0	170	0	343,480	343,480	296,090	40,060	342,150	0
2021–22	343,480	75,000	168,980	3,770	47,890	197,840	197,840	0	350,000	350,000	0

Table 24: Additional environmental allowance

Water year	Carryover	HS share	AWD reached 0.97 ML/share	Credit	Account limit forfeit	Use	Spill	Balance
2004-05	0	184,256	Yes	5,528	0	0	0	5,528
2005-06	5,528	184,256	Yes	5,528	0	0	0	11,055
2006-07	11,055	185,223	Yes	5,557	0	0	0	16,612
2007-08	16,612	186,293	No	0	0	0	0	16,612
2008-09	16,612	187,170	Yes	5,615	0	0	0	22,227
2009-10	22,227	187,557	Yes	5,627	0	0	0	27,854
2010-11	27,854	191,584	Yes	5,748	4,723	0	28,878	0
2011-12	0	191,584	Yes	5,748	0	0	3,998	0
2012-13	0	191,584	Yes	5,748	0	0	5,748	0
2013-14	0	191,584	Yes	5,748	0	0	5,748	0
2014-15	0	191,637	Yes	5,749	0	5,751	0	(2)
2015-16	(2)	191,789	Yes	5,754	0	5,754	0	(2)
2016-17	(2)	193,74617	Yes	5,812	0	0	5,810	0
2017-18	0	193,747	Yes	5,812	0	5,81218	0	0
2018-19	0	189,70419	Yes	5,691	0	5,691	0	0
2019-20	0	189,704	Yes	5,691	0	5,691	0	0
2020-21	0	189,704	Yes	5,691	0	5,691	0	0
2021-22	0	189,705	Yes	5,691	0	5,691	0	5,691

¹⁷ Assessment included sub-categories of high security

¹⁸ Amended figure since 2017-18 water account publication

¹⁹ Assessment excludes sub-categories of high security

Note 8 – Surface water storage

This is the actual volume of water stored in the individual surface water storages at the date of reporting. The volumes provided represent the total volume of water in the storage, including dead storage, which is the volume of water that can't be accessed under normal operating conditions, for example the volume captured below the low-level outlet. It is assumed that the dead storage can be accessed if required via alternative access methods such as syphons.

The responsibility of operating Menindee Lakes is shared between NSW Department of Planning and Environment and the MDBA. It is under WaterNSW control when the storage volume falls below 480,000 megalitres until such time as the volume rises above 640,000 megalitres. The lakes then come under MDBA control until the volume falls back below 480,000 megalitres.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment

Data source

NSW Department of Planning and Environment HYDSTRA database

Methodology

Storage volumes are calculated by processing a gauged storage elevation through a rating table that converts it to a volume.

Additional information

A summary of capacity and dead storage volumes for major storages of the NSW Murray is presented in Table 25.

Table 25: Storage summary table

Name	Capacity (ML)	Dead storage (ML)
Hume Dam	3,005,156	1,790
Dartmouth Dam	3,856,000	71,000
Menindee Lakes	1,730,886	215,690
Lake Victoria	677,000	100,000
Lake Mulwala	117,500	NA
Torrumbarry Weir	36,810	NA

Storage volume plots for Hume, Dartmouth, Menindee and Lake Victoria storages are presented respectively in Figure 16, Figure 17, Figure 18 and Figure 19.

Note 9 – River channel storage

The volume of water stored in the river channel on 30 June of the reporting period

Policy

Not applicable

Data type

Derived from measured data

Data accuracy

B – Estimated in the range +/- 25%

Providing agency

MDBA

Data sources

Murray MDBA monthly summary spreadsheet

Methodology

Calculated as part of the MDBA Murray Flow Model using the following methodology.

For each river section:

$$V_i = Q_i \times T_i$$

The river channel storage will be equal to the sum of all river section volumes.

$$\text{River Channel Storage} = \sum_{i=1}^n V_i$$

Table 26: Summary of river channel storage calculation components

Symbol	Variable	Unit
Q	Average flow in the river section, calculated by averaging the daily flows at the upstream and downstream river gauges	ML/d
V	Volume in each river section	ML
T	Average travel time for a parcel of water to travel through the river section	days

Assumptions and approximations:

- Travel times are estimated to the nearest day.
- Daily flow change between gauging sites is assumed to be linear.

Note 10 – Snowy required annual release

Snowy Hydro Limited provides an annual fixed minimal accountable release, known as the ‘required annual release’ (RAR) to the Murray (1,062,000 megalitres per year). However, in years of severe drought when the current inflow sequence is worse (drier) than the historical dry sequence, the Snowy Hydro delivery of the RAR could put the Snowy Scheme at risk of running out of water. In those years the RAR may be reduced by the dry inflow sequence volume (DISV), which is the measure of the cumulative difference between the historic dry sequence and the current inflow sequence. Any shortfall in the delivery of the DISV will be repaid in the future when annual inflows improve.

Further adjustments to the RAR can also be made each year as a result of pre-releases made in the previous year or for water savings in the Murray that have been dedicated to Snowy River environmental flows. The RAR and those items that adjust it are monitored continually and updated whenever changes in the catchment dictate it. Montane release is environmental water to support the high-altitude streams that have been impacted by the Snowy Mountains Scheme. It is diverted to Hume Dam catchment, with the majority of volume lost before reaching the dam.

Snowy Hydro Limited operates under a May to April accounting year, which is different to the water accounting period being considered in this report. For the purpose of this GPWAR total contributions from Snowy Hydro to Hume dam, during a July to June water year are estimated in Note 11, Table 29. A high-level summary of key release components from Snowy Hydro for the May to April water year is provided Table 27.

Policy

Snowy Water Licence 2010

Data type

Derived from measured data

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Data sources

Snowy Mountains Authority water operations report

Methodology

Not applicable

Additional information

A summary of RAR accounting for the Snowy–Murray development is provided in Table 27. Further information on the operating requirements for Snowy Hydro Limited are available at www.industry.nsw.gov.au/water/basins-catchments/snowy-river/corporate-licence

Table 27: Annual Snowy–Murray RAR delivery summary May to April Water Year.

Water Year	Total RAR delivered ²⁰	Pre-released RAR (for following water year)	Above target discretionary releases	Other releases to Hume
01-May-2018 to 30-Apr-2019	715,000	199,000	0	0
01-May-2019 to 30-Apr-2020	527,000	127,000	0	0
01-May-2020 to 30-Apr-2021	881,000	301,000	50,000	0
01-May-2021 to 30-Apr-2022	515,000	228,000	293,000	0

²⁰ Includes accountable deliveries to snowy montane rivers and Hume Dam

Note 11 – Storage inflow

Storage inflow refers to the volume of water flowing into the major headwater storages – Hume Dam, Dartmouth Dam, Menindee Lakes and Lake Victoria.

Policy

Not applicable

Data type

Derived from measured data

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment

Data sources

NSW Department of Planning and Environment: HYDSTRA, Integrated quantity and quality model (IQQM)

Methodology

In most of the major storages in NSW there is no direct measurement of inflows. However, it is possible to calculate inflows by using a mass balance approach (based on balancing the change in storage volume) where the inflow is the only the unknown. This is referred to a 'back-calculation' of inflows.

The back-calculation figures were derived using a one-day time step with the inflow calculated according to the equation below. The daily inflows are then summed to provide an annual inflow figure according to the following formula, with components described in

Table 28.

$$I = \sum_{i=1}^n \left(\Delta S_i + O_i + Se_i + \frac{(E_i - R_i) * A_i}{100} \right)$$

Table 28: Components for back-calculation of inflow

Symbol	Variable	Unit
I	Inflow	ML/day
ΔS	Change in storage volume	ML
O	Outflow	ML/day
Se	Seepage	ML/day
R	Rainfall	mm/day
E	Evaporation (Mortons shallow lake estimation, SILO)	mm/day
A	Surface area – derived from height to surface areas lookup curve	ha

Assumptions and approximations:

- Constant storage-specific pan evaporation factors are applied (one annual factor).
- Seepage was assumed to be zero.

Additional Information

Inflow to Hume is largely regulated by upstream infrastructure operated by Snowy Hydro, and releases from Dartmouth storage. A breakdown of the estimated contributing sources is provided in Table 29. Additional information on the required releases from Snowy Hydro are provided in Note 10.

Table 29: Contributing Inflow Summary Hume Dam

Water Year	Total inflow estimate	Delivered from Snowy Hydro infrastructure ²¹	Dartmouth releases ²²	Natural Hume Inflow estimate ²³
2018-2019	2,963,986	765,462	1,500,831	697,694
2019-2020	3,061,307	752,540	1,101,887	1,206,880
2020-2021	3,334,301	1,182,257	137,095	2,014,949
2021-2022	5,153,347	1,075,280	167,099	3,910,968

²¹ Releases at M1 power station

²² No loss processes have been allowed for between Dartmouth and Hume storage. By magnitude these are considered negligible.

²³ Total inflow estimate minus deliveries from Snowy Hydro, minus Dartmouth releases.

Note 12 – Storage evaporation and storage rainfall

This refers to the volume of water effective on Hume Dam, Dartmouth Dam, Menindee Lakes and Lake Victoria that is either lost as a result of evaporation or gained as a result of rainfall.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

B – Estimated in the range +/- 25%

Providing agency

NSW Department of Planning and Environment, MDBA, WaterNSW

Data source

- NSW Department of Planning and Environment: HYDSTRA
- QLD Department of Natural Resources: SILO

Methodology

Daily rainfall and Mortons shallow lake evaporation data (accessed via SILO) are applied to storage surface area time-series from HYDSTRA or MDBA-supplied time-series data to achieve a volume in megalitres, which is then aggregated to an annual figure according to the following formulas, with the formula components described in Table 30. The rainfall and evaporation data utilised is equivalent to the data used in the storage inflow back-calculation (Note 12).

Rainfall:

$$\sum_{i=1}^n V_i = \left(\frac{R_i \times A_i}{100} \right)$$

Evaporation:

$$\sum_{i=1}^n V_i = \left(\frac{E_i \times A_i}{100} \right)$$

Table 30: Components for storage evaporation and rainfall

Symbol	Variable	Unit
V	Volume	ML/year
R	Rainfall	mm/day
A	Surface area – derived from height to surface areas lookup curve	Ha
E	Evaporation (Mortons shallow lake estimation, SILO)	mm/

Note 13 – River evaporation and river rainfall

This refers to the volume of water effective on the accounted river reach that is either lost as a result of evaporation or gained as a result of rainfall.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

C – Estimated in the range +/- 50%

Providing agency

NSW Department of Planning and Environment

Data source

- NSW Department of Planning and Environment: HYDSTRA, ARCGIS
- QLD Department of Natural Resources: SILO

Methodology

The volume applied for evaporation and rainfall on the regulated river is achieved by first calculating the daily time-series of the river area. This is achieved by breaking the river up into reaches and utilising the cross sections recorded at river gauging locations to determine the average width of the river with a given daily flow. River length is then determined between two gauging locations using ARCGIS and as such an area for each reach can be defined.

$$\text{Area (m}^2\text{)} = \text{Average W (m)} \times \text{L (m)}$$

Where W is the daily width determined from the gauging cross sections and L is the length as determined through ARCGIS analysis.

With daily area determined, various climate stations are then selected based on their proximity to each river reach. Rainfall and evaporation data is then extracted from SILO and applied to the area time-series to achieve the volume in megalitres, which is then aggregated to an annual figure.

Rainfall:

$$\sum_{i=1}^n V_i = \frac{R_i \times A_i}{10^6}$$

Evaporation:

$$\sum_{i=1}^n V_i = \frac{ETO_i \times K_c \times A_i}{10^6}$$

Table 31: Components for storage evaporation and rainfall

Symbol	Variable	Unit
V	Volume	ML/year
R	Rainfall	mm/day
A	Surface area - derived from height to surface areas lookup curve	m ²
ETO	reference evapotranspiration from SILO	mm/day
Kc	Crop coefficient for open water (1.05)	-

Note 14 – Gauged tributary inflow

The inflow into the regulated river that occurs downstream of the headwater storages that is measured at gauging stations.

Policy

Not applicable

Data type

Measured data

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment

Data sources

- NSW Department of Planning and Environment: HYDSTRA
- MDBA: Murray MDBA Monthly Report

Methodology

The flows are obtained by measuring river heights at gauging stations along the river, and then passing these heights through a rating table that converts them to a daily flow volume.

Additional information

Individual tributaries used in the calculation of the total gauged inflow for the reporting period are presented in Table 32. Daily inflow for the reporting period for NSW and Victorian tributaries are presented in Figure 52 and Figure 53 respectively.

Table 32: Summary of NSW Murray gauged tributary inflow

Type	Station code	Station name	Volume (ML)
Victoria Murray gauged tributary inflows	402205	Kiewa River	767,451
Victoria Murray gauged tributary inflows	405232	Goulburn River	883,169
Victoria Murray gauged tributary inflows	404210	Broken Creek	84,407
Victoria Murray gauged tributary inflows	406202	Campaspe River	47,752
Victoria Murray gauged tributary inflows	403241	Ovens River	1,897,630

Type	Station code	Station name	Volume (ML)
Torrumbarry system return (multiple tributaries and effluent returns)	-	-	186,290
Total Victorian gauged tributary inflow	-	-	3,866,699
NSW Murray tributary inflows	410130	Murrumbidgee River at D/S Balranald Weir	2,931,299
NSW Murray tributary inflows	410134	Billabong Creek at Darlot	438,389
NSW Murray tributary inflows	425007	Darling River at Burtundy	2,492,081
Total NSW gauged tributary inflow	-	-	5,861,769
Total Murray Gauged Tributary Inflow	-	-	9,728,468

Figure 52: NSW daily tributary inflow to Murray

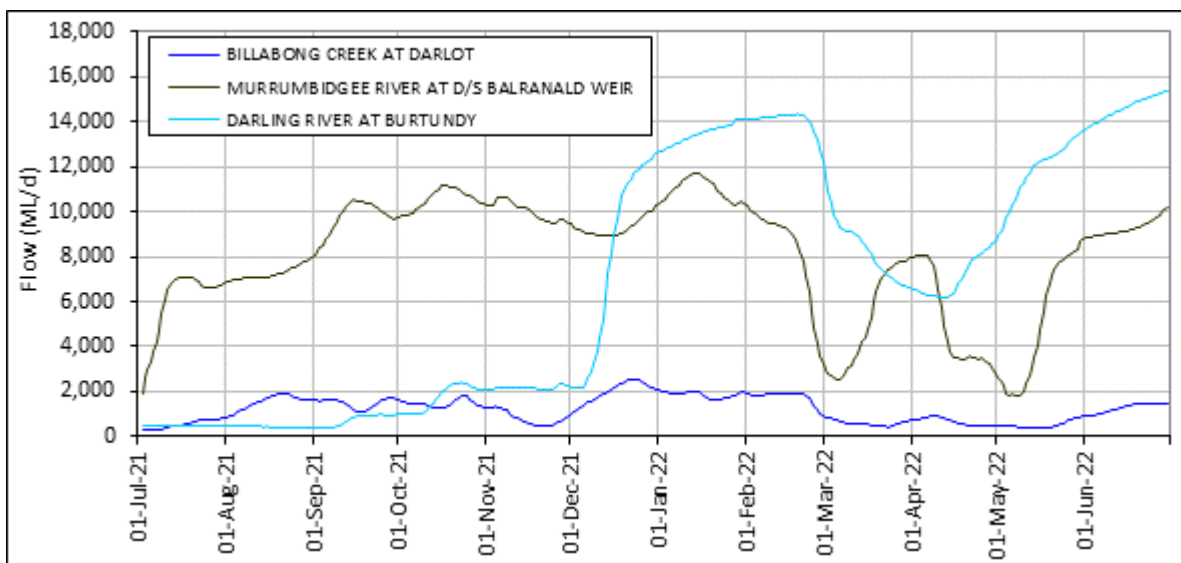
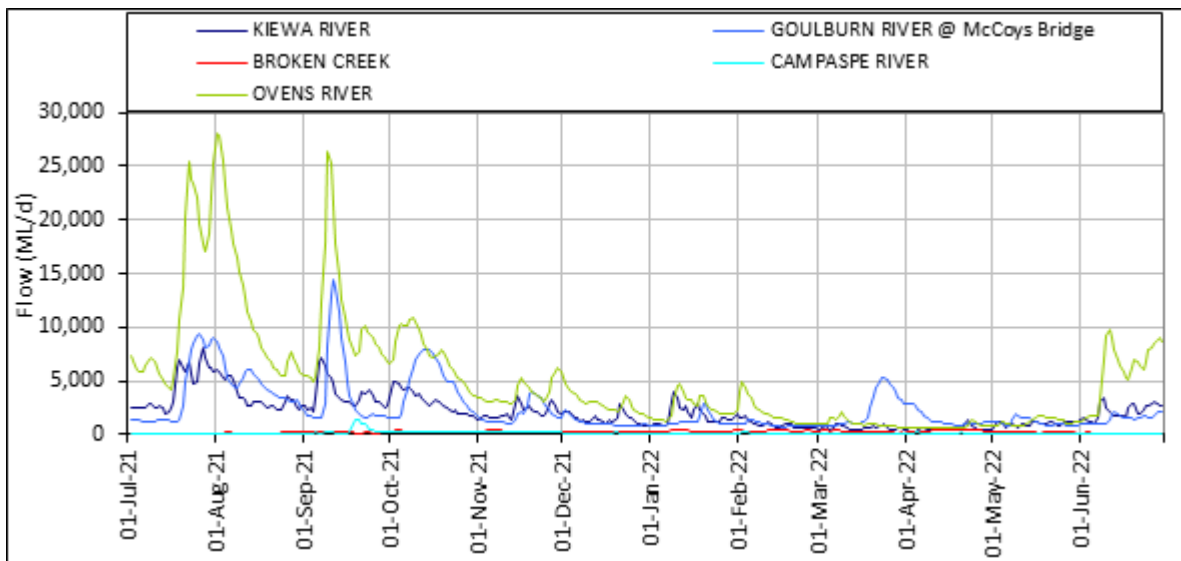


Figure 53: Victorian daily tributary inflow to Murray



Note 15 – Ungauged runoff estimate

This is the inflow into the river that occurs downstream of the headwater storages that is not measured.

Policy

Not applicable

Data type

Estimated

Data accuracy

C – Estimated in the range +/- 50%

Providing agency

NSW Department of Planning and Environment

Data sources

Not applicable

Methodology

For the purpose of this account, it was assumed that ungauged runoff was minimal and therefore assumed to be zero.

Note 16 – Dam releases, river inflow from dam releases

This refers to the volume of water released from Hume Dam, Dartmouth Dam and Lake Victoria storages. In the accounting process this release is represented as both a decrease in asset (of the dam) and an equal increase in asset (of the river).

It should be noted that the volume entering the Murray as a result of Menindee Lakes releases is provided as a gauged tributary inflow recorded at the Darling River at Burtundy and can be seen in Note 14.

Policy

Not applicable

Data type

Measured data

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

MDBA

Data sources

MDBA-provided spreadsheets

Methodology

The flows are obtained by measuring river heights at the gauging station downstream of the dam wall, and then passing these heights through a rating table that converts them to a daily flow volume. The releases have been represented in the 'Statement of Changes in Water Assets and Water Liabilities' as both a decrease in water asset (water leaving the dam) and an equal volume of increase in water asset (water released increasing the volume of the river). It would have been also possible to account this as a transfer in asset, whereby the volumes would not appear in the statements.

Additional information

Daily charts of storage release volumes in the reporting period for Hume, Dartmouth and Lake Victoria storages are provided in Figure 54, Figure 55 and Figure 56 respectively.

Figure 54: Hume Dam releases for the reporting period

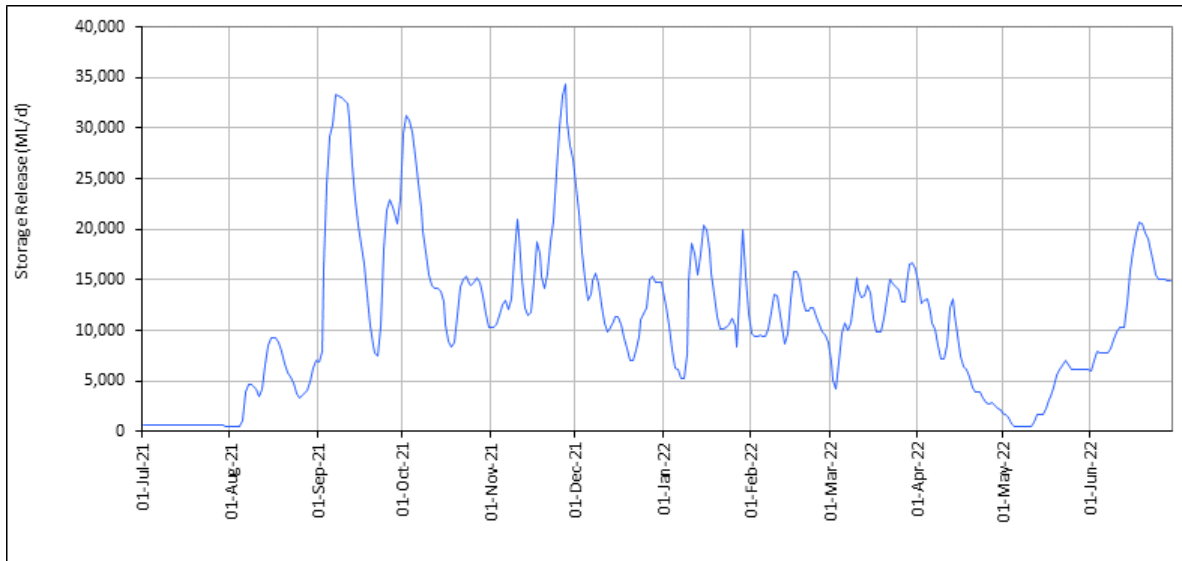


Figure 55: Dartmouth Dam releases for the reporting period

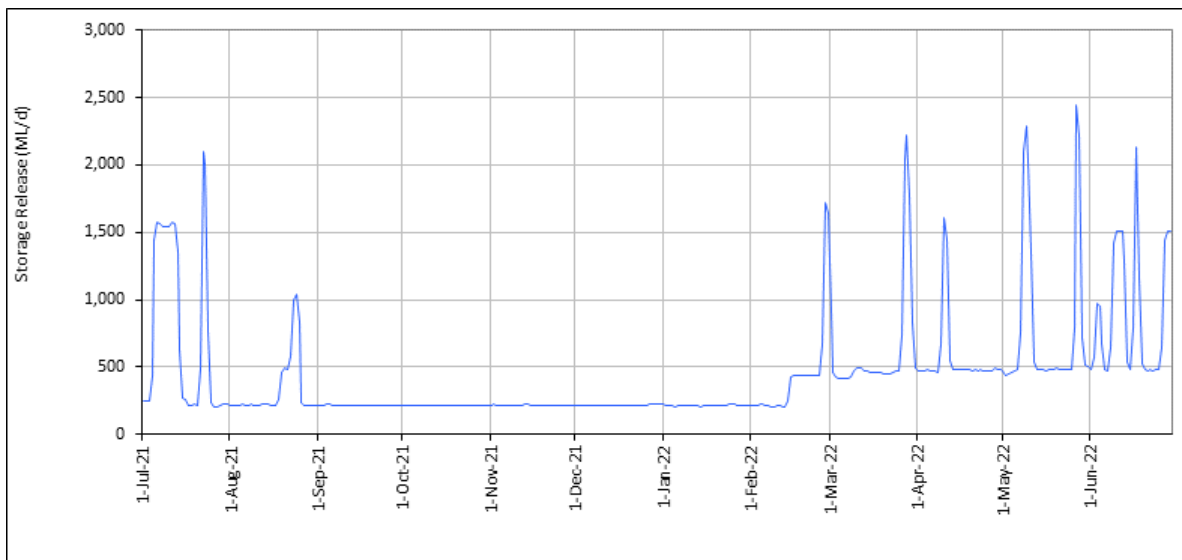
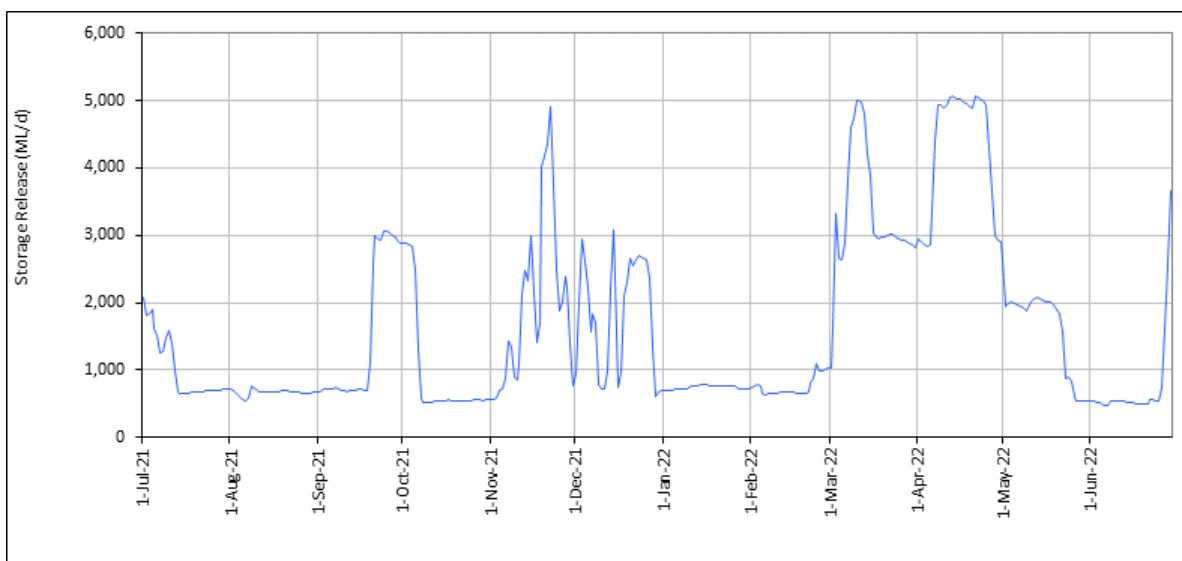


Figure 56: Lake Victoria Dam releases for the reporting period



Note 17 – End of system/flow leaving

This refers to flow that leaves the entity and does not return to the entity. For the NSW Murray the end of system represents the flow to South Australia. Flows leaving are represented by water diverted from the Murray to the Murrumbidgee via Finley Escape.

A minimum flow contribution of 1,850,000 megalitres per year is required to be provided to the South Australian border as per the Murray–Darling Basin Agreement. In addition, when defined storage volume triggers are exceeded, South Australia is entitled to additional dilution flows of 3,000 megalitres per day, 1,500 megalitres of which is from NSW resources. For more details refer to Water Sharing Plan.

Data type

Derived from measured data

Policy

- Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016
 - Appendix 3 – Operational guidelines for delivering flows prescribed by the Murray–Darling Basin Agreement in Schedule 1 of the Water Act 2007 of the commonwealth

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

MDBA

Data source

- MDBA: Murray MDBA Monthly Report
- MDBA: Website

Methodology

Summation of flows at gauging site/s measuring the volume of water that leaves the entity at end-of-system locations or via regulated effluents. For the NSW Murray reporting entity, the end-of-system flow is derived using the following methodology:

- flow at Murray River @ D/S Rufus River (4260200)
- **plus** diversion to Mulleroo Creek D/S offtake (above Lock 7) (414211A)
- **less** Lindsay River allowance (250 ML/day).

The gauges record a time-series of heights that are converted to a volume of water based on a derived 'height-to-flow' relationship (rating table).

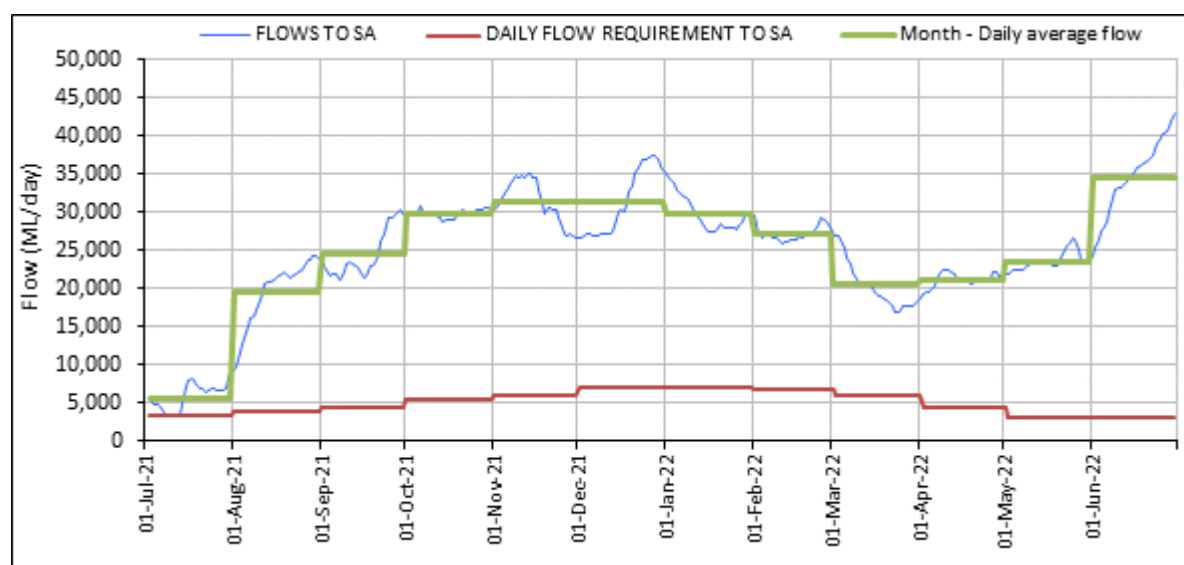
Additional Information

A breakdown of the end-of-system flow components and volumes for the reporting period is presented in Table 33. A daily chart of flow to South Australia for the reporting period is presented in Figure 57.

Table 33: End-of-system flows for reporting period

Station name	Outflow (ML)
NSW Murray flow to South Australia	5,018,790
Victoria Murray flow to South Australia	4,099,520
Total Murray River flow to South Australia	9,118,310
Finley Escape (outflow to Murrumbidgee)	12,17024
Total	9,130,480

Figure 57: End-of-system flow to South Australia



²⁴ Source: MDBA

Note 18 – NSW extractions from river

Actual volume of water directly pumped or diverted from the regulated river by licence holders. Occasionally (generally in the case of environmental water) volumes are ordered against a licence account for in-stream benefits or to pass through end-of-system target points. As such the volume reported to be physically extracted from the accounted river extent will not always be equal to the amount of water debited against accounts for usage, which has been described in Note 3. The volume stated for extractions from river excludes basic rights extractions, which is reported as a separate line item in Note 21.

Data type

Measured data

Policy

Not applicable

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment

Data source

Water Accounting System (owned by WaterNSW and Department of Planning and Environment)

Methodology

Extraction from the river is considered to be the total volume metered and debited to the allocation accounts minus any licenced account water that can be identified as being used within the system or ordered to be passed through the system. These volumes are generally associated with environmental water orders and have already been accounted for in other line items.

Additional information

Table 34 gives a reconciliation of physical extractions relative to accounted access licences usage.

Table 34: Reconciliation of physical extraction to account usage (ML)

Component	NSW Murray
Licenced extractions from river ²⁵	1,184,231
plus Licenced flow leaving system ²⁶	0
plus In-stream licenced usage ²⁷	198,000
Total account usage ²⁸	1,382,231

²⁵ Direct licenced extractions from the river excluding basic rights usage estimate

²⁶ Licenced water ordered to leave accounted NSW Murray extent for environmental benefits, subject to data availability, estimate based on MDBA matter 9.3 reporting

²⁷ Water ordered and used within accounted system for environmental benefit (not extracted from the river), subject to data availability

²⁸ The total amount of water accounted for usage against the allocation accounts plus uncontrolled flow use

Note 19 – Victorian extractions

This refers to the volume of water extracted from the accounted river extent by Victorian licence holders. While detailed information is not available within this account, it is necessary to include the bulk figures extracted to maintain the integrity of the river physical mass balance. Total volumes extracted in megalitres have been provided as a total for all licence categories.

Data type

Measured data

Policy

Water Amendment Act 2008

Available from the Australian Government's Federal Register of Legislation website (www.legislation.gov.au)

Data Accuracy

A – Estimated in the range +/- 10%

Providing Agency

MDBA

Data Source

MDBA monthly summary spreadsheet

Methodology

Figures are reported as per the MDBA operational data

Note 20 – Snowy water savings transfer

This represents the water transferred annually to Snowy Hydro for use to improve river health and deliver environmental benefits in the Snowy and Murray Rivers. The licensed entitlement, held by the NSW government, was created as a result of water savings projects. These licences are subject to the same rules and regulations as all other access licences within the same category.

Data Type

Administration

Policy

- Snowy Water Inquiry Outcomes Implementation Deed (SWIOID)
- Snowy Water Licence (October 2011)

Available from the Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning and Environment)

Methodology

The water is transferred to an account that is managed by Snowy Hydro for use in the following season. The volume of account water transferred each year is all the account water in the allocation accounts of the water savings licences as of 31 January each year.

The transfer is not a physical movement of water from the NSW Murray, rather is achieved by an accounting exercise, with an equivalent reduction to the required annual release (defined in note 10) in the following year applied and incorporated to the Snowy annual operating plan. The nominated volume will then be released into the Snowy River (via a defined watering pattern targeted to environmental outcomes), rather than being passed to Hume.

Any water crediting NSW Murray access licence accounts after 31 January via an AWD or allocation trade must be allowed to be carried over and becomes part of the water that is transferred in the following year. It is important to note that the transfer of water on 31 January should not result in

any reduction in the total volume of water that these licenses are entitled to as a result of accounting rules around carryover and limits. Accounting adjustments are required to ensure this. For this report, figures quoted are the result of detailed reworking of the individual water allocation accounts and therefore may not match those quoted in other sources that do not include future adjustments.

Note 21 – Basic rights extractions

This is the non-licensed right to extract water to meet basic requirements for household purposes (non-commercial uses in and around the house and garden) and for watering of stock. It is available for anyone who has access to river frontage on their property.

This water cannot be used for irrigating crops or garden produce that will be sold or bartered, for washing down machinery sheds or for intensive livestock operations.

In times of limited supply, there may be restrictions on taking water for domestic and stock use.

Data Type

Estimated

Policy

Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016

- Part 5 Requirements for water
 - Division 2 Requirements for water for basic landholder rights
 - Clause 18 Domestic and Stock rights

Available from the Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

C – Estimated in the range +/- 50%

Providing agency

NSW Department of Planning and Environment

Data source

Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016

Methodology

The estimation of Domestic and Stock rights uses a series of input components including water usage, stocking rates, population and property shape based on local knowledge to calculate riparian (stock and domestic) requirements in megalitres per year. The annual extraction for Domestic and Stock rights in the water accounts is assumed to be the estimated figure stated in the *Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016* (2,118 megalitres).

Note 22 – Supplementary/uncontrolled-flow extractions

This is the volume of water extracted or diverted under supplementary access licences and uncontrolled-flow rules during announced periods of supplementary water. Supplementary flow events are announced periodically during the season when high-flow events occur with the period of extraction and volume of water to be extracted determined based on the rules as set out in the water sharing plans. It is important to note that supplementary access licences differ from other categories of access licence in that the volume of water in the account refers to an annual upper limit for extractions and its provision is totally reliant on the occurrence of high-flow events.

Uncontrolled flow refers to a specific volume of non-debit water that is pumped or diverted from the river by general-security licence holders under specific licence and river flow conditions defined in the water sharing plan. The water sharing plan also defines rules by which the non-debit uncontrolled flow that has been taken is to be debited back to the general-security licence accounts.

Data type

Measured data

Policy

Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016

- Part 7 Limits to the availability of water
 - Division 2 - Available water determinations
 - Clause 49 Available water determinations for supplementary water access licences
- Part 9 Rules for managing access licences
 - Division 2 – Daily access rules
 - Clause 54 Taking of water under supplementary water access licences
 - Clause 55 Taking of uncontrolled flows under regulated river (General Security) access licences.

Refer to the applicable water sharing plan available from the Department of Planning, Industry and Environment website at www.industry.nsw.gov.au/water

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

NSW Department of Planning and Environment

Data source

Water Accounting System (jointly owned by WaterNSW and NSW Department of Planning and Environment)

Methodology

Supplementary and uncontrolled flow water extraction and diversion data is collected by either on-farm meters that measure extraction or gauges on diversion works. Meter readings are collected for individual licence holders at intervals during the year and converted via a calibration factor to a volume of water extracted. Water diverted from the river is measured by recording the height at either the gauge or weir with the volume diverted being derived by passing these heights through a rating table. However, with supplementary and uncontrolled flow water being extracted through the same pumps as those extracting water under other categories of access licences, additional information is required to separate out supplementary and uncontrolled flow extraction. Licence holders provide notification of their intention to pump prior to pumping or diverting water during the declared supplementary event and provide meter readings both at the commencement and conclusion of pumping. This enables the supplementary and uncontrolled flow extraction to be assessed independent of other categories of access licences.

Additional information

Supplementary and uncontrolled flow access periods for the reporting period are summarised in Table 35.

Table 35: Supplementary and uncontrolled flow access announcements – Category: General Security, Supplementary

Catchment	River section	Section start date	Section end date	% use limit	Supplementary usage	UCF Usage
Darling River Went. Pool	Murrayg, Wentworth Weir Pool	15-Jul-21	30-Jun-22	100	413	427
Edward River	Eedward2, Toonalook To Stevens	15-Jul-21	30-Jun-22	100	10	68
Edward River	Eedward3, Stevens To Moulamein	15-Jul-21	30-Jun-22	100	1,050	187
Edward River	Eedward4, Moulamein To Liewah	15-Jul-21	30-Jun-22	100	1,029	703
Edward River	Eedward5, Liewah To Wakool Junction	15-Jul-21	30-Jun-22	100	526	0
Colligen Creek	Ecolligen, O/T To Weir	15-Jul-21	30-Jun-22	100	5,288	14
Niemur River	Eniemur, O/T To Moulamein Rd	15-Jul-21	30-Jun-22	100	232	3
Niemur River	Eniemur, Mallan School To Wakool Confluence	15-Jul-21	30-Jun-22	100	85	0
Niemur River	Eniemur, Moulamein Rd To Mallan School	15-Jul-21	30-Jun-22	100	1,340	132
Merran Creek	Merran Creek, Cuttings To Franklings Bridge	15-Jul-21	30-Jun-22	100	258	0
Merran Creek	Merran Creek, Franklings Bridge To Moulamein Rd	15-Jul-21	30-Jun-22	100	887	1,363
Merran Creek	Merran Creek, Moulamein Rd To Station 409036	15-Jul-21	30-Jun-22	100	536	342
Moir Creek	Murrayb, Moira	15-Jul-21	30-Jun-22	100	896	850
Lake Mulwala	Murraya, Lake Mulwala	15-Jul-21	30-Jun-22	100	48,093	0

Catchment	River section	Section start date	Section end date	% use limit	Supplementary usage	UCF Usage
Wakool River	Ewakool, Brassi Rd To Wakool Rd	15-Jul-21	30-Jun-22	100	53	0
Wakool River	Ewakool, Stoney Xing To Murray Jn	15-Jul-21	30-Jun-22	100	459	138
Wakool River	Ewakool, Moulamein Rd To Gee Gee	15-Jul-21	30-Jun-22	100	23	98
Wakool River	Ewakool, Gee Gee To Coonamit	15-Jul-21	30-Jun-22	100	168	86
Wakool River	Ewakool, Coonamit To Stoney Xing	15-Jul-21	30-Jun-22	100	155	89
Coobool Creek	Murrayd, Coobool Creek	15-Jul-21	30-Jun-22	100	137	129
Gum Creek	Murrayd, Gum Creek	15-Jul-21	30-Jun-22	100	85	99
Mulligans Creek	Murrayd, Mulligans Creek	15-Jul-21	30-Jun-22	100	114	62
St Helena Creek	Murrayd, St Helena Creek	15-Jul-21	30-Jun-22	100	175	0
Unnamed watercourse	Murraya, 889900 Unnamed Watercourse	15-Jul-21	30-Jun-22	100	1,888	0
Murray River	Murrayb, Yarrawonga To Edward O/T	15-Jul-21	30-Jun-22	100	30	0
Murray River	Murrayc, Barmah To Torrumbarry	15-Jul-21	30-Jun-22	100	400	241
Murray River	Murrayd, Torrumbarry To Wakool Jn	15-Jul-21	30-Jun-22	100	2,785	7,294
Murray River	Murrayf, Wakool To Euston Weir	15-Jul-21	30-Jun-22	100	114	156
Murray River	Murrayg, Euston Weir To Mildura	15-Jul-21	30-Jun-22	100	639	195
Murray River	Murrayh, Mildura To S.A.	15-Jul-21	30-Jun-22	100	48	162
Colligen Creek	Ecolligen, O/T To Weir	26-Aug-21	30-Sep-21	100	22,393	0
Edward River	Eedward2, Toonalook To Stevens	7-Sep-21	30-Nov-21	100	241	243
Edward River	Eedward3, Stevens To Moulamein	7-Sep-21	30-Nov-21	100	548	159
Edward River	Eedward4, Moulamein To Liewah	7-Sep-21	30-Nov-21	100	346	274
Edward River	Eedward5, Liewah To Wakool Junction	7-Sep-21	30-Nov-21	100	206	120
Colligen Creek	Ecolligen, Weir To Werai Station	7-Sep-21	30-Nov-21	100	21	198
Colligen Creek	Ecolligen, O/T To Weir	7-Sep-21	30-Nov-21	100	11,301	6,673
Niemur River	Eniemur, O/T To Moulamein Rd	7-Sep-21	30-Nov-21	100	195	0
Niemur River	Eniemur, Moulamein Rd To Mallan School	7-Sep-21	30-Nov-21	100	649	263
Gulpa Creek	Eedward1, Gulpa Creek	7-Sep-21	30-Nov-21	100	27	891
Lake Mulwala	Murraya, Lake Mulwala	7-Sep-21	30-Nov-21	100	35,398	21,012
Wakool River	Ewakool, Brassi Rd To Wakool Rd	7-Sep-21	30-Nov-21	100	20	0
Wakool River	Ewakool, O/T To Brassi Rd	7-Sep-21	30-Nov-21	100	319	0
Wakool River	Ewakool, Stoney Xing To Murray Jn	7-Sep-21	30-Nov-21	100	186	19
Wakool River	Ewakool, Coonamit To Stoney Xing	7-Sep-21	30-Nov-21	100	9	157
Merribit Creek	Ewakool, Merribit Ck	7-Sep-21	30-Nov-21	100	133	0
Unnamed watercourse	Murraya, 889900 Unnamed Watercourse	7-Sep-21	30-Nov-21	100	3,172	1,813
Murray River	Murraya, Hume To Yarrawonga	7-Sep-21	30-Nov-21	100	1	4

Catchment	River section	Section start date	Section end date	% use limit	Supplementary usage	UCF Usage
Murray River	Murrayb, Yarrawonga To Edward O/T	7-Sep-21	30-Nov-21	100	52	112
Murray River	Murrayc, Barmah To Torrumbarry	7-Sep-21	30-Nov-21	100	779	931
Edward River	Eedward2, Toonalook To Stevens	13-Nov-21	28-Feb-22	100	158	0
Edward River	Eedward3, Stevens To Moulamein	13-Nov-21	28-Feb-22	100	68	0
Edward River	Eedward4, Moulamein To Liewah	13-Nov-21	28-Feb-22	100	16	0
Niemur River	Eniemur, Moulamein Rd To Mallan School	13-Nov-21	28-Feb-22	100	96	0
Murray River	Murrayb, Yarrawonga To Edward O/T	13-Nov-21	28-Feb-22	100	20	0
Murray River	Murrayc, Barmah To Torrumbarry	13-Nov-21	28-Feb-22	100	87	0
Merran Creek	Merran Creek, Moulamein Rd To Station 409036	7-Jan-22	28-Feb-22	100	85	0
Murray River	Murrayb, Yarrawonga To Edward O/T	7-Jan-22	28-Feb-22	100	19	0
Murray River	Murrayc, Barmah To Torrumbarry	7-Jan-22	28-Feb-22	100	268	0
Murray River	Murrayd, Torrumbarry To Wakool Jn	7-Jan-22	28-Feb-22	100	66	0
Lake Mulwala	Murraya, Lake Mulwala	31-Jan-22	28-Feb-22	100	482	0
Merran Creek	Merran Creek, Moulamein Rd To Station 409036	25-Feb-22	28-Feb-22	100	85	0
Murray River	Murrayg, Euston Weir To Mildura	15-Mar-22	30-Jun-22	100	34	3
Murray River	Murrayd, Torrumbarry To Wakool Jn	20-Apr-22	30-Jun-22	100	154	0
Edward River	Eedward3, Stevens To Moulamein	10-May-22	30-Jun-22	100	78	0
Edward River	Eedward4, Moulamein To Liewah	10-May-22	30-Jun-22	100	0	0
Wakool River	Ewakool, Coonamit To Stoney Xing	10-May-22	30-Jun-22	100	22	0

Figure 58: Uncontrolled Flow Usage

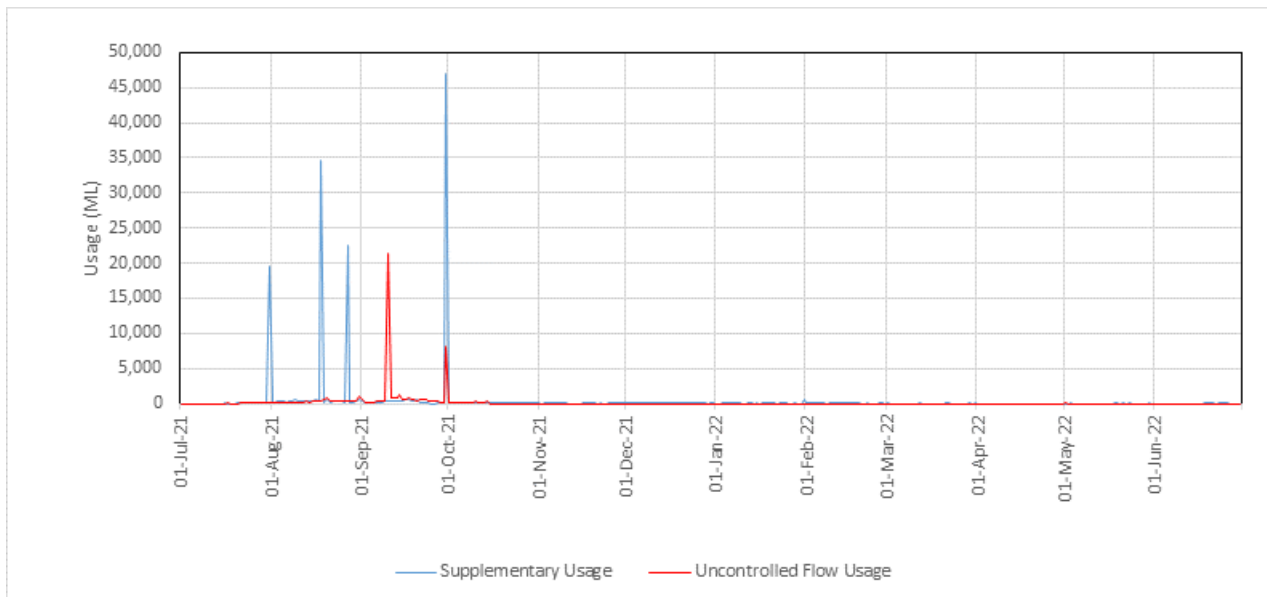
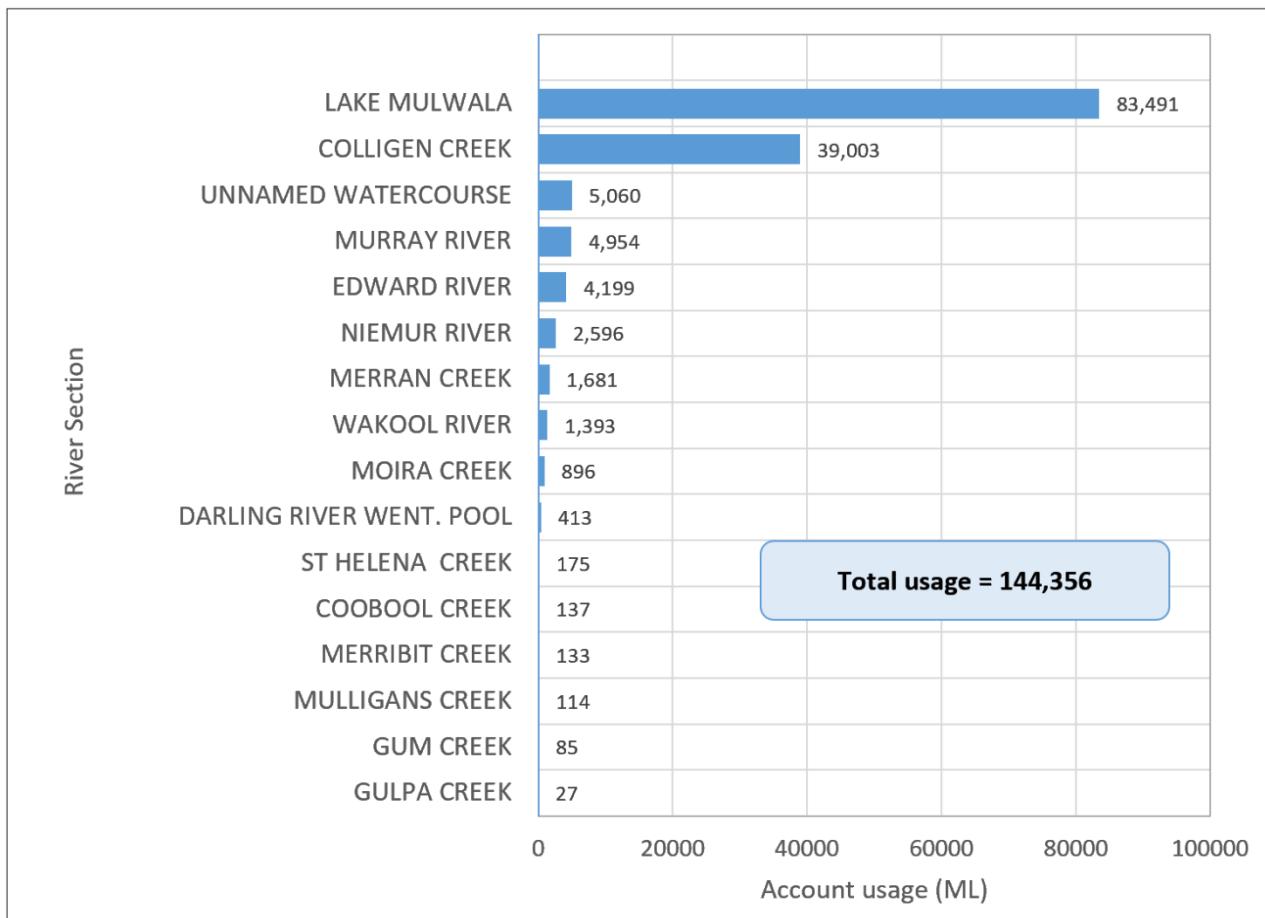


Figure 59: Supplementary water usage by river section



Note 23 – Unaccounted difference

In theory, if all the processes of a water balance could be accurately accounted for, the unaccounted difference would be zero. Due to the large uncertainties in many of the volumes presented in the accounts, the various sources from which the data has been obtained, and the fact that not all processes of the water cycle have been accounted (for example ungauged inflow), the statements are not balanced at the end of the accounting process. In order to balance the accounts a final balancing entry is required, and this is termed the unaccounted difference. As technology progresses and accuracy improves in the account estimates, it is anticipated that this figure should reduce in future accounts.

Data type

Not applicable

Policy

Not applicable

Data accuracy

D – Estimated in the range +/- 100%

Providing agency

Not applicable

Data source

Not applicable

Methodology

The unaccounted difference is equal to the amount required to obtain the correct volume in river at the end of the reporting period, after all the known physical inflows and outflows have been accounted. The double-entry accounting process attempted to represent the physical movement of water by creating a river asset. The opening and closing balance of the river volume was estimated according to Note 9.

Surface water unaccounted difference

$$UVSW = R_s - R_c + RI - R_o$$

Where:

- **UVSW** = Unaccounted difference for surface water
- **Rs** = Opening river volume estimate
- **Rc** = Closing river volume estimate
- **Ro** = Physical outflows from the river (e.g. extractions)
- **RI** = Physical inflows to the river (e.g. runoff, return flows, dam releases)

Additional information

The unaccounted difference as a percentage of total accounted inflow to the water source is presented in Table 36.

Table 36: Unaccounted difference percentage of inflow

Water year	Accounted river inflow ²⁹ (ML)	Unaccounted difference (ML)	% of inflow
2015-16	1,292,190	1,292,190	17
2016-17	15,984,889	2,938,301	18
2017-18	7,481,336	742,963	10
2018-19	6,763,501	953,063	14
2019-20	6,629,037	1,085,562	16
2020-21	7,378,443	906,569	12
2021-22	15,043,316	1,478,962	10

²⁹ Gauged tributary inflow, plus rainfall on river plus inflow from storage releases.

Note 24 – Prior year account adjustments

This is a line item that is used to correct balances opening balances for the reporting period of water assets or water liabilities. The double-entry accounting being applied is a continuous process whereby the closing balance of one year is the opening balance for the following year.

Occasionally corrections will be required for a variety of reasons including:

- errors identified in prior-year reporting
- data changes since prior-year reporting
- better estimates at hand since prior-year reporting.

An account correction is different to the unaccounted difference transaction, which is a physical volume added or subtracted from the river asset balance to successfully achieve mass balance after all the known processes have been accounted for.

Data type

Calculated

Accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

NSW Department of Planning and Environment

Data source

Not applicable

Methodology

A journal entry is placed in the reporting year to ensure the correct adjustment is made to the comparative year closing balances in order to ensure the accounts balance for the reporting year.

Additional information

There were no Prior reporting year adjustments made in 2021-2022.

References

WASB 2012, Australian Water Accounting Standard 1 Preparation and Presentation of General Purpose Water Accounting Reports (AWAS 1), Bureau of Meteorology