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General Purpose Water Account Report

Barwon-Darling

2020-21



Acknowledgement of Country

The Department of Planning and Environment 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 Barkandji, Murrawarri, Ngemba, and Ngiyampaa Nations and that the land and waters of the Barwon-Barka River catchment 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 Barwon-Barka River catchment landscape and natural resources. Published by NSW Department of Planning and Environment.

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Abbreviations

<i>Acronym</i>	<i>Description</i>
<i>ARCGIS</i>	<i>Mapping and spatial analysis platform for designing and managing solutions through the application of geographic knowledge</i>
<i>AWAS 1</i>	<i>Australian Water Accounting Standard 1</i>
<i>AWD</i>	<i>Available water determination</i>
<i>CARM</i>	<i>Computer Aided River Management</i>
<i>Ck</i>	<i>Creek</i>
<i>D/S</i>	<i>Downstream</i>
<i>GPWAR</i>	<i>General Purpose Water Accounting Report</i>
<i>IDEC</i>	<i>Individual Daily Extraction Limit</i>
<i>MDBA</i>	<i>Murray-Darling Basin Authority</i>
<i>ML</i>	<i>Megalitres (1,000,000 litres)</i>
<i>ML/d</i>	<i>Megalitres per day</i>
<i>MODFLOW</i>	<i>Modular Three-Dimensional Finite-Difference Groundwater Flow Model</i>
<i>NSW</i>	<i>New South Wales</i>
<i>SILO</i>	<i>Climatic data provision system run by Queensland government for the provision of both measured and modeled data.</i>
<i>U/S</i>	<i>Upstream</i>

Glossary

<i>Term</i>	<i>Definition</i>
<i>Access Rights</i>	<i>These are the rights associated with an access licence to extract water and include the access licence share, daily extraction limit and access rules as set out in the water sharing plan.</i>
<i>Active Management</i>	<i>The management practice undertaken to operate the unregulated Barwon-Darling in accordance with the access rules as established in the Water Sharing Plan in order to protect environmental water from extraction as it travels through the unregulated river system.</i>
<i>Allocation</i>	<i>The specific volume of water allocated to water allocation accounts in a given season, defined according to rules established in the relevant water plan.</i>
<i>Allocation assignments</i>	<i>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.</i>
<i>Allocation Account</i>	<i>Water account attached to an access licence used to track the balance of account water.</i>
<i>Aquifer</i>	<i>Soil or rock below the land surface that is saturated with water. A confined aquifer has layers of impermeable material above and below it and is under pressure. When the aquifer is penetrated by a well, the water rises above the top of the aquifer. In an unconfined aquifer, the upper water surface (water table) is at atmospheric pressure and thus is able to rise and fall.</i>
<i>Available Water Determination (AWD)</i>	<i>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.</i>
<i>Australian Water Accounting Standard (AWAS)</i>	<i>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.</i>
<i>Back-calculation</i>	<i>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).</i>

<i>Term</i>	<i>Definition</i>
<i>Basic rights</i>	<i>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.</i>
<i>Computer Aided Improvements to River Operations (CAIRO)</i>	<i>A spreadsheet-based water balance model used for optimising river operations (orders and releases)</i>
<i>Computer Aided River Management (CARM)</i>	<i>Two base models exist: CARMlite – A spreadsheet-based water balance model for optimizing river management. CARM – Computer model that simulates flow and river behaviour such as river demand from irrigation, towns, environment etc. to help optimize river management.</i>
<i>Carryover</i>	<i>The volume or share component that may be reserved by a licence holder for use in the proceeding year.</i>
<i>Catchment</i>	<i>The areas of land which collect rainfall and contribute to surface water (streams, rivers, wetlands) or to ground-water. A catchment is a natural drainage area, bounded by sloping ground, hills or mountains, from which water flows to a low point.</i>
<i>Daily Announcement</i>	<i>During a flow event daily announcement are made providing details of the flow class by management zone and the days water can be accessed.</i>
<i>Dealings</i>	<i>A water dealing refers to a change that can be made to a licence, in particular, those arising from trading including the sale of all or part of an access licence or account water. May also include a change in location, licence category or consolidation/subdivision of licences.</i>
<i>Double entry accounting</i>	<i>Double-entry accounting is a method of record-keeping that records both where money (or in this case water) comes from and where it goes. Using double-entry means that water is never gained or lost - it is always transferred from somewhere (a source account) to somewhere else (a destination account).</i>
<i>Effluent</i>	<i>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.</i>
<i>Entity</i>	<i>A defined geographical area or zone within the accounting region. Transactions and reports are produced for each entity.</i>

<i>Term</i>	<i>Definition</i>
<i>End of system</i>	<i>The last defined point in a catchment where water information can be measured and/or reported.</i>
<i>Environmental water</i>	<i>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.</i>
<i>Equity</i>	<i>Total assets minus total liabilities</i>
<i>Evaporation</i>	<i>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.</i>
<i>Evapotranspiration</i>	<i>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.</i>
<i>Extraction</i>	<i>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.).</i>
<i>Flow Class</i>	<i>Flow classes in the Barwon-Darling are established for each management zone and are based on flow thresholds established at river gauging stations.</i>
<i>General Purpose Water Accounting Report (GPWAR)</i>	<i>A report prepared according to the Australian Water Accounting Standard. It is comprised of 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</i>
<i>Groundwater</i>	<i>Water location beneath the ground in soil pore spaces and in the fractures of rock formations.</i>
<i>High security licence</i>	<i>A category of licence water access licence implemented under the Water Management Act 2000. Receives a higher priority than general security licences but less priority than essential requirements in the available water determination process.</i>
<i>HYDSTRA database</i>	<i>A database used by Lands and Water to store continuous time series data such as river flow, river height, and water quality.</i>
<i>Individual Daily Extraction Limit (IDEC)</i>	<i>These are established to restrict daily extraction rates for each access licence to protect against rapid extraction of flows as they travel down the system. The IDEC is part of each individuals access licence.</i>

<i>Term</i>	<i>Definition</i>
<i>Inflows</i>	<i>Surface water runoff and deep drainage to groundwater (groundwater recharge) and transfers into the water system (both surface and groundwater) for a defined area.</i>
<i>Inter-valley trade</i>	<i>Trade of licence holder allocation account water, via allocation assignment, from one catchment to another catchment (or state).</i>
<i>Intra-valley trade</i>	<i>Trade of licence holder allocation account water, via allocation assignment, within the same catchment.</i>
<i>Liability</i>	<i>A legally binding obligation to settle a debt.</i>
<i>Management Zone</i>	<i>The Barwon River is divided into fourteen management zones to enable more effective river management. Access rules are established and announcements to access water via flow classes are made at the management zone level.</i>
<i>Median</i>	<i>The middle point of a distribution, separating the highest half of a sample from the lowest half.</i>
<i>Non-physical transaction</i>	<i>An accounting transaction representing a process that is not a component of the water cycle (e.g., an available water determination).</i>
<i>Physical transaction</i>	<i>An accounting transaction representing a process of the water cycle (e.g., extraction)</i>
<i>Recharge</i>	<i>Groundwater recharge is a <u>hydrologic</u> process where <u>water</u> drains downward from <u>surface water</u> to <u>groundwater</u>. Groundwater is recharged naturally by <u>rain</u>, floods and <u>snow</u> melt and to a smaller extent by drainage directly from surface water (such as rivers and lakes).</i>
<i>Replenishment flows</i>	<i>Flows provided along effluent systems downstream of a water source to supply water for household, town use and stock.</i>
<i>Resumption of flow</i>	<i>These are flow rules that protect the critical first flows after an extended low flow or dry period. They restrict access to the first flow after an extended low flow or dry period until flow targets specified in the water sharing plan are reached.</i>
<i>Return inflows</i>	<i>Water that has been diverted from a river by a water user and is then returned to the river after use (e.g., can include non-consumptive uses, such as hydropower, cooling water for industry or water for aquaculture). This water is included as an inflow to the basin because the water is available to be diverted downstream or will pass the basin outlet.</i>

<i>Term</i>	<i>Definition</i>
<i>Share component</i>	<i>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.</i>
<i>Snowpack</i>	<i>Volume of water stored in packed snow that upon melting will result in a system inflow.</i>
<i>Steady State</i>	<i>A condition in a physical groundwater system where the volume does not change over time, or in which any one change in volume is continually balanced by another.</i>
<i>Storage</i>	<i>A state-owned dam, weir or other structure which is used to regulate and manage river flows in the catchment and the water bodies impounded by these structures.</i>
<i>Storage discharge</i>	<i>The volume of water released from storage in a specified time frame.</i>
<i>Storage volume</i>	<i>The total volume of water held in storage at a specified time.</i>
<i>Surface water</i>	<i>All water that occurs naturally above ground including rivers, lakes, reservoirs, creeks, wetlands and estuaries.</i>
<i>Temporary restrictions</i>	<i>An order made under section 324 of the Act by the Minister to restrict or prohibit the taking of water under unregulated river (B Class) access licences and/or unregulated river (C Class) access licences to protect fish passage across major weirs, suppress blue-green algae blooms and to meet basic landholder rights.</i>
<i>Tributary</i>	<i>A smaller river or stream that flows into a larger river or stream. Usually a number of smaller tributaries merge to form a river.</i>
<i>Ungauged catchment</i>	<i>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.</i>
<i>Unregulated river</i>	<i>A river system where the flow is not regulated by artificial structures such as Dams, Weirs, Off-takes, Storages, etc.</i>
<i>Unregulated River Access Licence</i>	<i>A category of water access licence implemented under the Water Management Act 2000. Forms the bulk of the unregulated water access licence entitlement volume in NSW and is a low priority entitlement i.e. only allowed to access water after commitments to the environment, basic landholder rights including town water supply, are met in the available water determination process.</i>

<i>Term</i>	<i>Definition</i>
<i>Water accounting</i>	<i>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</i>
<i>Water assets</i>	<i>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 intervalley trading).</i>
<i>Water liabilities</i>	<i>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.</i>
<i>Water Licencing System (WLS)</i>	<i>The system used by WaterNSW to manage water access licence information and transaction.</i>
<i>Water sharing plan</i>	<i>A water management plan that defines the rules for sharing of water within a region under the Water Management Act 2000.</i>

Directors foreword

This is the 1st release of the General Purpose Water Accounting Report (GPWAR) for the Barwon-Darling Unregulated River Water Source. It has been prepared for the accounting period 1 July 2020 to 30 June 2021 (*reporting period*), under the Australian Water Accounting Standard 1 (AWAS 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 the reporting period.
- A section detailing the flow class events that occurred for the water year including summaries by management zones including physical flow diagrams.
- A physical flow diagram, illustrating changes in river 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), 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
 - held environmental water account balances
 - a detailed available water determination report
 - temporary trading by licence category
 - active management announcements and usage by management zones
 - physical inflows and outflows to the system for the water year

While groundwater has not been directly included in this GPWAR (aside from those processes that directly affect the regulated river), annual groundwater summary reports by water source are published separately and can be accessed via the Department of Planning and Environment website (dpie.nsw.gov.au/water).

As Director Water Analytics, I hereby declare:

The information presented in these accounts as a faithful representation of the management and operation of the Barwon-Darling Unregulated 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.

Lands and Water has to the best of its ability 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 Barwon-Darling River system is the longest river in Australia originating in the Great Dividing Range near the NSW-QLD border flowing 2,750 km through western NSW until it enters the Murray River at Wentworth. The river and its tributaries drain an area of 699,000 square kilometers of NSW and southern Queensland.

The Barwon River begins upstream of Mungindi at the junction of the Weir and Macintyre Rivers and is joined by a number of major tributaries – the Gwydir, Namoi, Castlereagh, Macquarie and Bogan rivers from the south, and the Culgoa River from the north. Downstream of the Culgoa junction the river becomes the Darling with the Warrego and Paroo Rivers being the only significant tributaries only flowing into the Darling during major flooding. Near Wilcannia during floods Talyawalka Creek anabranch leaves the Darling River feeding Talyawalka Lakes a series of 19 large overflow lakes which are of national significance for their waterbird habitat. Downstream of Wilcannia the Darling River flows into the Menindee Lakes Scheme, a series of seven large, shallow lakes that have been modified for water storage.

Although considered an unregulated system, the Barwon-Darling River upstream of Menindee has been subject to significant impacts from headwater dams, in the Border Rivers, Gwydir, Namoi, Lachlan and Macquarie catchments, and water extraction, with over one third of its average annual flow being diverted from the river or its tributaries (Thoms et al. 1996).

The sinuous nature of the Barwon-Darling River has resulted in the formation of many small lagoons and anabranches along its length providing valuable local wetland habitat after floods.

The Barwon-Darling is characterised by low relief with 60 per cent of the catchment having elevations of less than 300 metres (Thoms et al. 2004a). In the northern part of the catchment being considered here, elevations range from 500 metres around Cobar and Broken Hill to 50-100 metres on the floodplain between Wilcannia and Menindee.

The Barwon-Darling River was a rich resource to the various Aboriginal tribes that occupied the region. These include the Baarkindji, Ngemba and Kamilaroi people who lived along its riverbanks, the Barundji, Kunja and Murrawari along its northern tributaries, and the Wongaibon who lived on the plains south of the river. Today there are around 14,000 people living along the Barwon-Darling upstream of Menindee, and in the catchments north of the river to the Queensland border. Cobar is the largest centre in the region with 4,100 people. Other major service centres are Bourke, Brewarrina, Lightning Ridge and Walgett which all support populations of 1000-2000 people.

Grazing accounts for 94 per cent of the catchment's land use. The region also supports small areas of dryland cropping in the east and irrigation development along the river at Bourke.

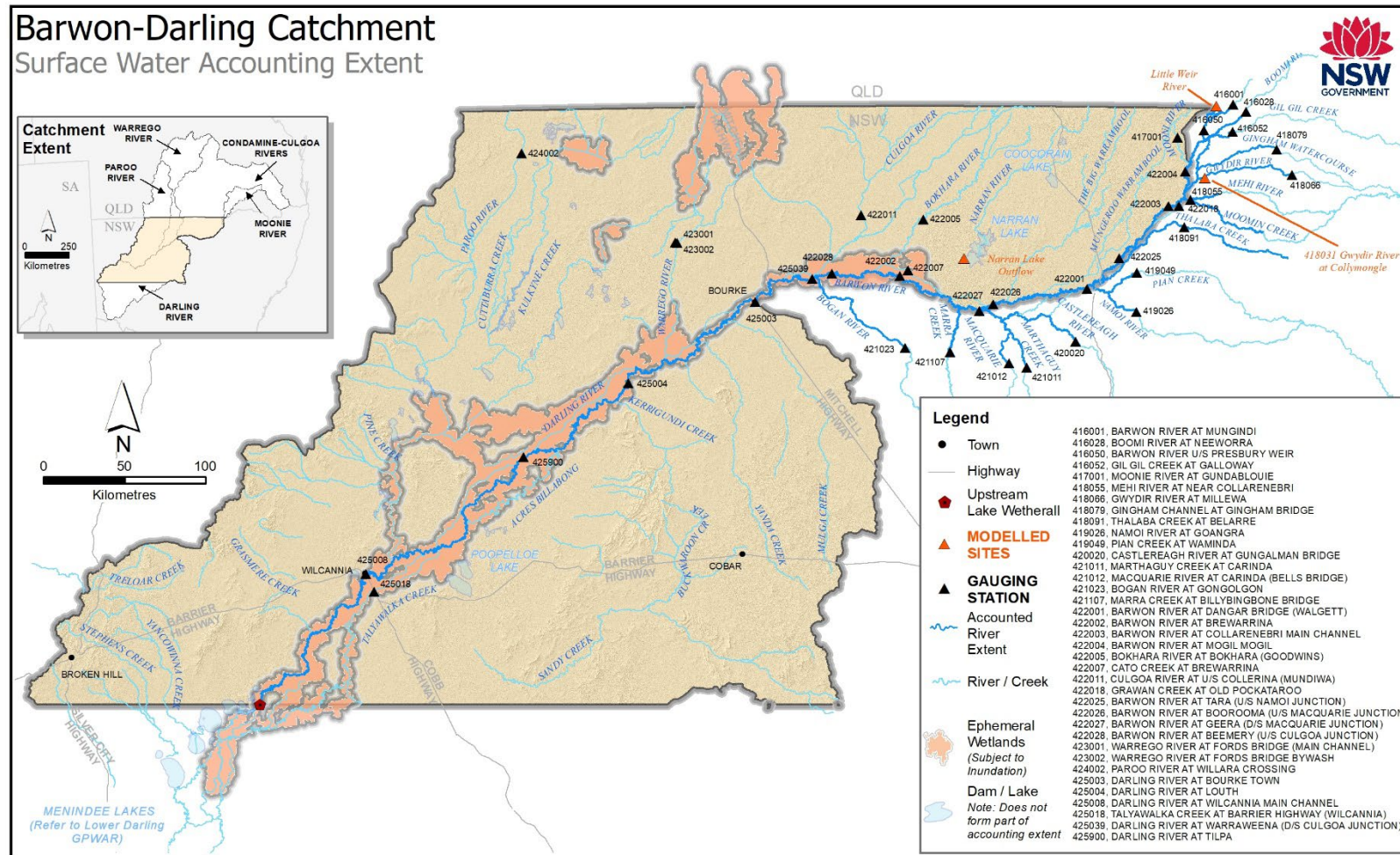
Accounting extent

This report covers the extent illustrated in Figure 1 and details the water management associated with that area of around 150,000 square kilometers. It includes; the Barwon River from Mungindi to the rivers confluence with the Darling River, the Darling River flowing south-west through Bourke and Wilcannia being the last gauged site and hence the end of the accounting extent. For management of flow events in the Barwon-Darling the extent extends through to upstream of Lake Wetherall (see [Figure 1](#)).

A full list of the water courses considered to be part of the Barwon-Darling unregulated River can be obtained in the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012 (see <https://legislation.nsw.gov.au/#/view/regulation/2012/488>).

Presently, we do not have modelling capabilities to address physical groundwater within the unregulated river.

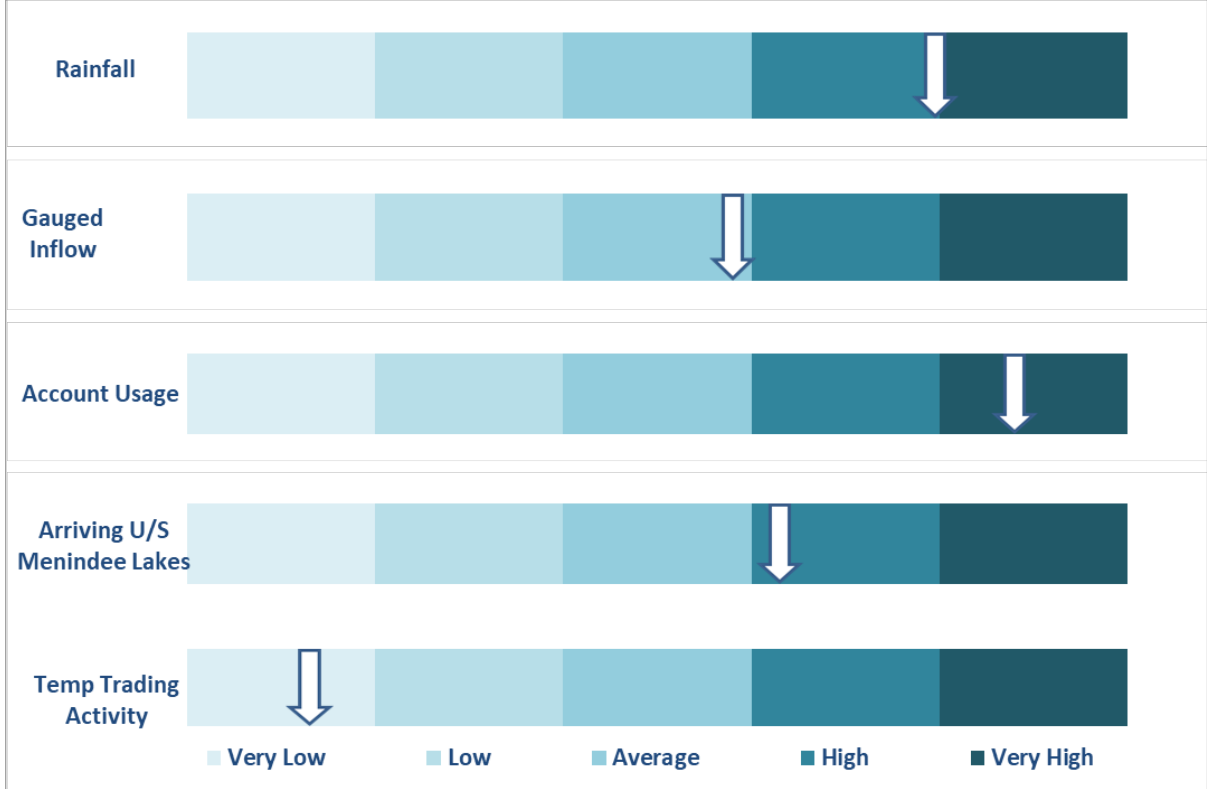
Figure 1: Surface water geographical extent of the accounts



Snapshot

The key indicators for 2020–21 relative to other years under water sharing plan management conditions are presented in Figure 2.

Figure 2: Summary indicators for the reporting period



Climate

The Barwon-Darling River system is unique in that its climatic condition is dependent on all the catchments that feed it including regulated and unregulated. Therefore, climatic indicators as a means to determine potential flows in the Barwon-Darling need to be across all the catchments that feed it.

River Climatic Conditions

Below are a group of rainfall gauges along the Barwon-Darling which provide an indication of the specific climatic conditions along the river itself.

At Bourke (Airport AWS), 391 mm of rainfall was recorded in the reporting period (Table 1). Comparatively, this volume of rainfall is:

- 125 % of the long term historical median rainfall for this location
- 47 % of the highest volume on record at the location

The majority of rainfall fell in February 2021 (101 mm) and March 2021 (91 mm) (Figure 3 and Figure 4).

At Mungindi (Post Office), 565 mm of rainfall was recorded in the reporting period (Table 2). Comparatively this volume of rainfall is:

- 120% of the long term historical median rainfall for this location
- 57% of the highest volume on record at the location

The majority of rainfall fell in December 2020 (99 mm) and February 2021 (162 mm) (Figure 3 and Figure 4).

At Wilcannia (Aerodrome AWS), 348 mm of rainfall was recorded in the reporting period (Table 3). Comparatively this volume of rainfall is:

- 153% of the long term historical median rainfall for this location
- 45% of the highest volume on record at the location

The majority of rainfall fell in March 2021 (76 mm) and April 2021 (54 mm) (Figure 3 and Figure 4).

A spatial comparison of rainfall in the reporting period against a longer term comparison period is presented Figure 5 (2020–21) and Figure 6 (average annual rainfall 1961–1990). Rainfall distribution was average across the entire catchment area for the reporting period.

Figure 3: Monthly rainfall compared to historical median at Bourke, Mungindi and Wilcannia

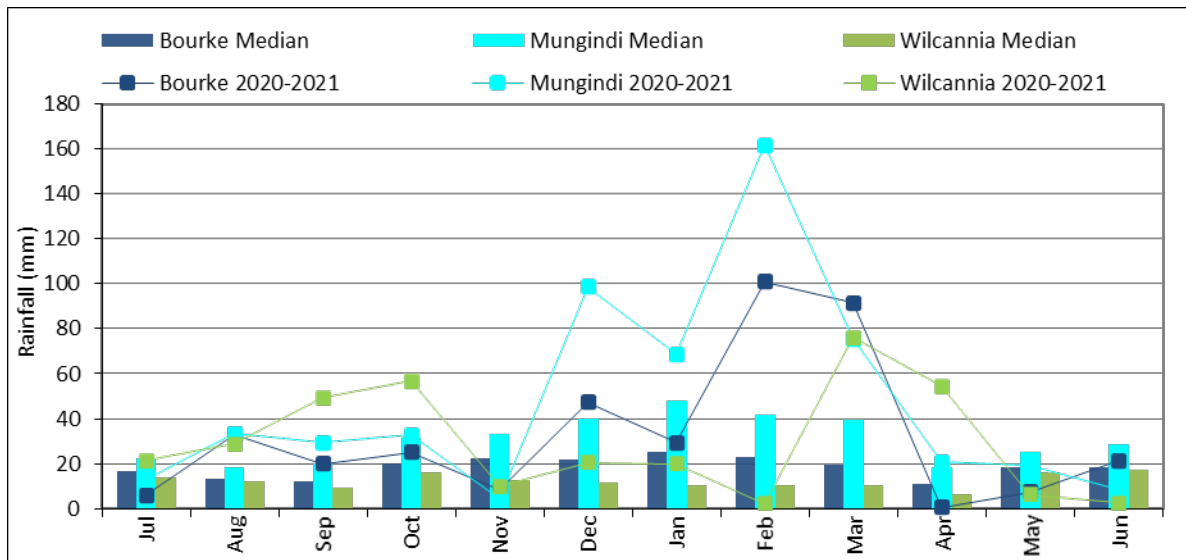


Figure 4: Deviations from historical median rainfall at Bourke, Mungindi and Wilcannia

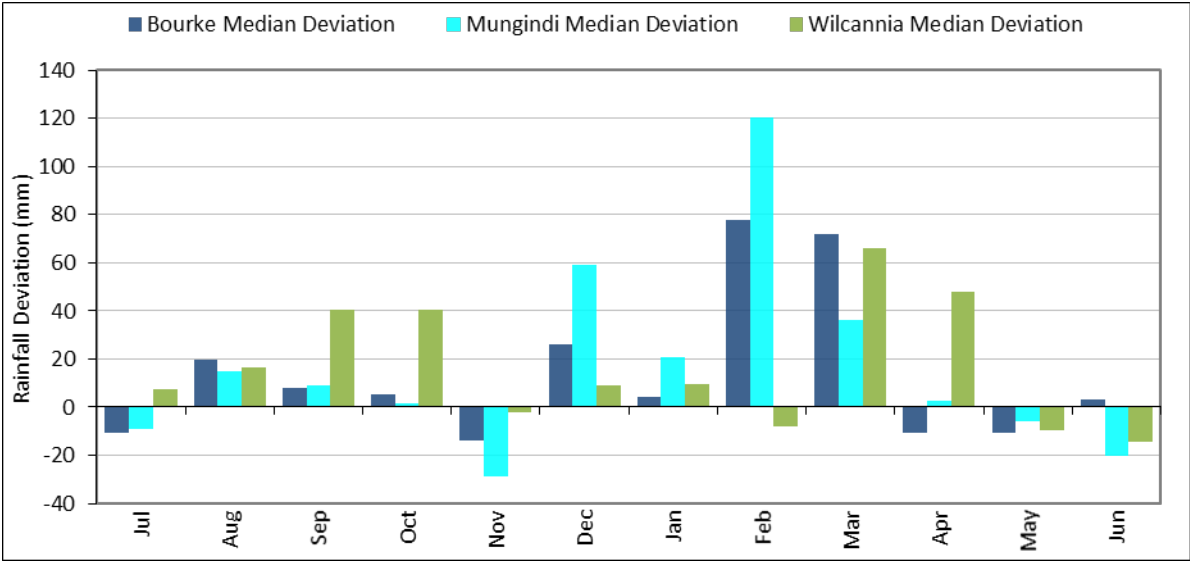


Table 1: Monthly rainfall and historical monthly statistics at Bourke¹

Bourke	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2020–21	6.0	33.0	20.0	25.0	8.6	47.4	29.2	101.0	91.4	0.4	7.2	21.4	390.6
Historical statistics													
Mean	22.8	18.7	18.9	26.1	28.9	32.6	38.4	38.5	34.8	25.4	28.6	27.5	338.5
Median	16.6	13.2	11.8	19.8	22.6	21.5	24.9	23.2	19.3	11.1	18.1	18.3	312.0
Lowest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highest	175.2	95.5	105.1	155.6	158.4	195.2	219.8	265.8	219.6	211.9	188.3	132.4	826.8
Highest Year	1998	1983	1998	1955	2000	2010	1995	1976	1956	1990	1989	1920	1889-1890

Table 2: Monthly rainfall and historical monthly statistics at Mungindi¹

Mungindi	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2020–21	13.0	33.4	29.2	32.6	4.4	98.8	68.6	161.8	75.6	20.8	19.0	8.2	565.4
Historical statistics													
Mean	32.6	24.9	27.5	38.7	45.4	51.4	71.2	62.2	52.8	29.3	33.8	33.7	499.6

¹ Long term statistics are derived from the Bureau of Meteorology – climate data online. The data presented is collected from stations '48245 - Bourke (Airport AWS)', '52020 - Mungindi (Post Office)' and '46012 - Wilcannia (Aerodrome AWS)'. Historical statistics uses data from June 1889 to June 2021 (for all three Stations).

Mungindi	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
Median	22.2	18.6	20.0	31.3	33.3	39.8	48.1	41.5	39.5	18.3	25.1	28.4	470.4
Lowest	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Highest	257.2	146.8	148.5	197.7	256.6	191.9	406.2	366.0	274.5	251.0	170.0	118.4	990.8
Highest Year	1950	1966	1906	1969	2000	1942	1974	1976	1894	1988	1983	1930	1889-1890

Table 3 Monthly rainfall and historical monthly statistics at Wilcannia¹

Wilcannia	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
2020–21	21.2	28.6	49.4	56.6	10.0	20.6	19.8	2.2	76.2	54.4	6.2	2.6	347.8
Historical statistics													
Mean	17.9	17.0	15.5	23.5	19.9	24.6	25.5	24.9	21.9	16.5	21.8	22.4	249.6
Median	14.0	12.3	9.1	15.9	12.4	11.3	10.4	10.3	10.1	6.3	15.8	17.3	226.6
Lowest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highest	71.8	79.7	124.2	123.0	101.0	210.3	219.7	161.2	268.7	156.8	106.7	91.9	778.1
Highest Year	1956	1901	2016	2010	1933	1936	1984	2000	1956	1974	1906	1923	1973-1974

Figure 5: Annual rainfall for the reporting period

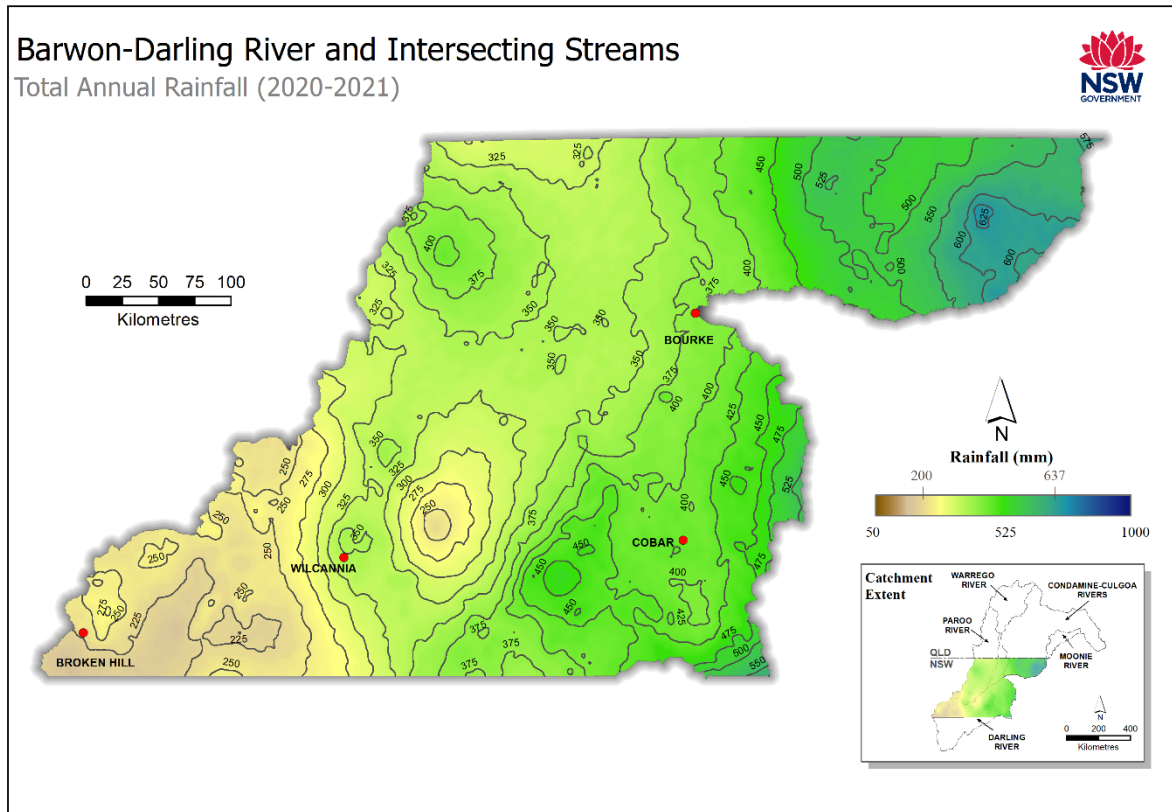
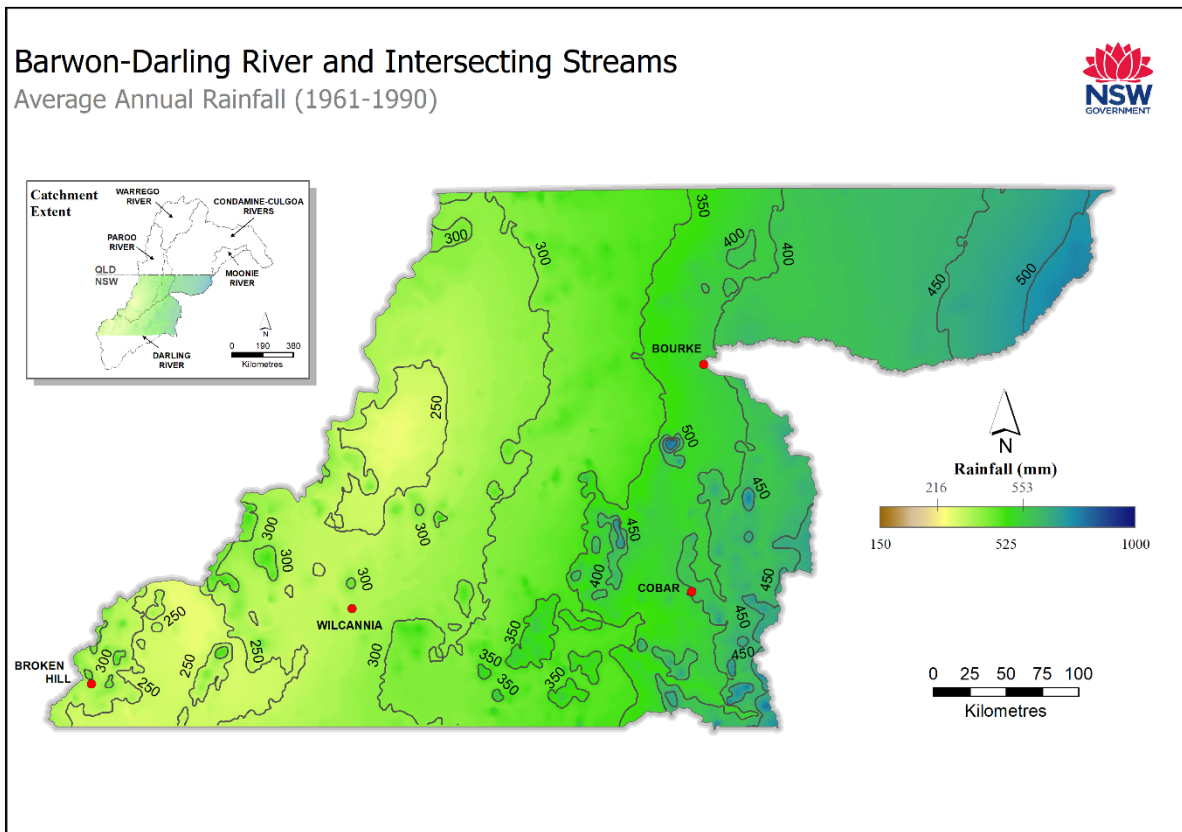


Figure 6: Average annual rainfall (1961 – 1990)

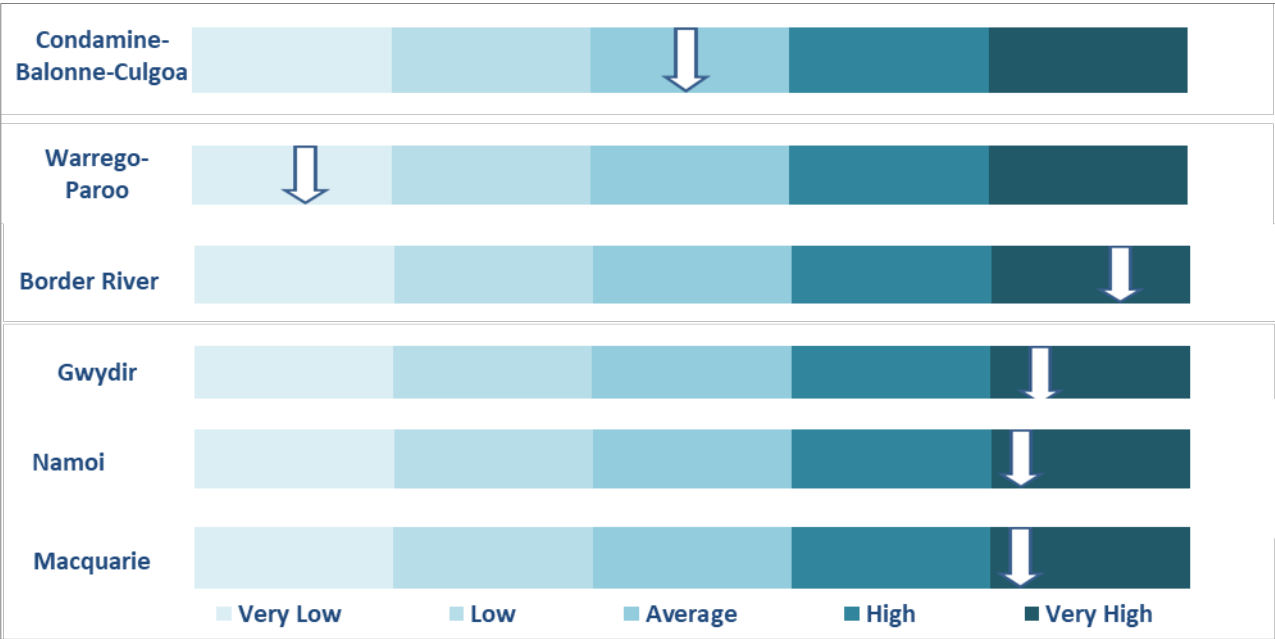


Catchment Climatic Conditions

The Barwon-Darling river system is fed by 6 major catchments in NSW and Queensland including Condamine-Balonne, Warrego-Paroo, Border Rivers, Gwydir, Namoi and Macquarie. While a number of these catchments are regulated thus impacting the volume of water that they feed into the Barwon-Darling their climatic conditions still provide a good indicator of inflow to the Barwon Darling.

The chart at Figure 7 provides a representation of the climatic conditions across the entire Barwon-Darling catchment. It indicates that for the reporting period rainfall percentile for Border Rivers, Gwydir, Namoi and Macquarie catchments were very high, Condamine-Balonne-Culgoa catchment was average while the Warrego-Paroo was very low.

Figure 7: Snapshot of rainfall percentile across catchment



River Inflows

As the Barwon-Darling is an unregulated system and is not supported by a headwater storage it relies on tributary inflows from connected water sources. The inflows have varied significantly, cycling through prolonged periods of predominantly dry and predominantly wet climatic regimes. From 1980 to 2000 the system experienced predominantly wet conditions with two drier periods mid 1980's and early 1990's (Figure 7). Over the last 20 years the trend has been generally drier conditions, with two distinct periods separated by a shorter sequence of wet conditions between 2009 and 2012. Annual inflows are highly variable relative to the mean.

For the reporting period a total gauged inflow from connecting water sources of 2,188,277 megalitres was recorded (Figure 9), which is:

- 83% long-term average annual inflow since 1980-81 (2,640,749 megalitres)
- moderate relative to the long-term data set exceeding 56 per cent of years in the dataset (1980–81 to 2020–21)
- the fourth consecutive year of below average flow.

Gauged river inflows are made up of contributions from a number of intersecting water sources including Border Rivers, Gwydir, Namoi, Macquarie, Bokhara, Culgoa, Warrego and Paroo. For the reporting period the distribution of inflow was as follows:

- The majority of the inflows were from the Border Rivers contributing 817,918 megalitres being 37% of the total inflow and the Gwydir contributing 732,412 megalitres being 33% of the total inflow (Figure 11 and Figure 12).
- The peak period of inflow was in April 2021 with the majority of the flow from the Border Rivers and Gwydir water sources (Figure 10).
- A comparison between reporting year inflow distribution and the long-term annual inflows since 1980-81 can be seen at Figure 12 and Figure 13. Historically the main contributing water source has been the Border Rivers contributing 30%, with the Gwydir, Namoi and Macquarie adding a combined contribution of 54% of the inflow. In the reporting period the main contributing water sources were Border Rivers, and Gwydir contributing 70% of the inflow.
- Historical Annual inflow contributions by water source can be seen at Figure 14.
- Additional details on the individual rivers and creeks that make up each water sources contribution refer to Note 11.

Figure 8: River Inflows deviation from the mean

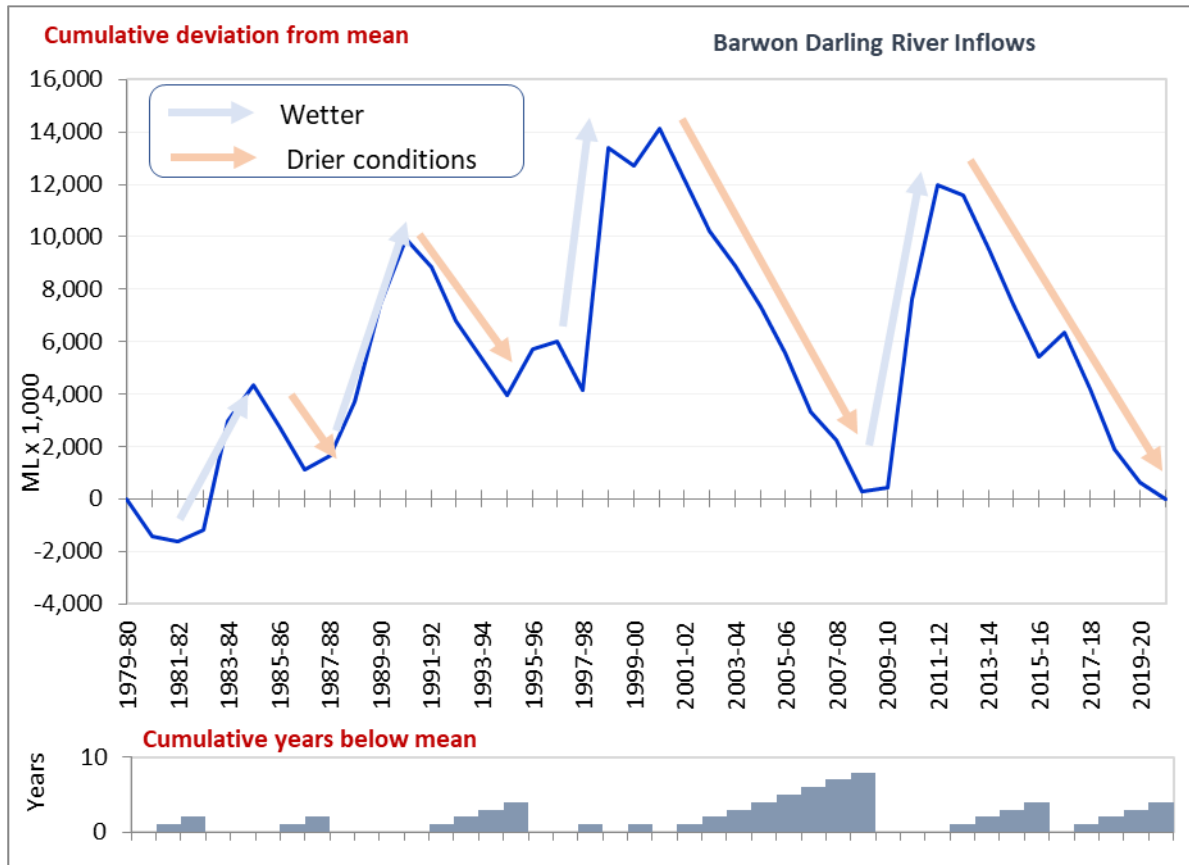


Figure 9: Long-term total gauged inflow to Barwon-Darling (ML/year)

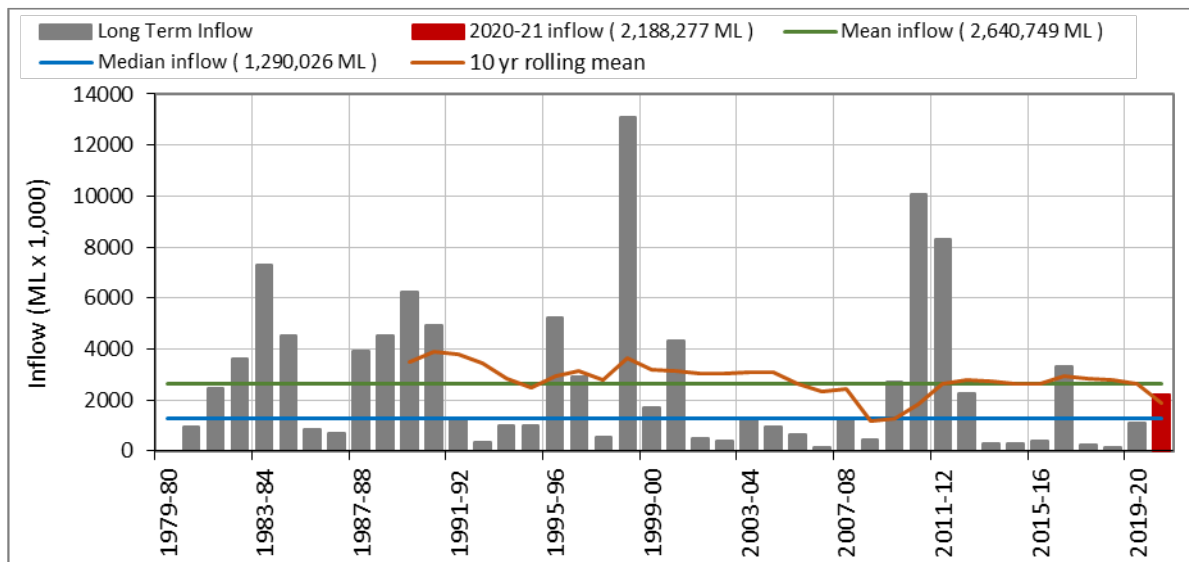


Figure 10: Daily inflow contribution by catchment for the reporting period

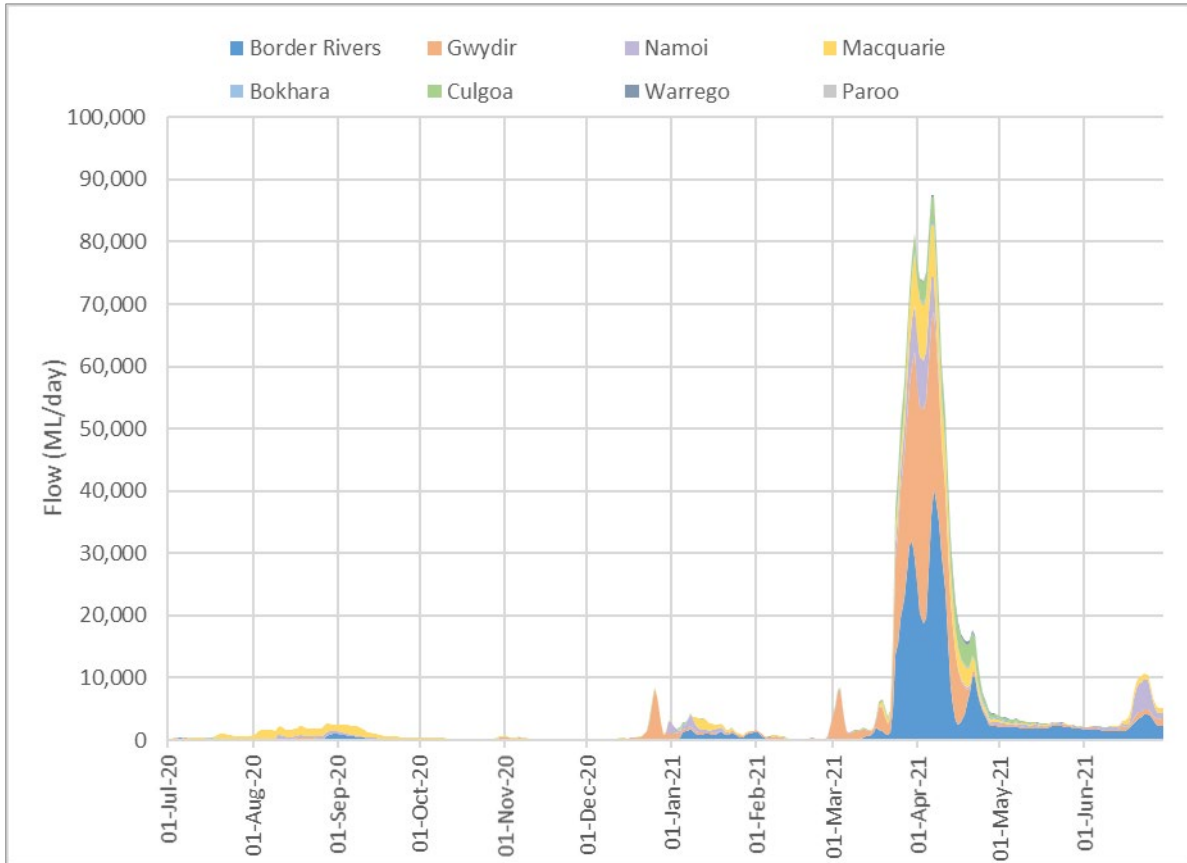


Figure 11: Gauged tributary annual inflows by catchment for the reporting period

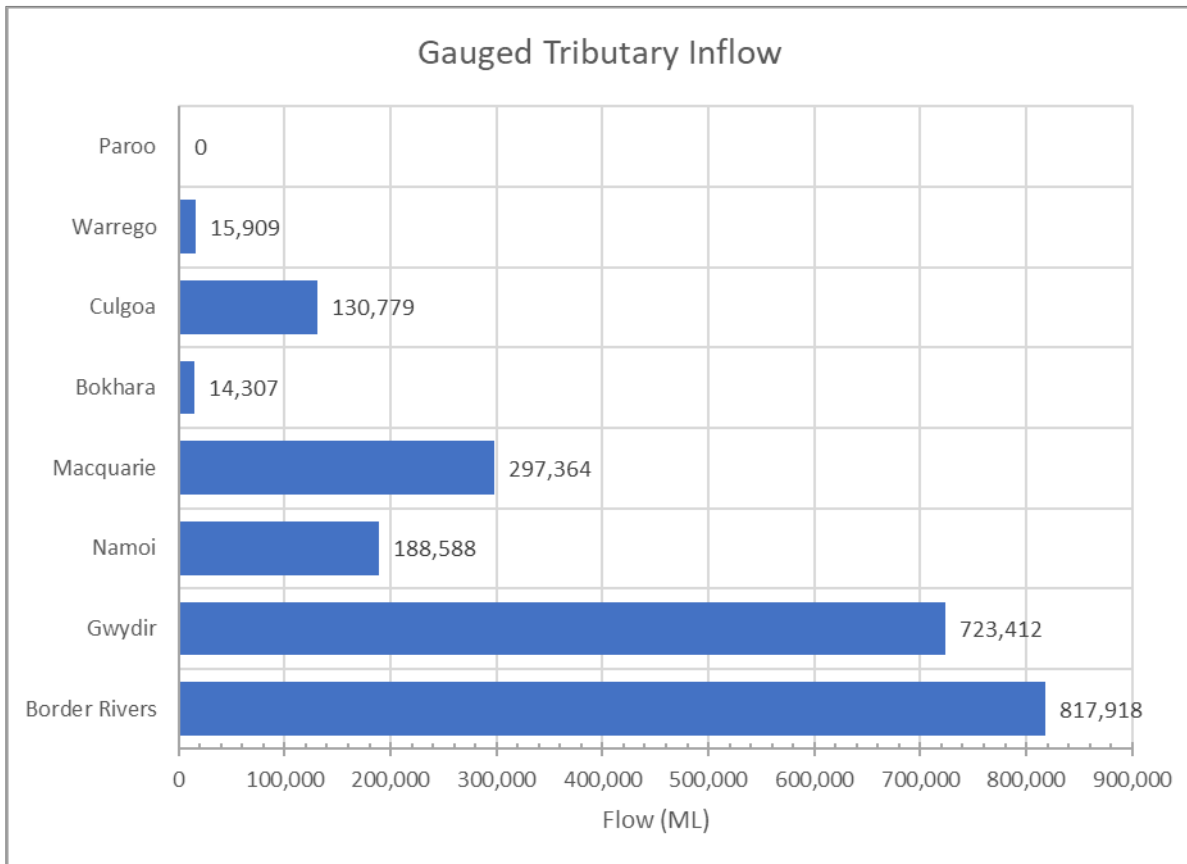


Figure 12: Catchment Inflow proportional contribution for reporting period

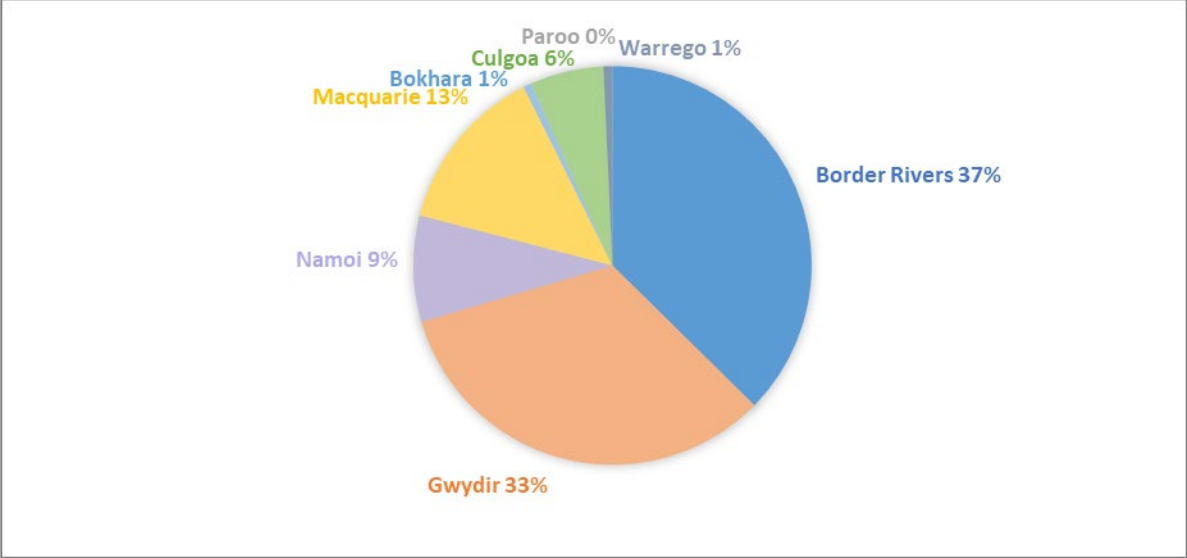


Figure 13: Historical inflow proportional contribution by catchment since 1980-81

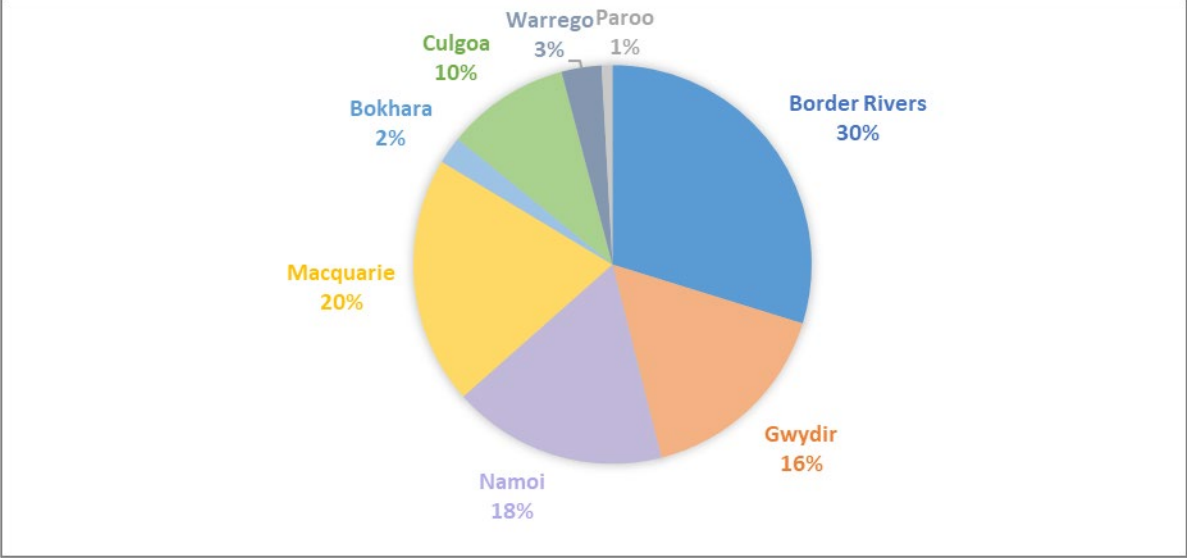
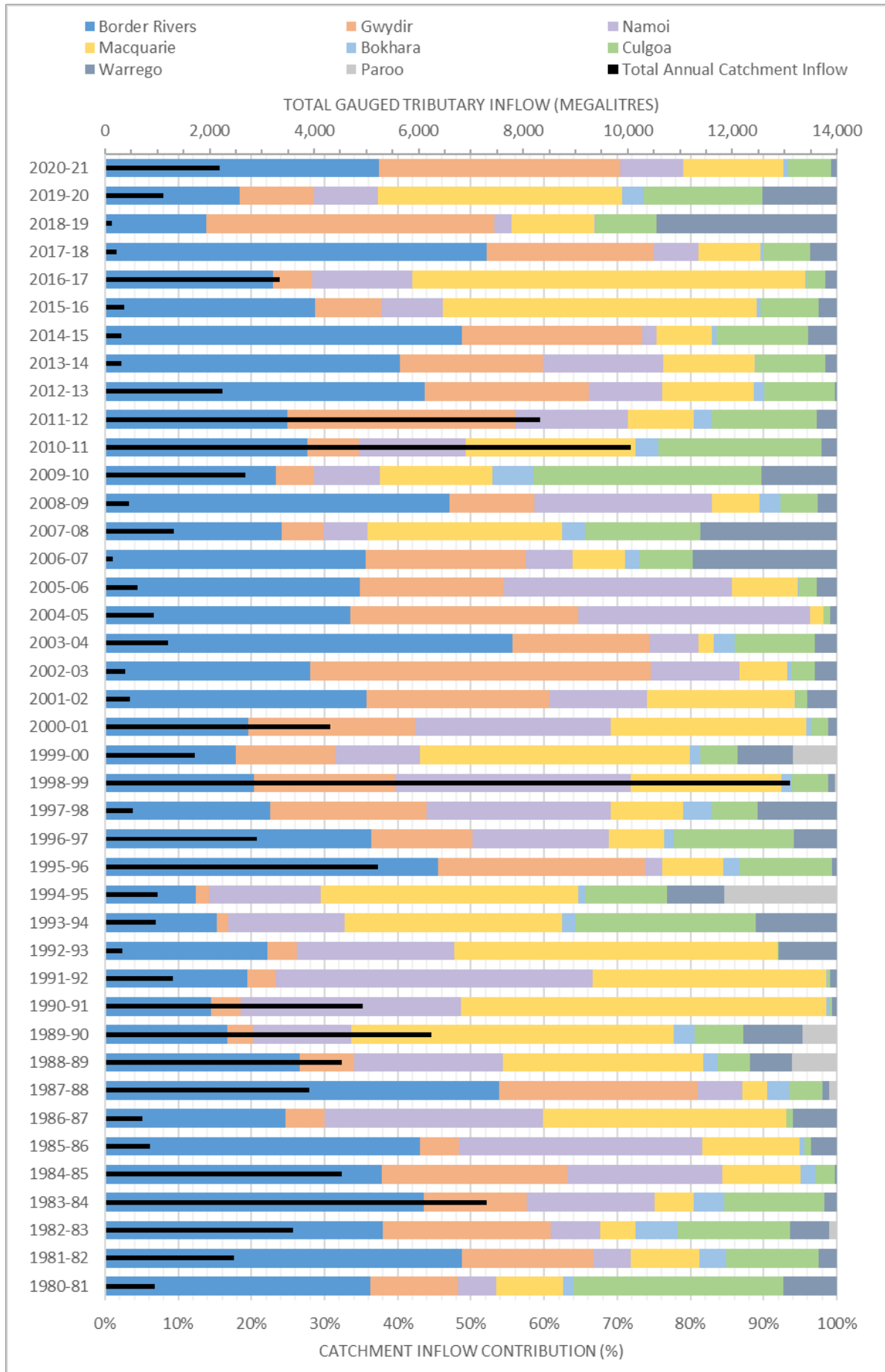


Figure 14: Historical annual inflow contribution percentage by catchment



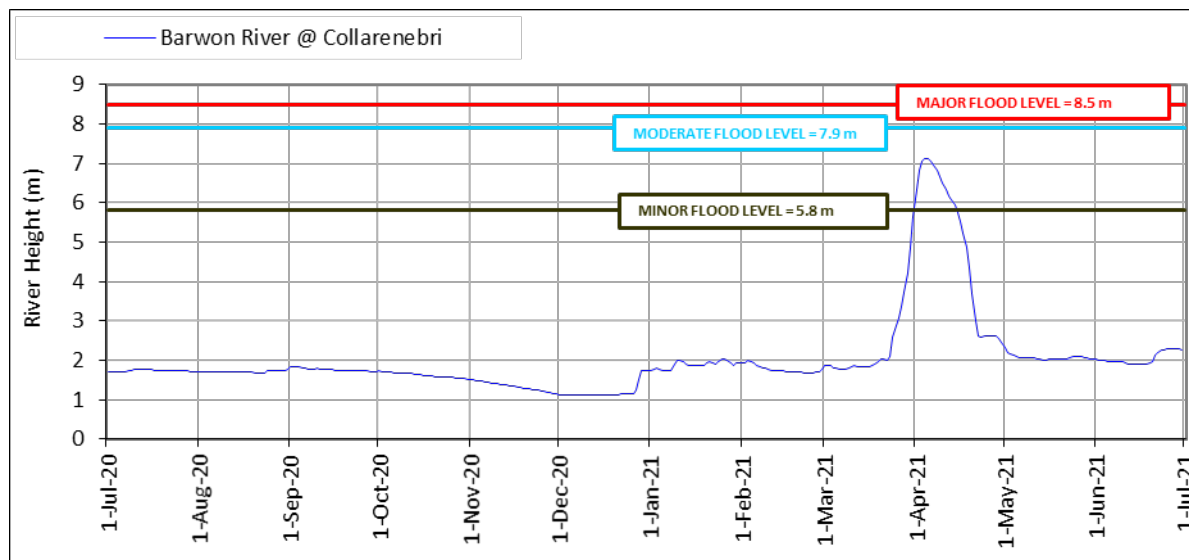
Major high flow events

High flow events occurred in the Barwon-Darling during the reporting period. River heights at 5 key sites all exceeded minor flood level with 2 site reaching moderate flood level (see Figure 15 to Figure 19). Table 4 below provides a summary.

Table 4: Barwon-Darling maximum flood heights at key sites

Site	Max. Height	Date	Flood Level
Collarenebri	7.106	4 April 2021	Minor
Brewarrina	7.142	20 April 2021	Moderate
Bourke	10.946	29 April 2021	Minor
Louth	10.186	9 May 2021	Moderate
Wilcannia	9.417	19 May 2021	Minor

Figure 15: Barwon River at Collarenebri maximum daily flow heights²



² Flood indicator levels sourced from the Bureau of Meteorology

Figure 16: Barwon River at Brewarrina maximum daily flow heights²

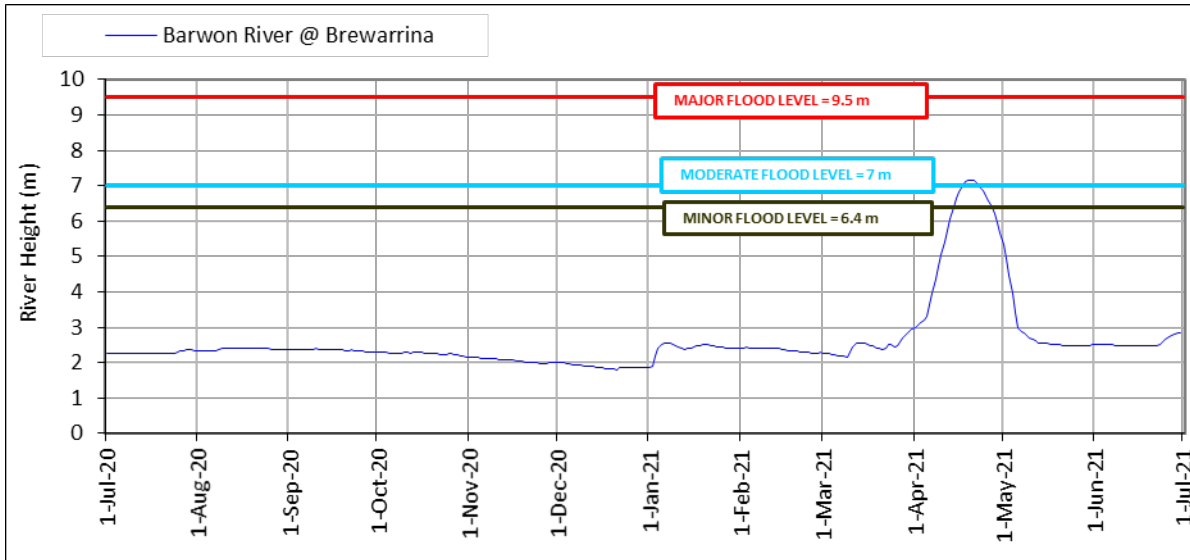


Figure 17: Darling River at Bourke maximum daily flow heights²

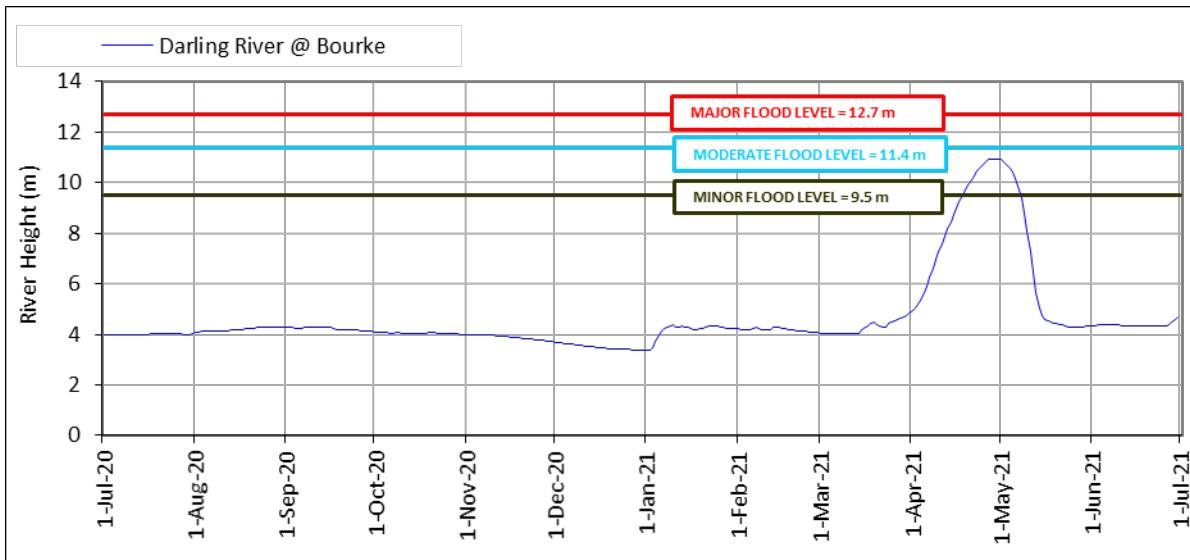


Figure 18: Darling River at Louth maximum daily flow heights²

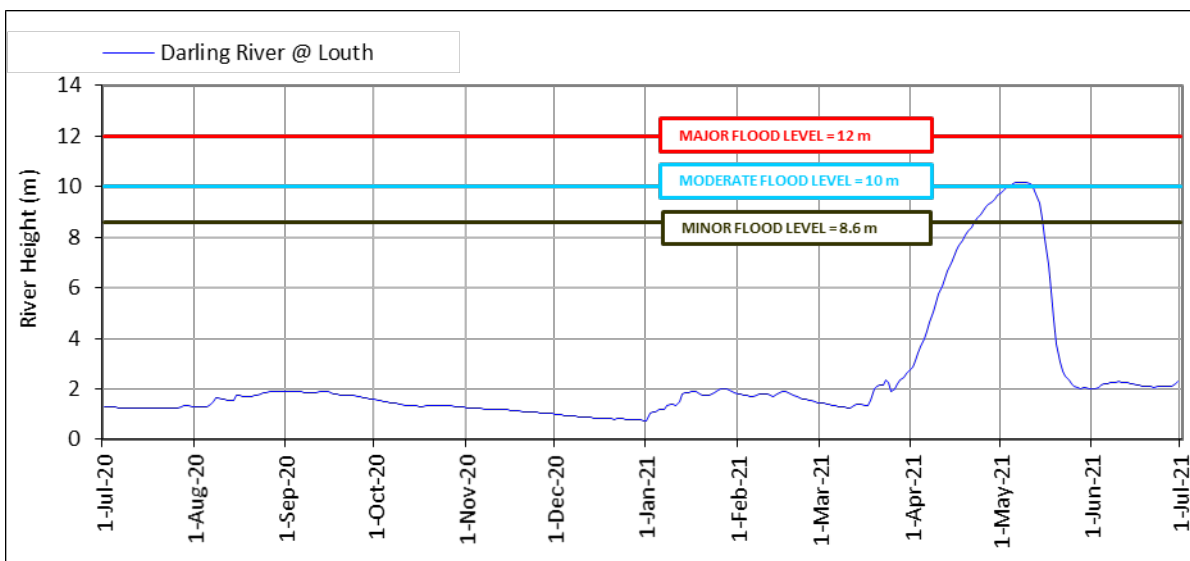
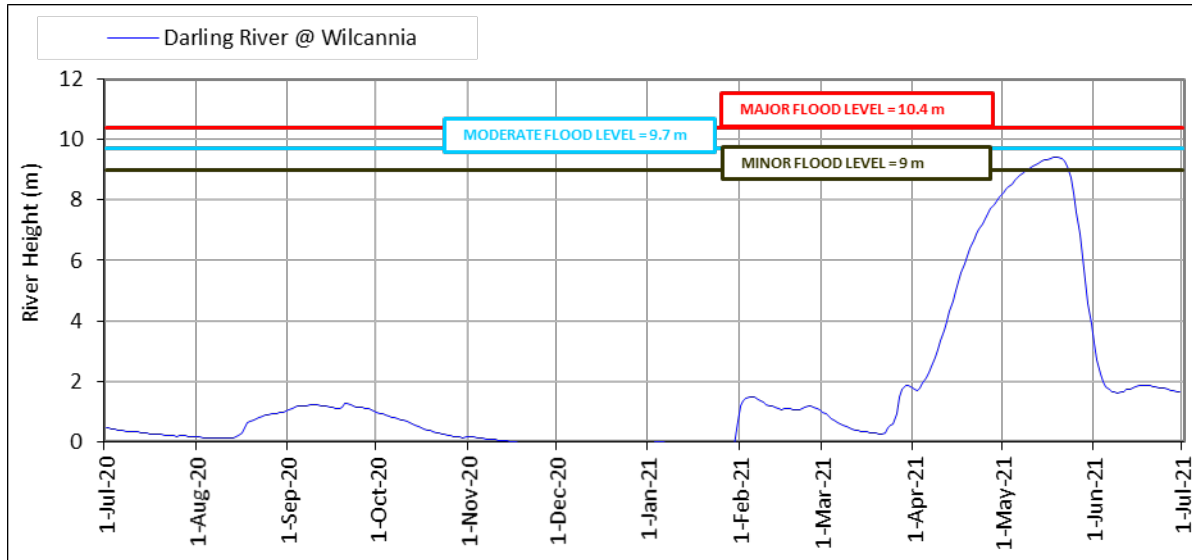


Figure 19: Darling River at Wilcannia maximum daily flow heights²



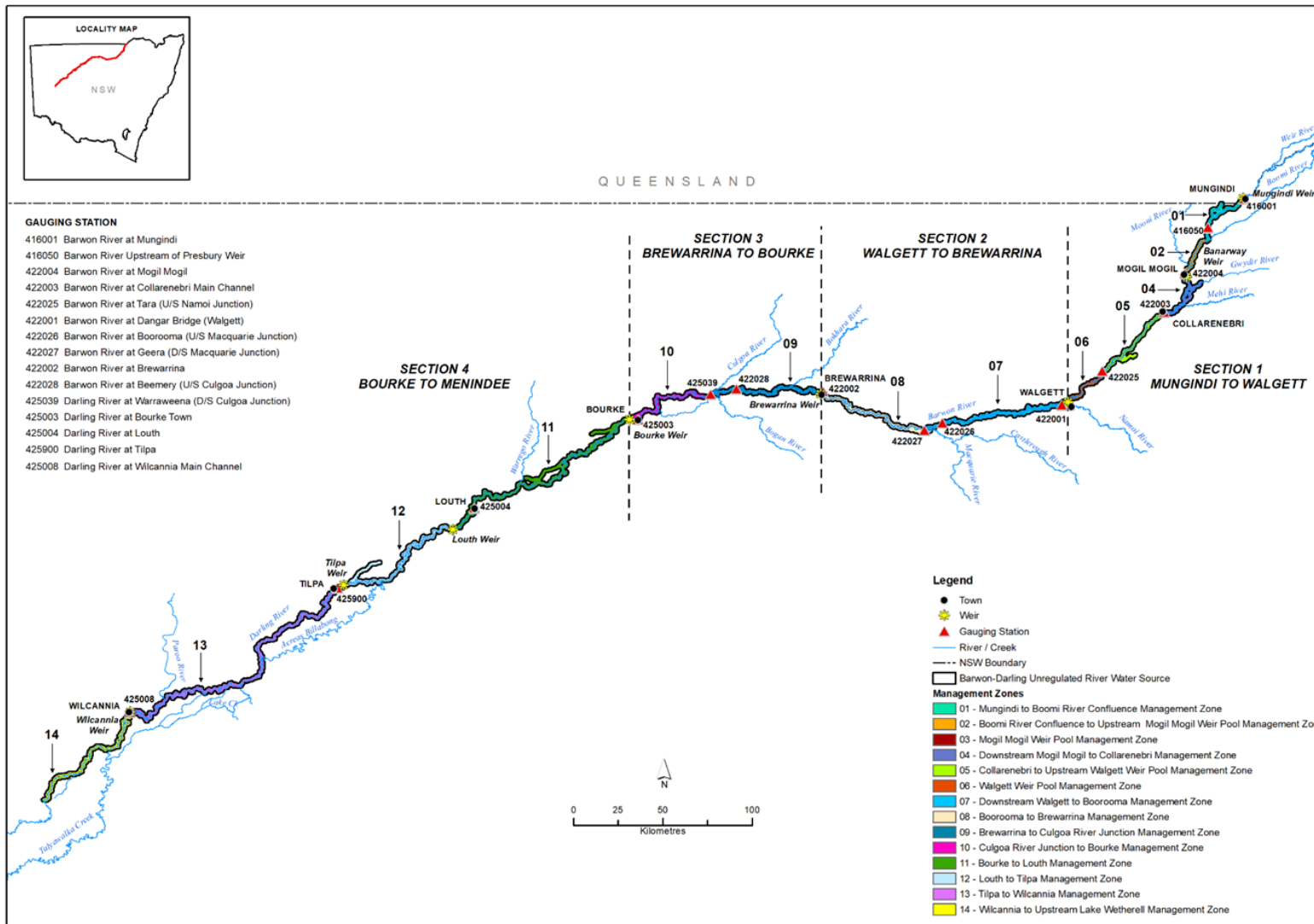
Surface water resources and management

Legislation

The Barwon-Darling Unregulated River Water Source was managed under the conditions set out in the Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012. This plan commenced on 4 Oct 2012 and will remain active until 30 June 2025. The Minister may extend this Plan for a further period of 10 years after it is due to expire, in accordance with section 43A of the Act. The water sharing plan was produced to meet the water management principles outlined in the water Management Act 2000.

The water sharing plan establishes fourteen management zones and four sections for the unregulated river water source (see Figure 20). The management zones were established to enable the development of rules governing daily extraction of water that reflect local hydrological and ecological conditions. Flow volumes and travel time, for instance, vary considerably along the entire length of the river. The sections were established to facilitate trading along the Barwon-Darling River, whilst preventing third party impacts and localised environmental impacts of water trade (DPI Water 2012).

Figure 20: Map showing Barwon-Darling River Sections and Management Zones



Plan Amendments

The Water Management Act allows the Minister to amend management plans including water sharing plans. The Barwon-Darling Water Sharing Plan has been amended 5 times since commencement.

The most recent amendments made to the plan are in Outcomes from the Water Reform Action Plan, for the Better Management of Environmental water in NSW which was the NSW Governments response to a number of reports into water management in the Barwon-Darling including, the Murray–Darling Basin Water Compliance Review, Ken Matthews’ Independent Investigation into NSW Water Management and Compliance and The Natural Resources Commissions Review of the Barwon-Darling Water Sharing Plan.

Resumption of Flows

The Resumption of flow rules protect the critical first flows after an extended low flow or dry period. WaterNSW restricts access to the first flow after an extended low flow or dry period until flow targets specified in the water sharing plan are reached. As a result, this water remains in the system until downstream flows are adequately established.

Active management

Active management, which commenced on 1 December 2020, protects environmental water from extraction as it travels through the Barwon-Darling unregulated river system. It identifies and protects environmental water that originates from either held environmental water licences, planned environmental water protected by water sharing plans, and licence holders that nominate to protect water.

Flow forecasts by WaterNSW will provide licence holders with the likely timing and level of access (flow class) for flows arriving in the system, and any environmental water required to be protected. Licence holders can use this information to determine whether they would like to submit an expression of interest to access water during the event. The expression of interest will indicate which days access is required, how much the licence holder wishes to pump, and whether the licence holder wishes to extract or protect their water. Therefore, it will allow for the water that is available, in excess of the protected water, to be distributed equitably amongst licence holders.

Daily announcements will be made during the event providing details of the flow class by management zone and the days water can be accessed. Management of water extractions is via individual daily limits which are provided to the access licence holders. These daily limits are restricted to the Individual Daily Extraction Component (IDEC) for each licence to protect against rapid extraction of flows as they travel down the system. Access Licence holders who wish to extract water must make sure they only pump up to their daily limit, as indicated on their licence conditions (IDEC) or what was announced.

Licence holders who wish to protect water can do so up to their daily limit. This volume will be added to the other active environmental water that is protected as it moves down the river.

Temporary Restrictions

If it is necessary in the public interest, an order can be made under section 324 of the Act by the Minister to restrict or prohibit the taking of water under unregulated river (B Class) access licences

and/or unregulated river (C Class) access licences to protect fish passage across major weirs, suppress blue-green algae blooms and to meet basic landholder rights.

Access rights

Below is a summary of the access rights including shares and IDEC's.

- Access licence share components remained constant throughout the reporting period (Figure 21).

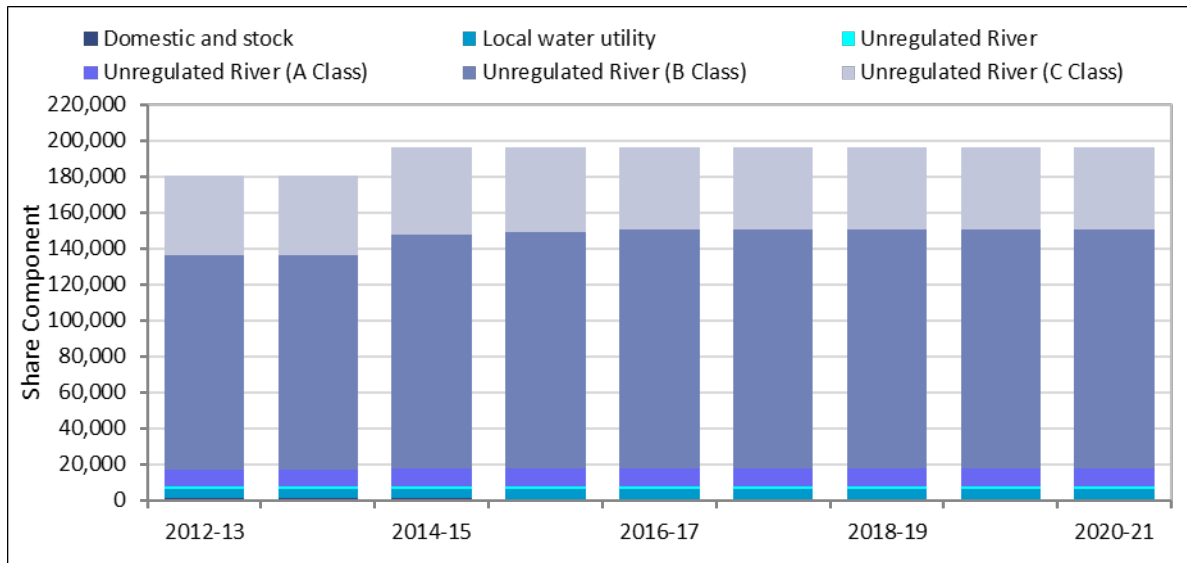
Total issued share on 30 June 2021 was 196,494 with the distribution of shares between licence categories shown in

- Table 5.
- Total IDEC issued on 30 June 2021 was 20,912 with the distribution between licence categories Table 4.

Share components and IDEC's are further distributed based on 14 Management Zones as shown in

- Table 6.

Figure 21: Share components since the commencement of the water sharing plan^[3] [4]



³ Includes all access licences issued under the water sharing plan and therefore held environmental water.

⁴ In 2013-14 the number of shares on issue was increased while the maximum AWD was decreased.

Table 5: Issued share component on 30 June 2021

Licence category	Share component	IDEC
Domestic And Stock	883	0
Domestic And Stock[Domestic]	9	0
Domestic And Stock[Stock]	7	0
Domestic And Stock[Town Water Supply]	63	0
Local Water Utility	5,373	0
Unregulated River	1,488	123
Unregulated River (A Class)	9,856	512
Unregulated River (B Class)	133,069	12,084
Unregulated River (C Class)	45,746	8,193
Total	196,494	20,912

Table 6: Table showing Share and IDEC by management zone as at 30 June 2021

Management Zone	Domestic and Stock	Local Water Utility	Unregulated River		Unregulated A Class		Unregulated B Class		Unregulated C Class	
	Share	Share	IDEC	Share	IDEC	Share	IDEC	Share	IDEC	Share
1	4	-	-	-	1	20	620	7,528	0	1
2	-	-	-	-	2	38	320	3,879	-	-
3	-	-	-	-	-	-	-	-	-	-
4	72	448	-	-	14	372	883	10,718	1,247	6,963
5	17	-	-	-	24	466	748	9,075	-	-
6	12	-	-	-	13	250	235	2,850	-	-
7	9	-	-	-	20	651	472	5,727	192	3,320
8	2,531	1,000	123	1,488	39	740	1,105	13,411	5,761	32,168
9	7	-	-	-	22	431	1,123	13,628	1	3
10	180	3,500	-	-	305	10,722	4,735	58,029	0	1,677
11	17	25	-	-	43	833	1,535	18,629	992	11,705
12	0	-	-	-	3	49	67	811	-	-
13	0	400	-	-	27	521	155	1,877	-	-
14	0	-	-	-	-	-	88	1,072	-	-

Flow Class Access Rules

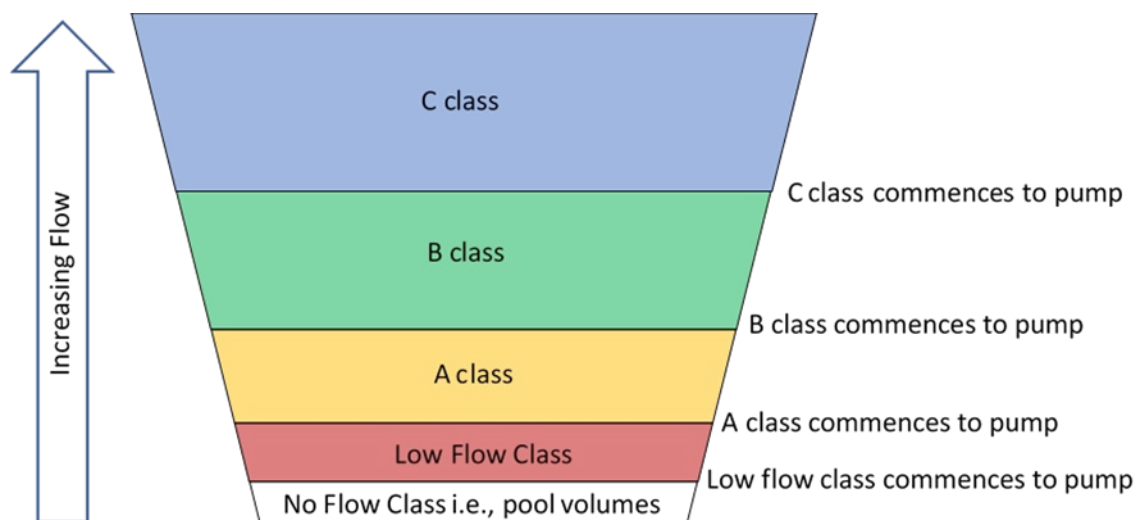
Access to water in unregulated rivers is managed by using flow classes. In the Barwon-Darling these are managed through access licence categories defined in the Water sharing plan and include Unregulated River A Class, Unregulated River B Class, Unregulated River C Class, Unregulated River, Domestic and Stock, and Local Water Utility.

The flow class thresholds are also known as commence to pump (on a rising river) and cease to pump (on a falling river) rules. The thresholds in the Barwon-Darling were originally based on the 2000–01 environmental flow rules.

The River is divided into fourteen Management zones to enable more effective management. Access licence holders may only access water when there are announced flows in these management zone and the mandatory conditions on licences are met. For domestic and stock, local water utility and unregulated river access licences access is allowed when announce flows are in the low flow class, A class, B class or C Class. Extraction by domestic and stock must not exceed 0.6ML/day when the announced flows in the management zone specified in the access licence are in the low flow class. For a conceptual diagram of flow class management refer to Figure 22.

For a detailed list of flow class thresholds refer to Note 18.

Figure 22: Conceptualisation of Flow Class Management



Flow Event Management

From 1 December 2020 event management in the Barwon-Darling System is undertaken via Active Management which identifies and protects environmental water while sharing any additional water equitably between access licence holders within specific water management zones.

Prior to active management access was by individual licence holders assessing the level of access by comparing river flows against trigger levels documented in the water sharing plan.

Temporary Restrictions

No Temporary water restrictions were in place for the reporting period.

Resumption of Flow (Prior to Active Management)

Prior to the introduction of Active Management a Resumption of Flow event occurred from August to end of September 2020 following a long period of no flows. While active management was not in place the Water Sharing Plan rules around Resumption of Flow were in place with licence holders with A, B and C class licences not permitted to pump during the event to ensure that the flows connected vital refuge pools for fish and other water dependent biota, improved water quality, and replenished town water supplies. It was triggered due to the flow conditions at the sites specified in the water sharing plan meeting the following conditions:

- Walgett being less than 326 ML/d for greater than 150 consecutive days
- Brewarrina being less than 468 ML/d for greater than 150 consecutive days
- Bourke being less than 450 ML/d for greater than 120 consecutive days
- Wilcannia being less than 200 ML/d for greater than 90 consecutive days

Figure 23 and Figure 24 shows the flow event as it passed through the system. An indication of the volume that potentially could have been extracted without the resumption of flow rules in place is indicated by the flow above the A-Class Start lines.

Figure 23: Flow event prior to introduction of Active Management in the Barwon River

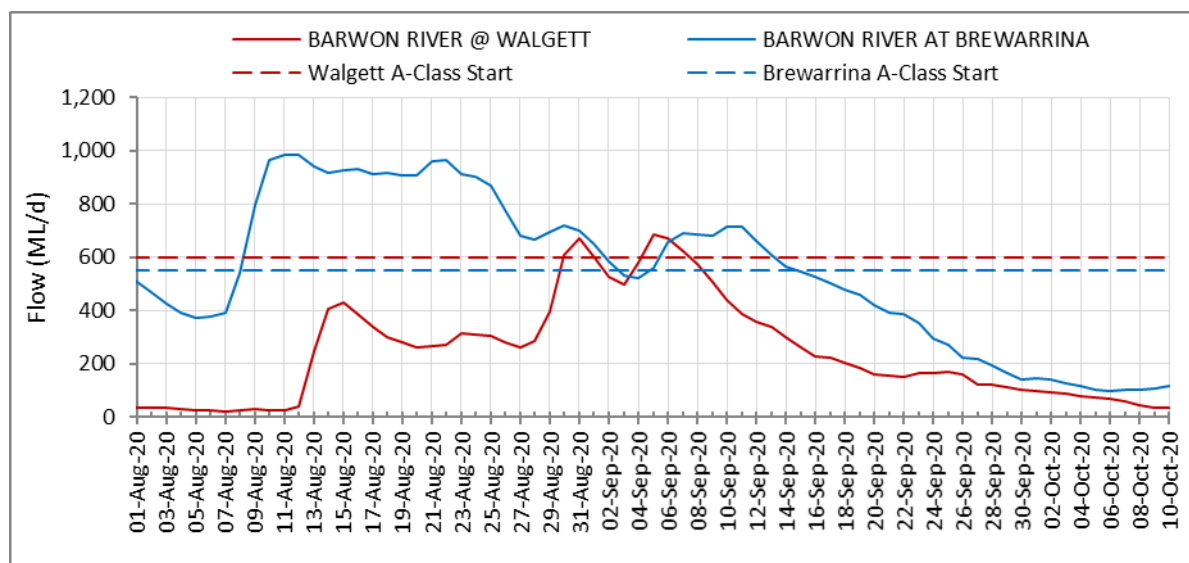
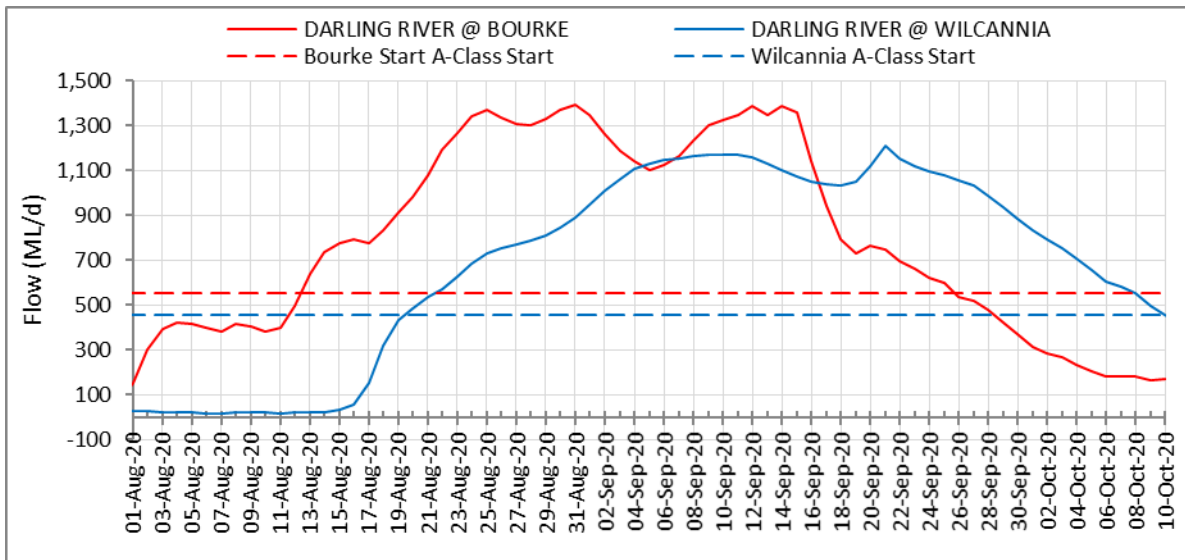


Figure 24: Flow event prior to introduction of Active Management in the Darling River



Resumption of Flow (Active Management)

Under the Water Sharing Plan for the Barwon-Darling, the Resumption of Flows Rule was activated for the first time under active management on 12 January 2021. It was triggered due to the flow at Wilcannia being below 200ML/day for 90 days.

Licence holders with A, B and C class licences were not permitted to pump during the Resumption of Flow event ensuring that the flows connected vital refuge pools for fish and other water dependent biota, improved water quality, and replenished town water supplies.

Ongoing rainfall led to the flow connectivity between Mungindi and Lake Wetherell by early February. The resumption of flows rule was partially relaxed on 24 January, then fully relaxed on 29 January 2021.

Figure 25 and Figure 26 provides a chart showing the resumption of flow event as it passes down the river. An indication of the volume that potentially could have been extracted without the resumption of flow rules in place is indicated by the flow above the A-Class Start lines.

Figure 25: Resumption of flow event along Barwon River

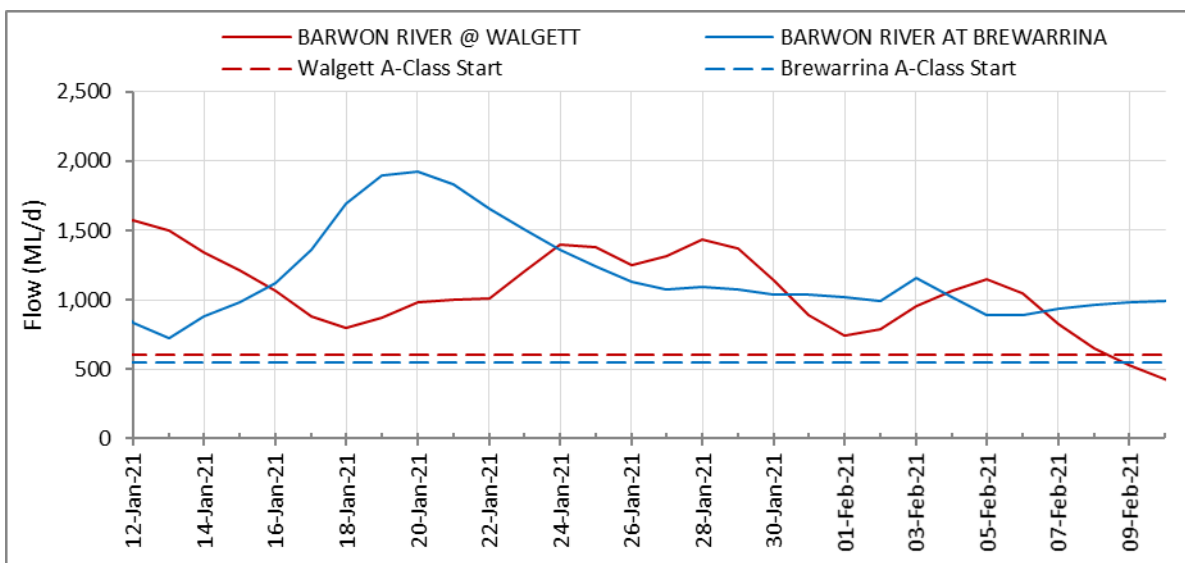
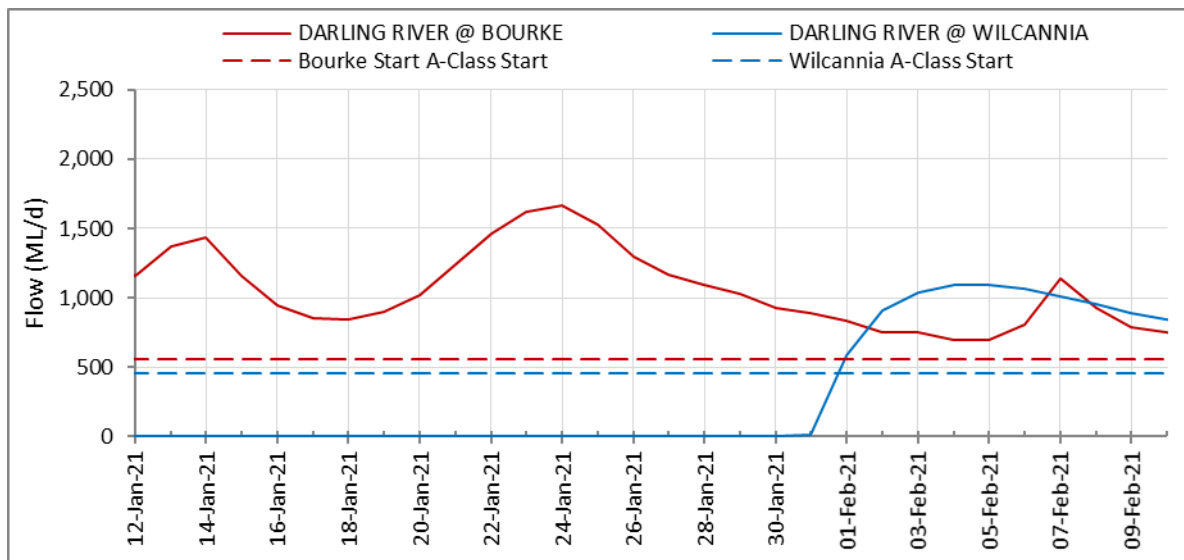


Figure 26: Resumption of flow event along Darling River



Flow Class Access via Active Management

This section provides a summary of the active management events in the Barwon-Darling unregulated water source. It does not include events associated with those connected unregulated water sources (e.g. Gwydir, Macquarie-Bogan) with the exception of their inflow contributions to the Barwon Darling. Flows at major sites along the Barwon and Darling Rivers can be seen at Figure 27 and Figure 28 respectively.

In 2020-21 there were three actively managed events including one that overlapped the Resumption of Flow event. The high-level detail of these 3 events is provided below and summarised in Table 7. A chart showing the protected HEW contributions both in-stream and from inflows is presented in Figure 29.

Event 1

This event occurred between 22 December 2020 and 12 March 2021 commencing in Zone 1 (Mungindi to Boomi Confluence). It was triggered by a planned HEW release from the Border Rivers of 896 megalitres to refresh water holes between Mungindi and Walgett. However, heavy rainfall in December across Gwydir, Namoi and water through the Macquarie Marshes resulted in increased inflows which provided flow through to the end of system.

Event 2

This event occurred between 10 March 2021 and 5 May 2021 commencing in Zone 2 (Boomi confluence to U/S Mogil Weir Pool). This event was fully managed through in-stream HEW licences through the expression of interest process under active management. There was no HEW arriving via inflows into the system.

Widespread rainfall across the system resulted in significant inflows to the Barwon-Darling and allowed daily access up to the maximum IDEC for the majority of the event.

Event 3

This event occurred between 20 May 2021 and 30 June 2021 commencing in Zone 2 (Boomi confluence to U/S Mogil Weir Pool). While this event was mostly managed through in-stream HEW

licences through the expression of interest process under active management there was a minor HEW inflow contribution from the Gil Gil Creek and Mehi River.

This event continued after 30 June 2021. As this event reporting is not adjusted for travel time a significant volume of water that was protected in the upstream sections did not arrive at Wilcannia before 30 June 2021. For detail in relation to the continuation of Event 3 (see Significant Events since 30 June 2021).

Figure 27: Flows along the Barwon River

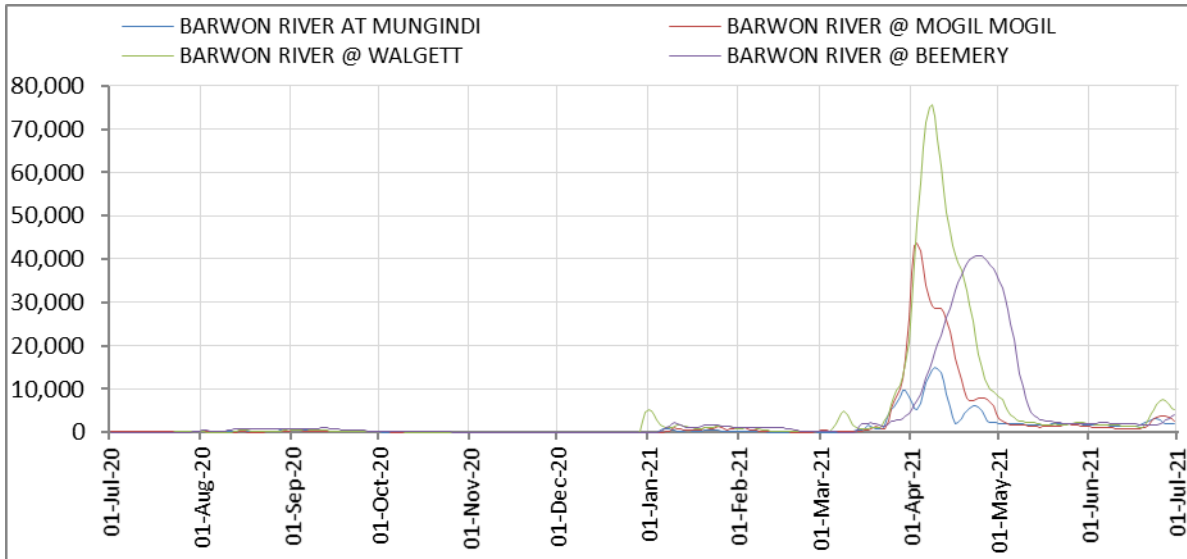


Figure 28: Flows along the Darling River

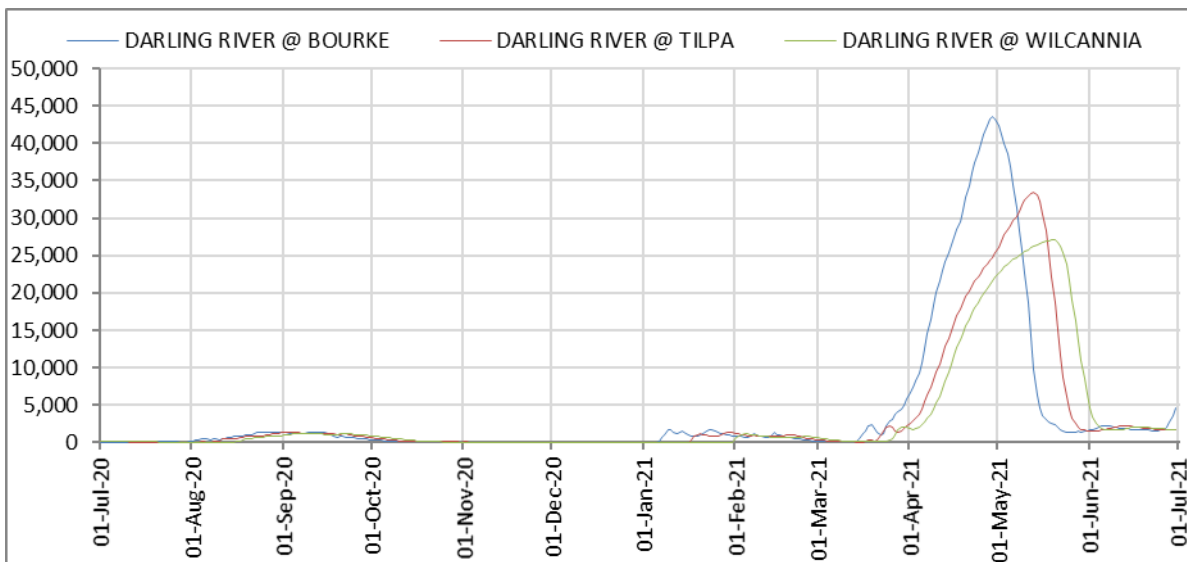


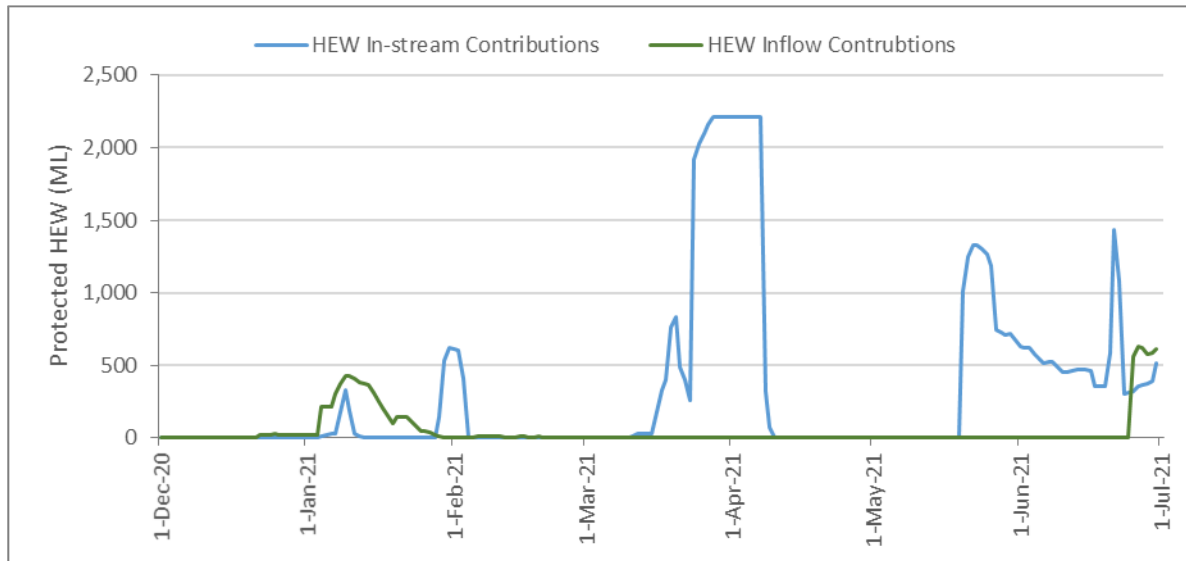
Table 7: Active management event summary table⁵

	Event 1	Event 2	Event 3	Active Management Since 1 December 2020
-	22-Dec-2020 to 12-Mar-2021	10-Mar-2021 to 5-May-2021	20-May-2021 to 30-Jun-2021	
-	Mungindi to Wilcannia	Mogil Mogil to Wilcannia	Mogil Mogil to Wilcannia	
-	Protected Volume (ML)	Protected Volume (ML)	Protected Volume (ML)	Total Protected (ML)
Protected In-stream - Barwon-Darling unregulated licences (HEW)				
Zone 2: Boomi confluence to u/s Mogil Weir Pool	615	6,820	3,758	11,193
Zone 4: d/s Mogil Weir to Collarenebri	2,905	25,587	20,153	48,645
Zone 8: d/s Macquarie confluence to Brewarrina	197	583	189	969
Zone 11: Bourke to Louth	80	3,724	3,724	7,528
Total In-stream HEW Protected	3,797	36,714	27,627	68,138
Protected Inflows from connected systems (HEW)				
Border Rivers Arriving	896	0	0	896

⁵ Note that the table is based on specific date range that is not adjusted for travel time. Hence, the protected flows entering the system will impact outside of the event date range at Wilcannia.

	Event 1	Event 2	Event 3	Active Management Since 1 December 2020
-	22-Dec-2020 to 12-Mar-2021	10-Mar-2021 to 5-May-2021	20-May-2021 to 30-Jun-2021	
-	Mungindi to Wilcannia	Mogil Mogil to Wilcannia	Mogil Mogil to Wilcannia	
Gil Gil Creek at Barwon Confluence	4,362	0	652	5,014
Mehi at Barwon Confluence	0	0	2,932	2,932
Namoi at Barwon Confluence	0	0	0	0
Macquarie at Barwon Confluence	646	0	0	646
Total HEW Inflows Protected	5,904	0	3,584	9,488
Protected Arriving at Wilcannia (HEW)	3,801	16,565	13,280	33,646

Figure 29: Protected HEW contributions



Flow Class Announcement

Widespread rain across the Barwon-Darling system and its tributaries from December 2020 to June 2021 resulted in significant periods of water access for licence holders. With active management in the Barwon-Darling commencing on 1 December 2020 account water access was managed on a daily basis to provide for consumptive users while still protecting the environmental water through the system. Daily announcements were made permitting access by licence category and management zone. In addition expression of interest were requested for those wanting to access licence account water and then used to distribute available water to individual licence holders up to their daily extraction limit.

Periods of flow class access by licence category and by zone is provided in Figure 30 and Figure 31.

Figure 30: Periods of Flow Class announcements Zones 1-7

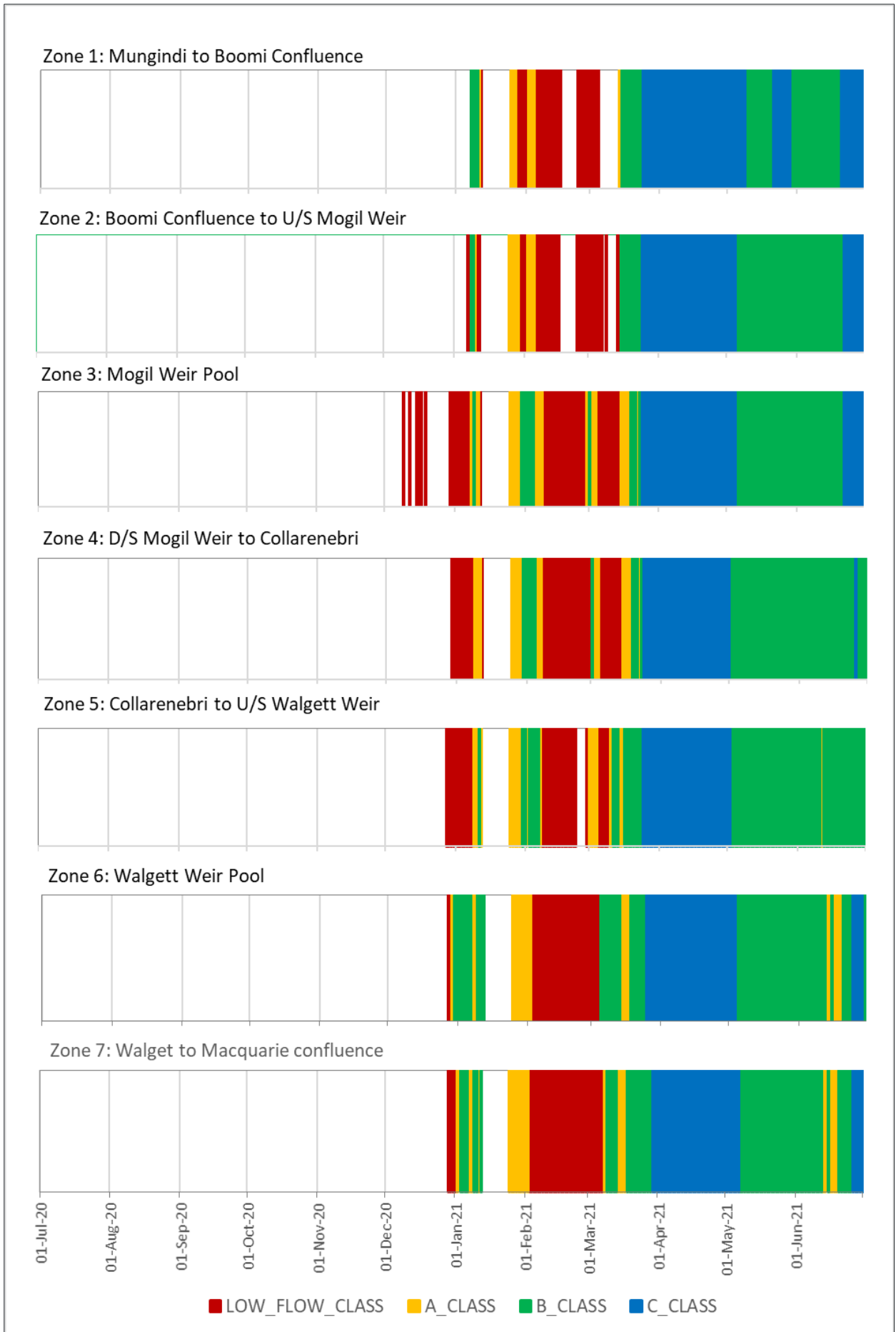
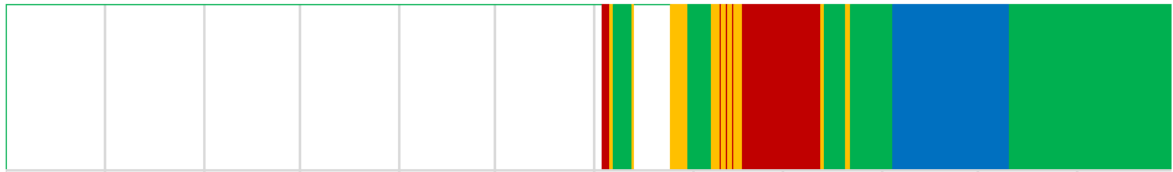


Figure 31: Periods of Flow Class announcements Zones 8-14

Zone 8: D/S Macquarie Confluence to Brewarrina



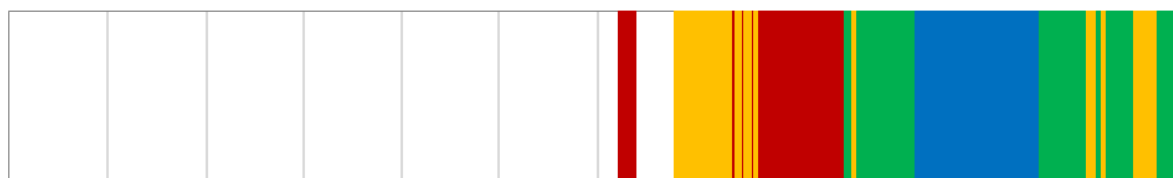
Zone 9: Brewarrina to Culgoa Junction



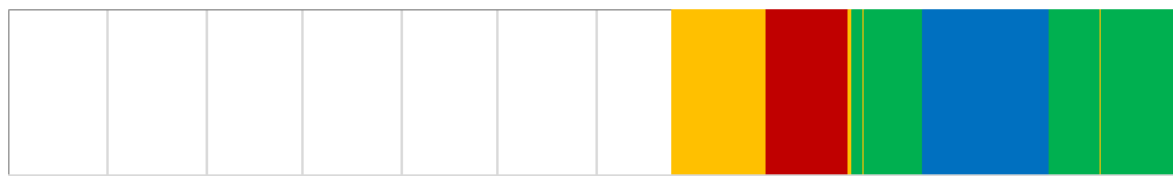
Zone 10: Culgoa Junction to Bourke



Zone 11: Bourke to Louth



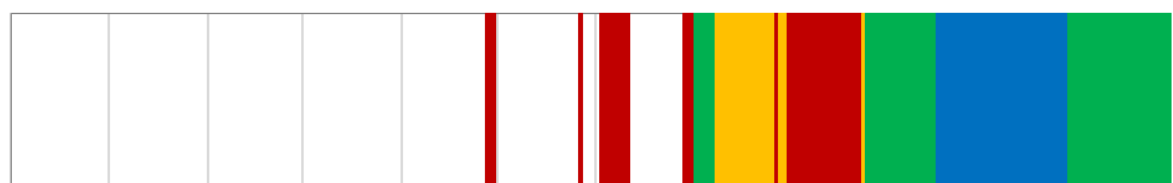
Zone 12: Louth to Tilpa



Zone 13: Tilpa to Wilcannia



Zone 14: Wilcannia to Lake Wetherell inflow



01-Jul-20
01-Aug-20
01-Sep-20
01-Oct-20
01-Nov-20
01-Dec-20
01-Jan-21
01-Feb-21
01-Mar-21
01-Apr-21
01-May-21
01-Jun-21

LOW_FLOW_CLASS A_CLASS B_CLASS C_CLASS

Flow Class Event Account Usage

Account usage refers to the total volume of water debited against an access licence. Usage for the flow events is broken up into that water which is extracted and the water that is protected and remains in the river for environmental benefit.

The total account usage from unregulated access licences totalled 262,351 megalitres for the reporting period. This included 194,016 megalitres extracted from the river and 68,335 megalitres protect for instream use by the environment (see Table 8).

Usage against held environmental water access licences did not occur until the introduction of active management on 1 December 2020.

Event usage is categorised by access licence category and water management zone. It is also broken up into whether it is protected and extracted usage. For more details on these refer to Figure 32, Figure 33 and Figure 34.

Figure 32: Licence category usage by zone

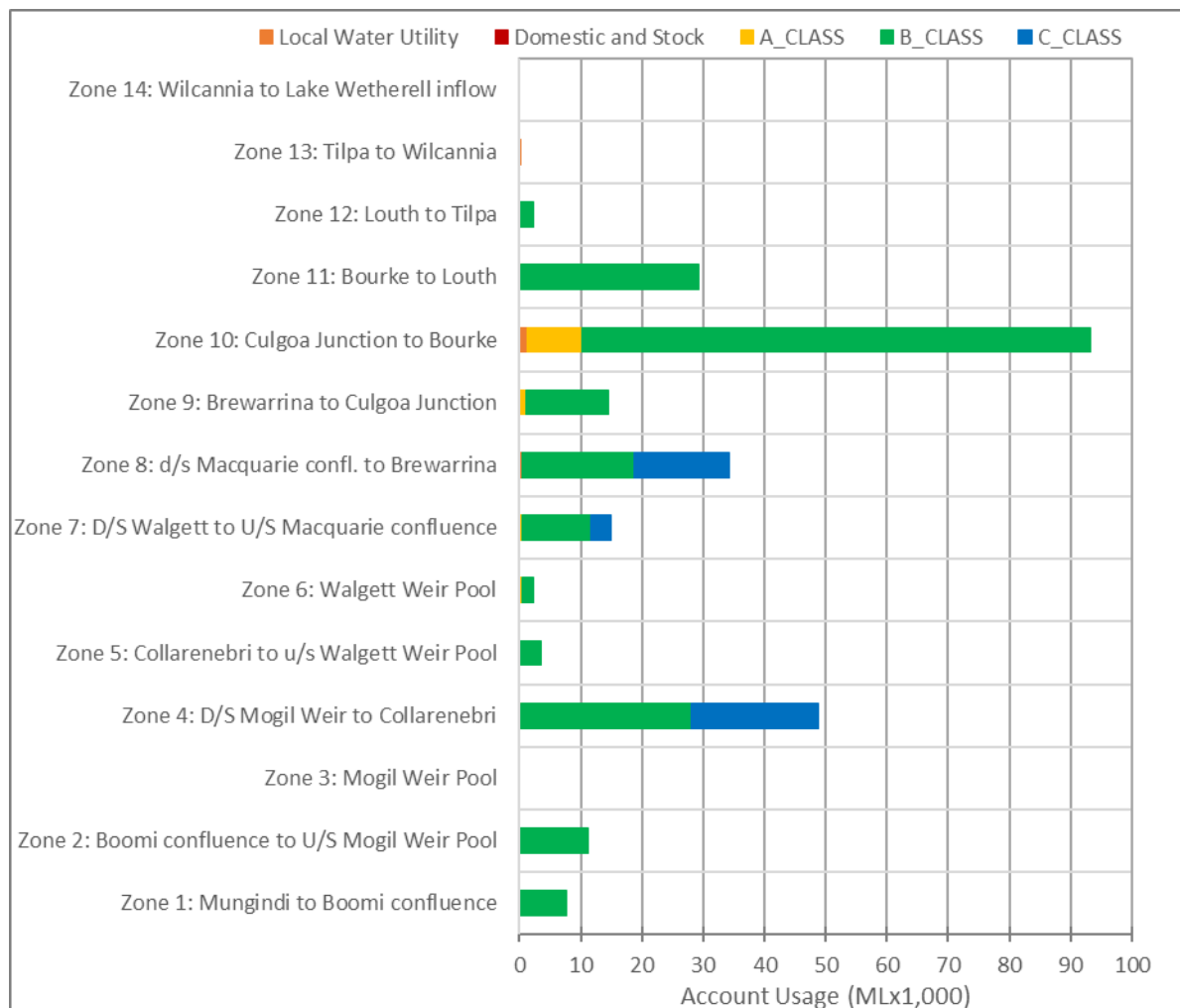


Figure 33: Usage by licence category detailing protected vs extracted

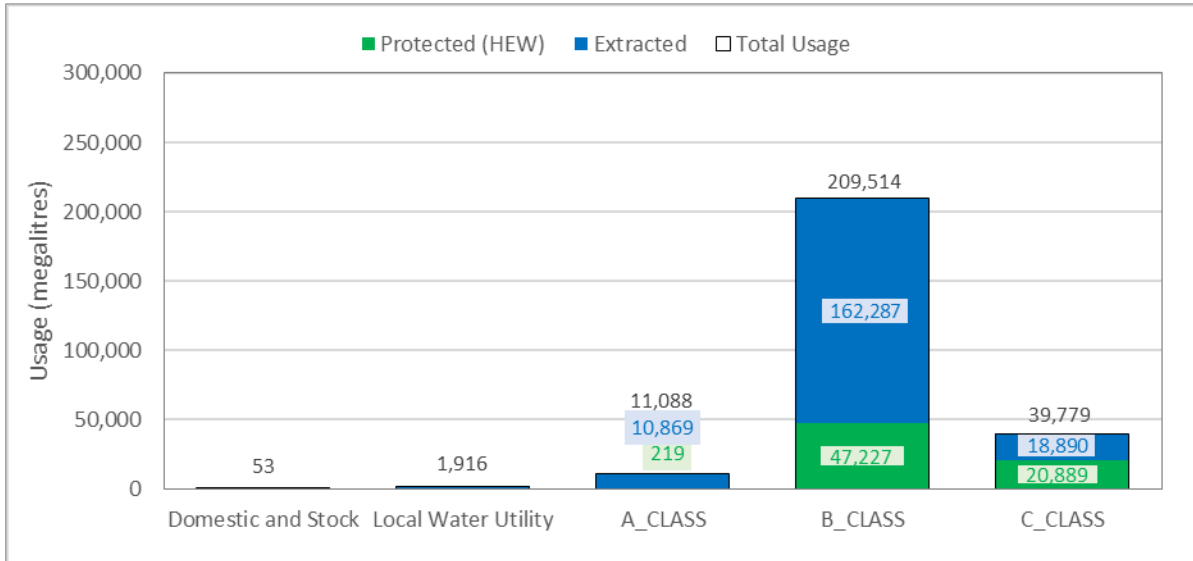


Figure 34: Usage by zone detailing protected vs extracted

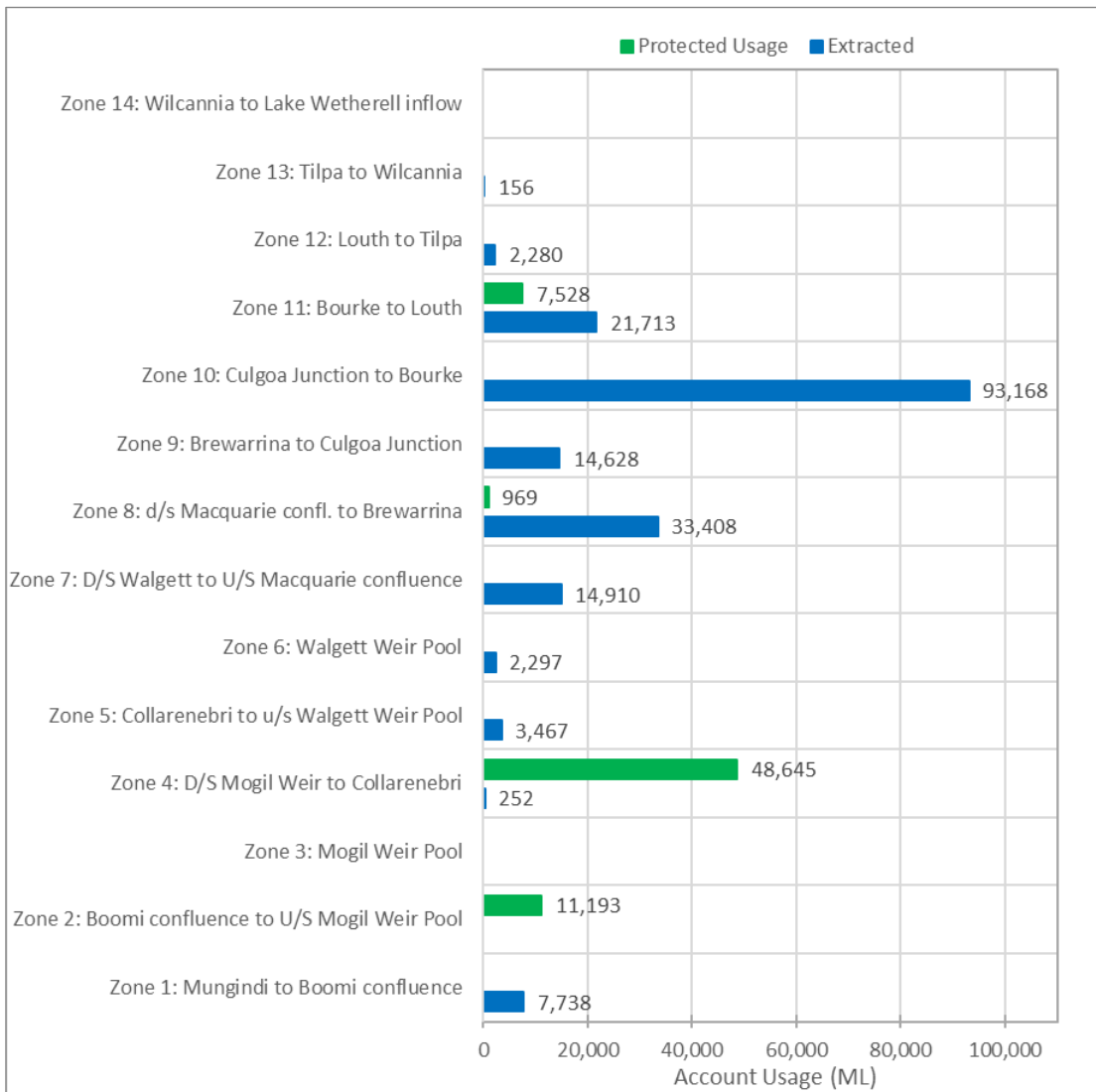


Table 8: Barwon-Darling Usage by Class, Zone, Protected, Extracted

Management Zone	Domestic and Stock	Local Water Utility	A_CLASS		B_CLASS		C_CLASS		Extracted Usage	HEW Protected Usage	Total Account Usage
			Extracted	Protected Usage	Extracted	Protected Usage	Extracted	Protected Usage			
Zone 1: Mungindi to Boomi confluence	0	0	0	0	7,738	0	0	0	7,738	0	7,738
Zone 2: Boomi confluence to U/S Mogil Weir Pool	0	0	0	0	0	11,193	0	0	0	11,193	11,193
Zone 3: Mogil Weir Pool	0	0	0	0	0	0	0	0	0	0	0
Zone 4: D/S Mogil Weir to Collarenebri	0	111	10	0	131	27,756	0	20,889	252	48,645	48,897
Zone 5: Collarenebri to u/s Walgett Weir Pool	17	0	35	0	3,415	0	0	0	3,467	0	3,467
Zone 6: Walgett Weir Pool	0	0	417	0	1,880	0	0	0	2,297	0	2,297
Zone 7: D/S Walgett to U/S Macquarie confluence	0	0	416	0	11,278	0	3,216	0	14,910	0	14,910
Zone 8: d/s Macquarie confl. to Brewarrina	36	420	0	0	17,278	969	15,674	0	33,408	969	34,377
Zone 9: Brewarrina to Culgoa Junction	0	0	1,034	0	13,594	0	0	0	14,628	0	14,628
Zone 10: Culgoa Junction to Bourke	0	1,204	8,958	0	83,006	0	0	0	93,168	0	93,168
Zone 11: Bourke to Louth	0	25	0	219	21,687	7,309	0	0	21,712	7,528	29,240

Management Zone	Domestic and Stock	Local Water Utility	A_CLASS		B_CLASS		C_CLASS		Extracted Usage	HEW Protected Usage	Total Account Usage
			Extracted	Protected Usage	Extracted	Protected Usage	Extracted	Protected Usage			
Zone 12: Louth to Tilpa	0	0	0	0	2,280	0	0	0	2,280	0	2,280
Zone 13: Tilpa to Wilcannia	0	156	0	0	0	0	0	0	156	0	156
Zone 14: Wilcannia to Lake Wetherell inflow	0	0	0	0	0	0	0	0	0	0	0
TOTALS	53	1,916	10,869	219	162,287	47,227	18,890	20,889	194,016	68,335	262,351

Physical Water Balance Diagrams by Zone

The following Diagrams in Figure 35, Figure 36, Figure 37, Figure 38 and Figure 39 present a detailed summary of the physical flow movements for each Barwon-Darling unregulated river management zone. They also include the protected flow summaries which also include items such as protected usage and losses that are not part of the physical flow calculation.

It should be noted that the high levels of unaccounted difference in the upper zones resulted from the flood event that occurred in April 2021 which resulted in both flows going over bank onto the flood plain, and ungauged overland inflows not accounted for.

Table 9: Explanation of terms used in Physical Flow diagrams (Figure 35, Figure 36, Figure 37, Figure 38 and Figure 39)

Item		Description
Arriving	Protected	Portion of the flow arriving at the upstream site in the management zone that is to be protected as it flows through the zone.
	Unprotected	Portion of the flow arriving at the upstream site in the management zone not required to be protected as it flows through the zone. This flow is available to be extracted when flow class access is permitted.
Leaving	Protected	Portion of the flow leaving the management zone at the downstream site that is to be protected in the downstream management zone.
	Unprotected	Portion of the flow leaving the management zone at the downstream site not required to be protected as it flows through the downstream management zone. This flow is available to be extracted when flow class access is permitted.
Inflow	Protected	Portion of the flow entering the management zone through tributaries that is to be protected as it enters and flows through the management zone.
	Unprotected	Portion of the flow entering the management zone through tributaries that does not need to be protected as it enters and flows through the management zone. This flow is available to be extracted in the management zone when flow class access is permitted.
Extractions		Water that is extracted from the management zone by licence category.
Protected Usage		Water that is accounted against a licence but not physically extracted from the river. This water is protected from through the management zone to the next management zone.
Protected Losses		This is a loss volume applied to the management zone that reduces the protected flow in the management zone.
Rainfall		Estimated annual volume of rainfall on the management zone.

Item	Description
Evaporation	Estimated annual volume of evaporation from the management zone.
Volume	The volume of water stored in the river channel on the day of reporting
Unaccounted Difference	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. As all processes of a water balance contain uncertainty in the volumes presented, in some cases large uncertainties, with a variety of sources from which the data is obtained and the fact that not all processes of the water cycle have been accounted, an unaccounted difference is required to achieve an accounting balance.

Figure 35: Physical Flow Diagram Zones 1-3

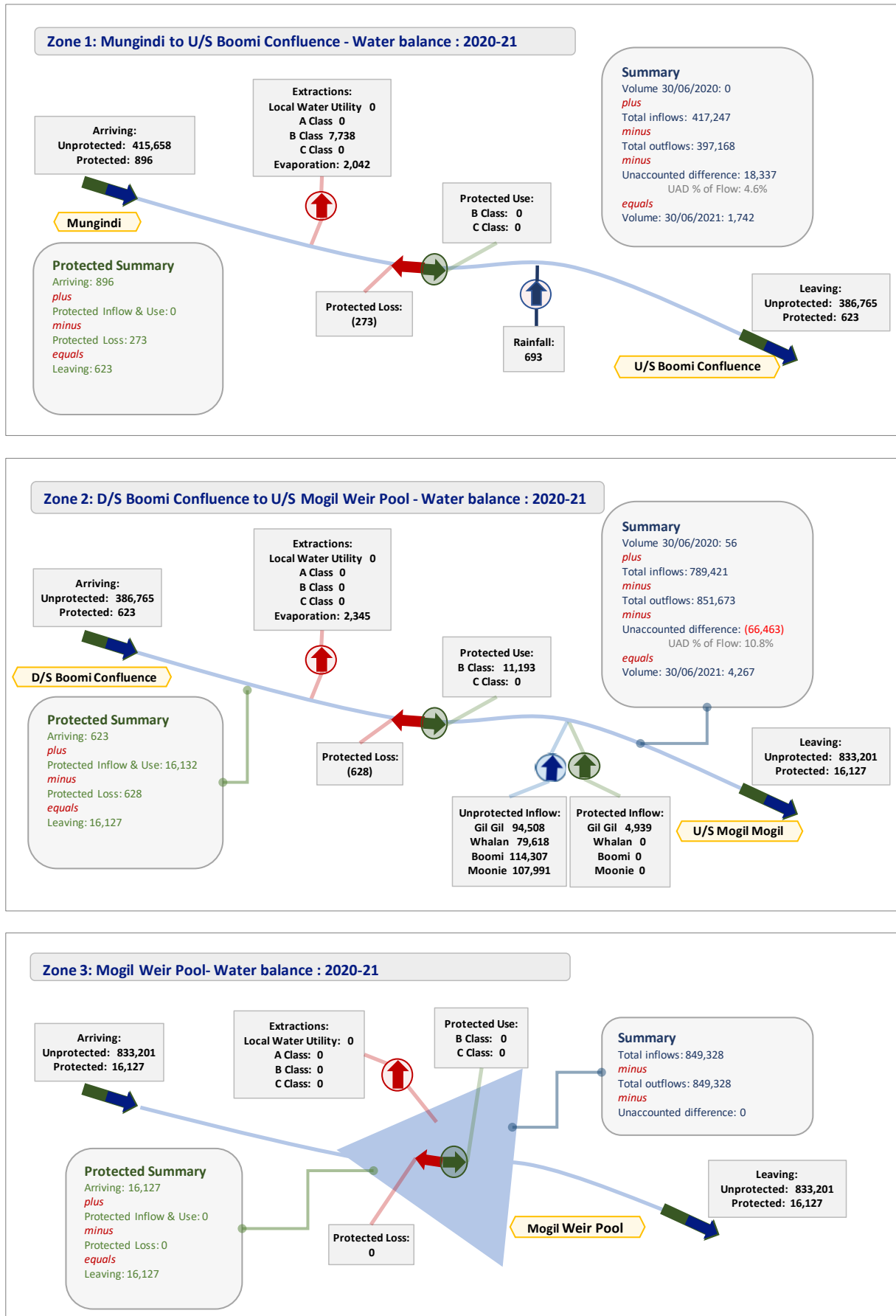
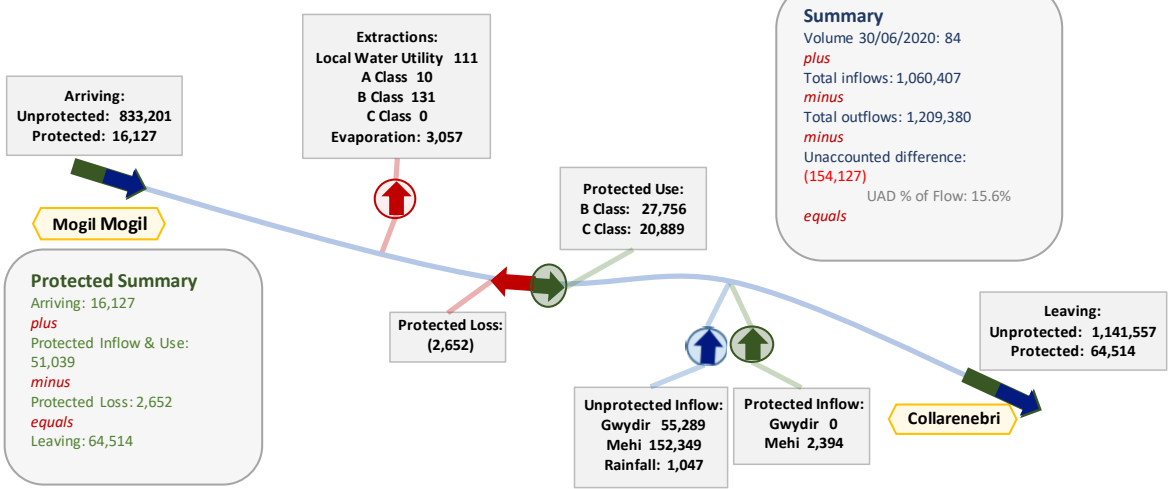
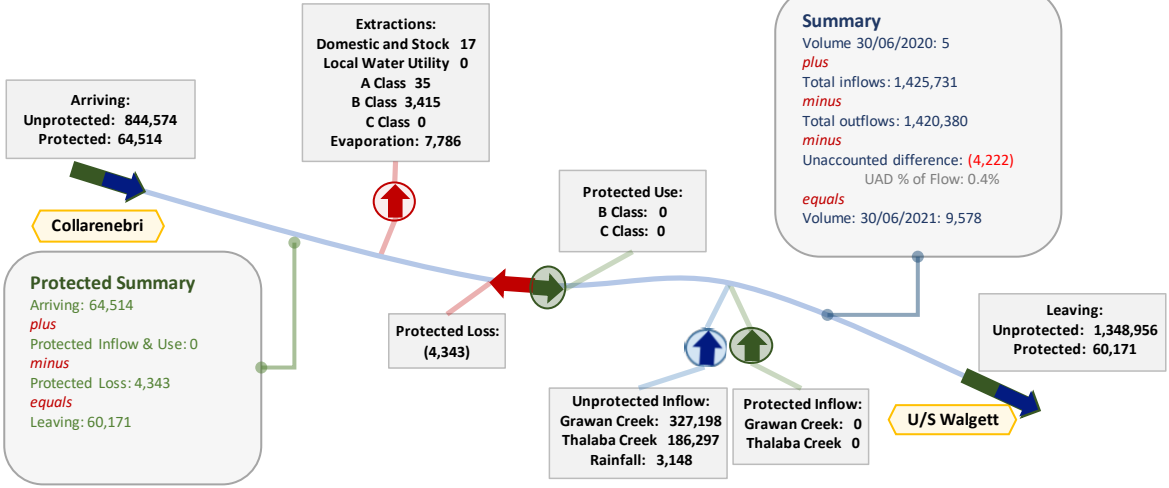


Figure 36: Physical Flow Diagram Zones 4-6

Zone 4: Downstream Mogil Mogil to Collarenebri - Water balance : 2020-21



Zone 5: Collarenebri to U/S Walgett Weir Pool - Water balance : 2020-21



Zone 6: Walgett Weir Pool - Water balance : 2020-21

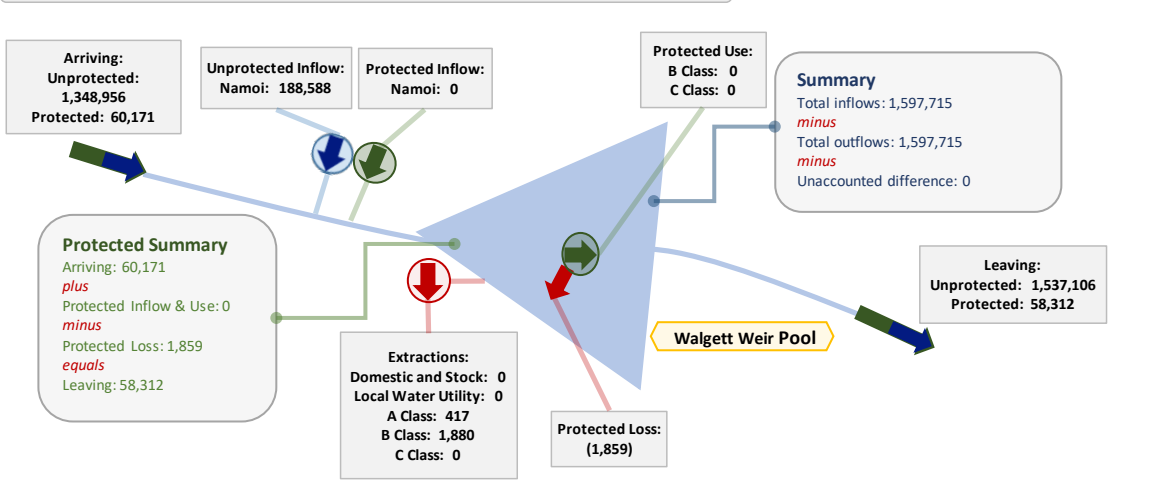


Figure 37: Physical Flow Diagram Zones 7-9

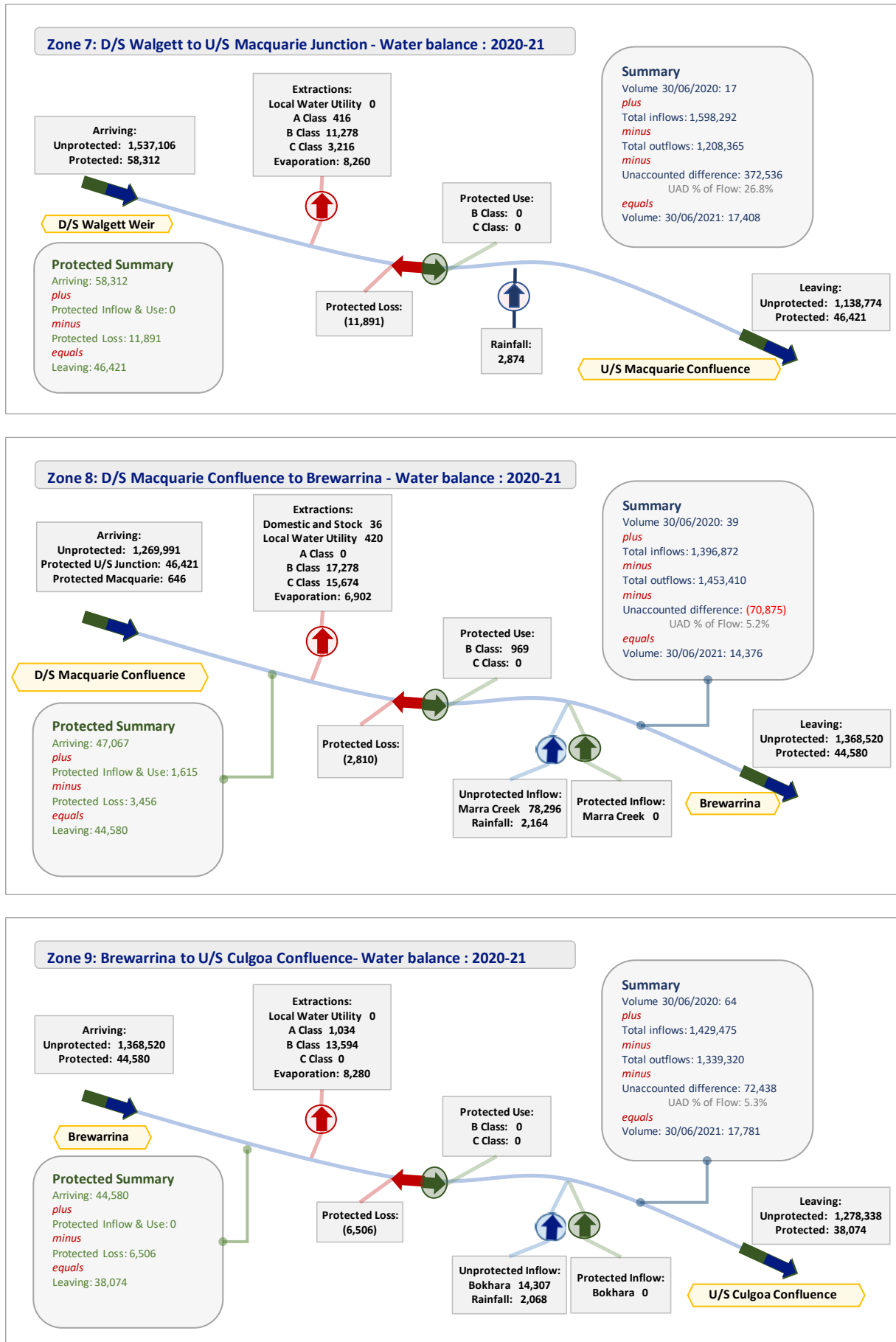


Figure 38: Physical Flow Diagram Zones 10-12

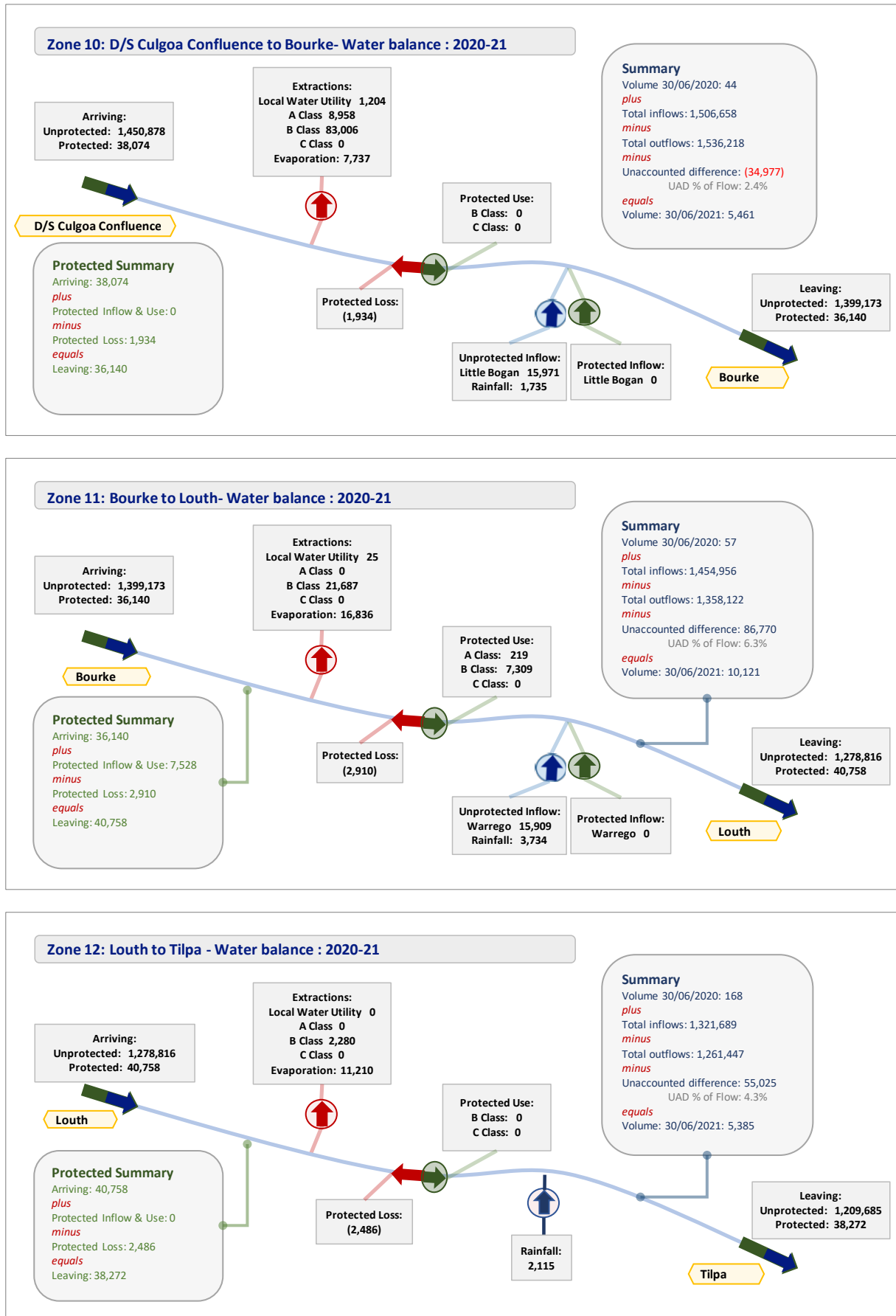
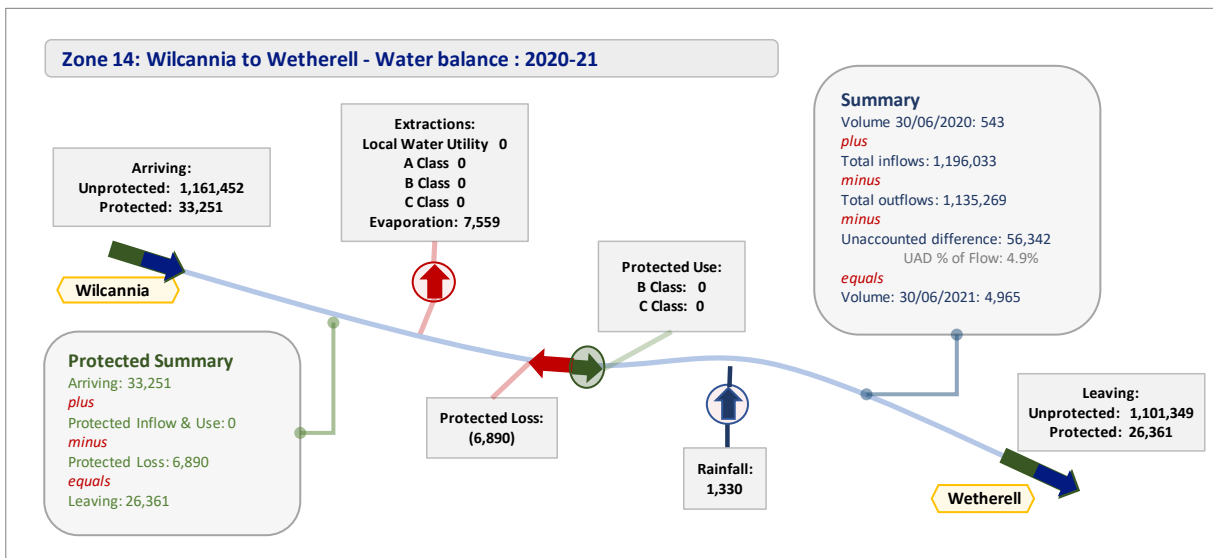
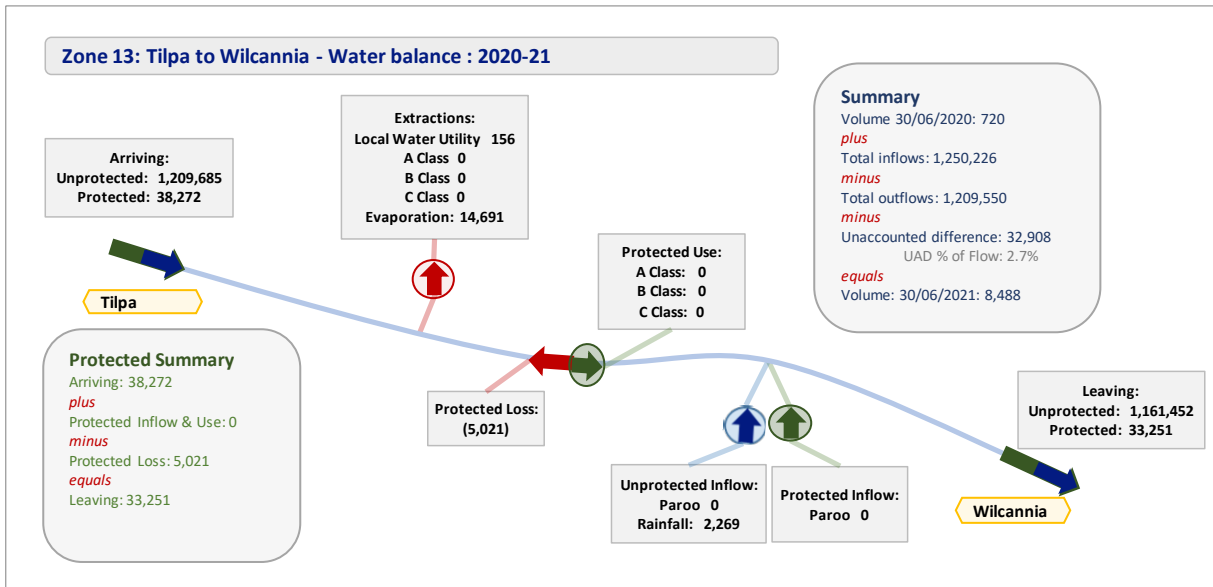


Figure 39: Physical Flow Diagram Zones 13-14



Access licence account management

An annual accounting procedure is implemented in this water source allowing for A, B and C Class Unregulated River access licence holders to utilise the flow event nature of the Barwon-Darling by having unlimited carryover provisions. A limit of 1 megalitre per share (100%) from available water determinations applies.

Annual use limits are also in place for A, B and C Class Unregulated River access licence holders. These limits are set at 3 ML/Share plus net trade (allocation assignments) plus any water allocation recredits applied. In addition an Individual Daily Extraction Component is assigned to each access licence limiting extractions to 1 ML per daily flow share.

All other categories of licence have a maximum credit of 100% or 1 ML per share, and do not have any carryover provisions available. Therefore, annual usage is restricted to 100% of their account plus net trade (allocation assignments) plus any water allocation recredits applied.

The access licence accounting rules are summarised in Table 10.

Table 10: Barwon-Darling licenced allocation accounting rules

Licence Category	AWD Limit	Carryover Limit	Annual Use Limit*
DOMESTIC AND STOCK	100%	0%	100%
DOMESTIC AND STOCK[DOMESTIC]	100%	0%	100%
DOMESTIC AND STOCK[STOCK]	100%	0%	100%
DOMESTIC AND STOCK[TOWN WATER SUPPLY]	100%	0%	100%
LOCAL WATER UTILITY	100%	0 ML/Share	100%
UNREGULATED RIVER	1 ML/share	0 ML/Share	1 ML/share
UNREGULATED RIVER (A CLASS)	1 ML/share	No restriction	3 ML/share
UNREGULATED RIVER (B CLASS)	1 ML/share	No restriction	3 ML/share
UNREGULATED RIVER (C CLASS)	1 ML/share	No restriction	3 ML/share

* Annual Use Limit is adjusted by net water allocations assigned plus any water allocations recredited to the water allocation account

Water Resources and Availability

Given this is an unregulated system, all licence categories receive full entitlement. The access during the year is dependant on meeting flow conditions that satisfy the water sharing plan access conditions.

Domestic and Stock (including Town Water Supply), and Local Water Utility received an opening available water determination (AWD) of 100% the maximum allowable under the water sharing plan.

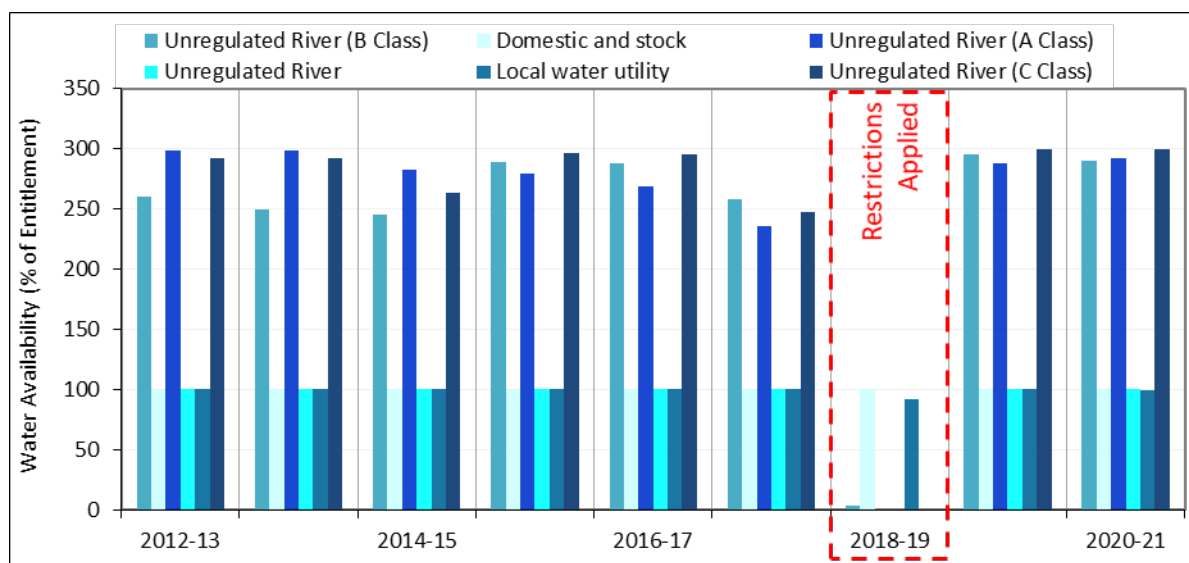
Unregulated River including A Class, B Class and C Class received an opening AWD of 1 megalitre per share, the maximum allowable under the water sharing plan.

access licences had a carryover of 1,146,134 megalitres into the reporting period, equating to 583 percent of total share. ⁶

Potential water availability for the reporting period was 559,608 megalitres equates to 285 percent of total share.

Low figures for potential availability in 2018-19 was a result of a 324 Order restricting access.

Figure 40: Barwon-Darling potential water availability⁷



Account usage

Usage from unregulated supply totalled 262,350 megalitres being the 2nd highest under water sharing plan management conditions (Figure 41)

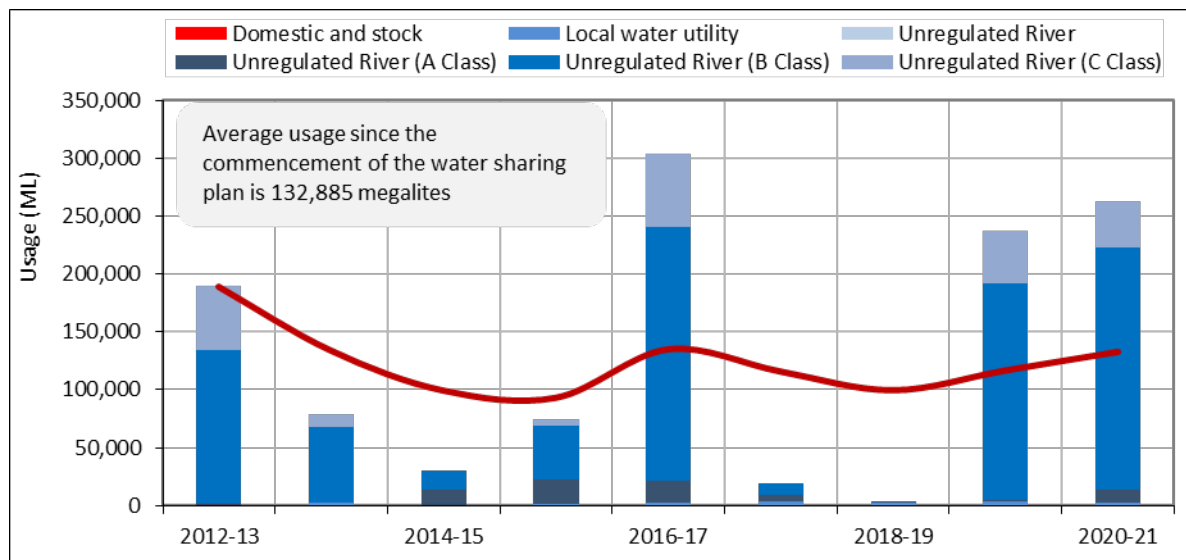
Of this usage:

- 209,514 megalitres was accounted against Unregulated River (B Class) licence holders
- 39,779 megalitres was accounted against Unregulated River (C Class) licence holders
- 11,088 megalitres accounted against Unregulated River (A Class) licence holders
- 1,916 and 53 megalitres were accounted against Local Water Utility and Stock and Domestic licence holders respectively.
- The average usage increased to 132,885 (2012-13 to 2020–21)

⁶ The maximum that may be taken in any year is 300%.

⁷ Potential water availability refers to the potential sum of water that is available in water accounts and could be accessed provided flow events make water available and taking into account annual use limits and restrictions placed on access under a 324 Order. It is the calculated potential available water (based on water sharing plan rules and applied restrictions) as presented as a percentage of the total share.

Figure 41: Total Barwon-Darling account usage by licence category including the moving average usage



Utilisation and inactive share

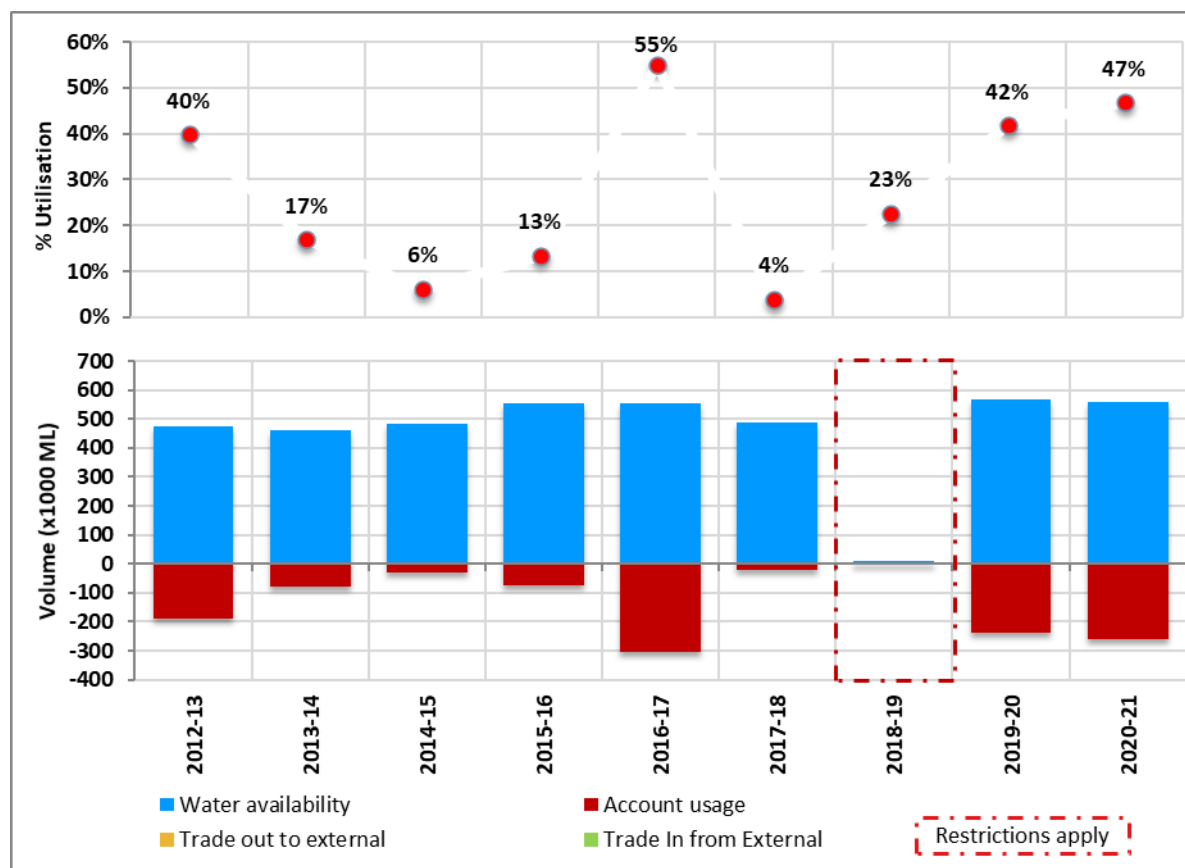
An access licence is considered to be inactive if the holding does not use water or access the temporary trade market for the reporting period (Table 11). Utilisation reflects the amount of water used, relative to the maximum potential amount available for use. It is important to note that as access to water on the Barwon-Darling is reliant on flow events, low utilisation and high inactivity reflects the years when access was limited.

- 45% of unregulated river (A Class) access licence share component was inactive for the reporting period a decrease of 47% on the prior year.
- 9% of unregulated river (B Class) access licence share component was inactive for the reporting period a decrease of 11% on the prior year.
- 12% of unregulated river (B Class) access licence share component was inactive for the reporting period a decrease of 15% on the prior year.
- Considering all categories of licence for unregulated supply 12% of share component was inactive.
- Utilisation of potential available water was 47%, an increase of 5% on the prior reporting period (Figure 42).

Table 11: Barwon-Darling inactive licence summary

Licence category	Reporting period (2020–21)			Inactive share % of total prior year (2019–20)
	Inactive licences (number)	Inactive share component	Inactive share % of total	
Domestic And Stock	13	494	56%	57%
Domestic And Stock[Domestic]	3	9	100%	100%
Domestic And Stock[Stock]	1	7	100%	100%
Domestic And Stock[Town]	1	63	100%	100%
Local Water Utility	1	32	1%	1%
Unregulated River	1	1,488	100%	100%
Unregulated River (A Class)	98	4,471	45%	92%
Unregulated River (B Class)	56	12,157	9%	20%
Unregulated River (C Class)	10	5,543	12%	27%
Total	184	24,264	12%	26%

Figure 42: Barwon-Darling utilisation (potential water availability versus usage)

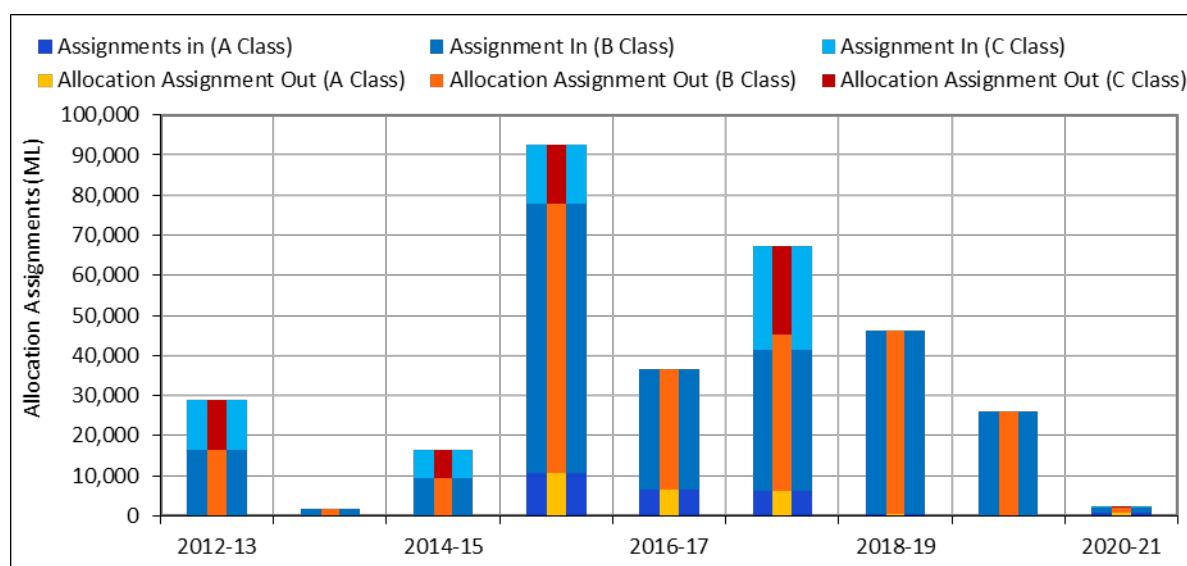


Temporary Trading

Temporary trading is implemented in this water source under the clause 71T (assignment of water allocations between access licences) of the Water Management Act 2000. Temporary trade is prohibited if it involves a transaction from an access licence to another access licence with more restrictive access conditions.

- The total volume of allocation assignments (temporary trade) within Barwon-Darling was 2,411 megalitres (Figure 43).
- The majority of allocation assignments historically occur in the B Class licence category followed by the C Class licence category.
- There is no external trade in the Barwon Darling.

Figure 43: Barwon-Darling allocation assignments by licence class

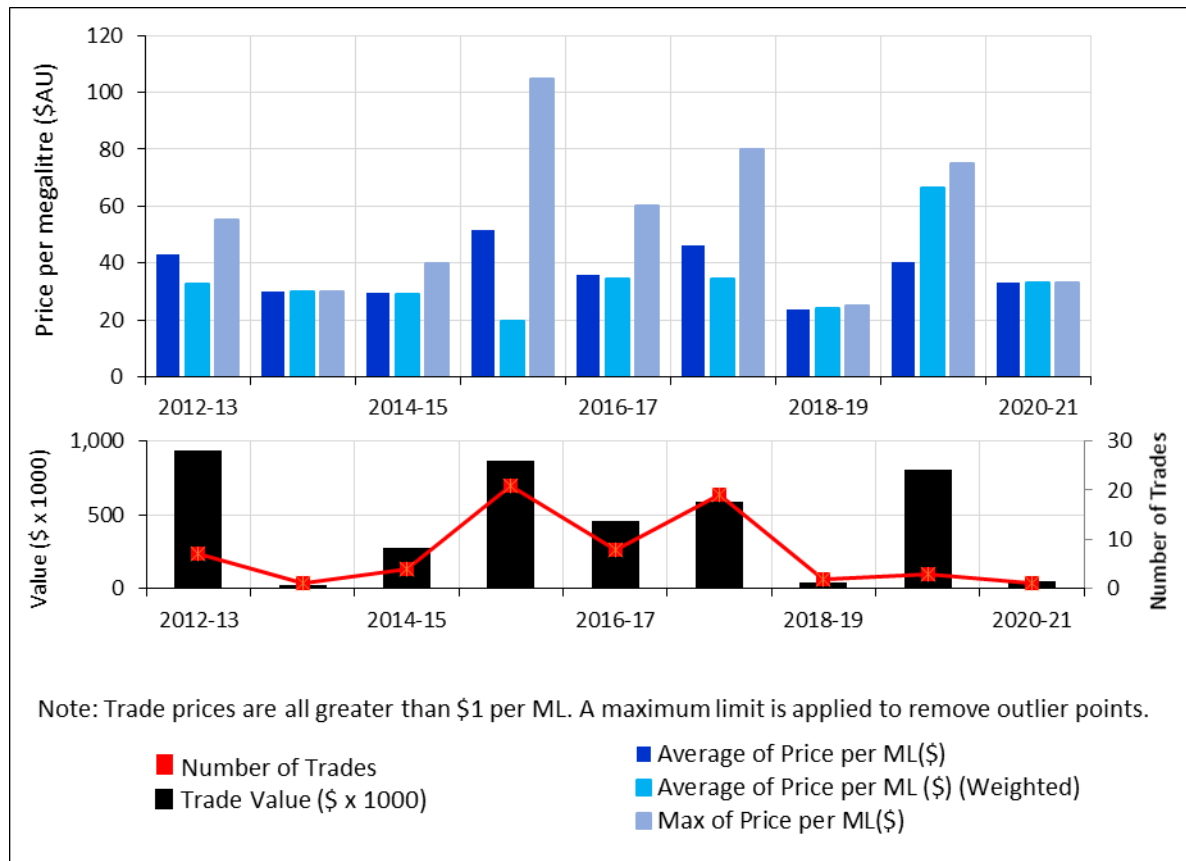


Temporary Commercial statistics

For the reporting period, considering commercial trades only (considerations greater than \$1 per megalitre), 1 transaction was processed (Figure 44) with the following characteristics:

- the average price for water was \$33 per megalitre (volume weighted average \$33)
- the maximum price for water was \$33 per megalitre
- the total trade value was \$50,000, a 94% decrease on the prior reporting period

Figure 44: Allocation assignment commercial statistics



Permanent trading

Permanent trading is implemented in this water source under the clause 71Q (Assignment of rights under access licence) and 71M (Transfer of access licence) of the Water Management Act 2000.

The Water Sharing Plan specifies certain restriction under 71Q and 71W (nominating water supply works) in particular that they are prohibited if it involves any transaction that moves a share or changes location of access to different river section within a licence class that will increase the ability to access shares within a river section to exceed the section share limit for that licence class.

Table 12 provides both the current shares and the share limit for each licence class and river section. For the reporting period all river sections are well within their share limits.

Table 12: 71Q transaction river section share limits and share at end of reporting period

	A Class		B Class		C Class	
	Share	Share Limit	Share	Share Limit	Share	Share Limit
Section 1	1,146	3,434	34,050	82,940	6,963	26,040
Section 2	1,391	2,534	19,138	38,282	35,488	114,197
Section 3	11,153	13,515	71,657	126,019	1,680	34,344
Section 4	1,403	5,860	22,389	38,246	11,705	44,720

Permanent Commercial statistics

For the reporting period, considering commercial trades only (> than \$1 per megalitres), no share assignment transactions were processed. No share transactions have occurred since 2018-19 (Figure 45 and Figure 46).

No licences were subject to a change of holder for commercial purposes in the reporting period (Figure 47). Note, reliable pricing information for change of holder dealings are unavailable as often the sale is bundled with land.

Figure 45: Share assignments commercial statistics – Unregulated River (A Class)

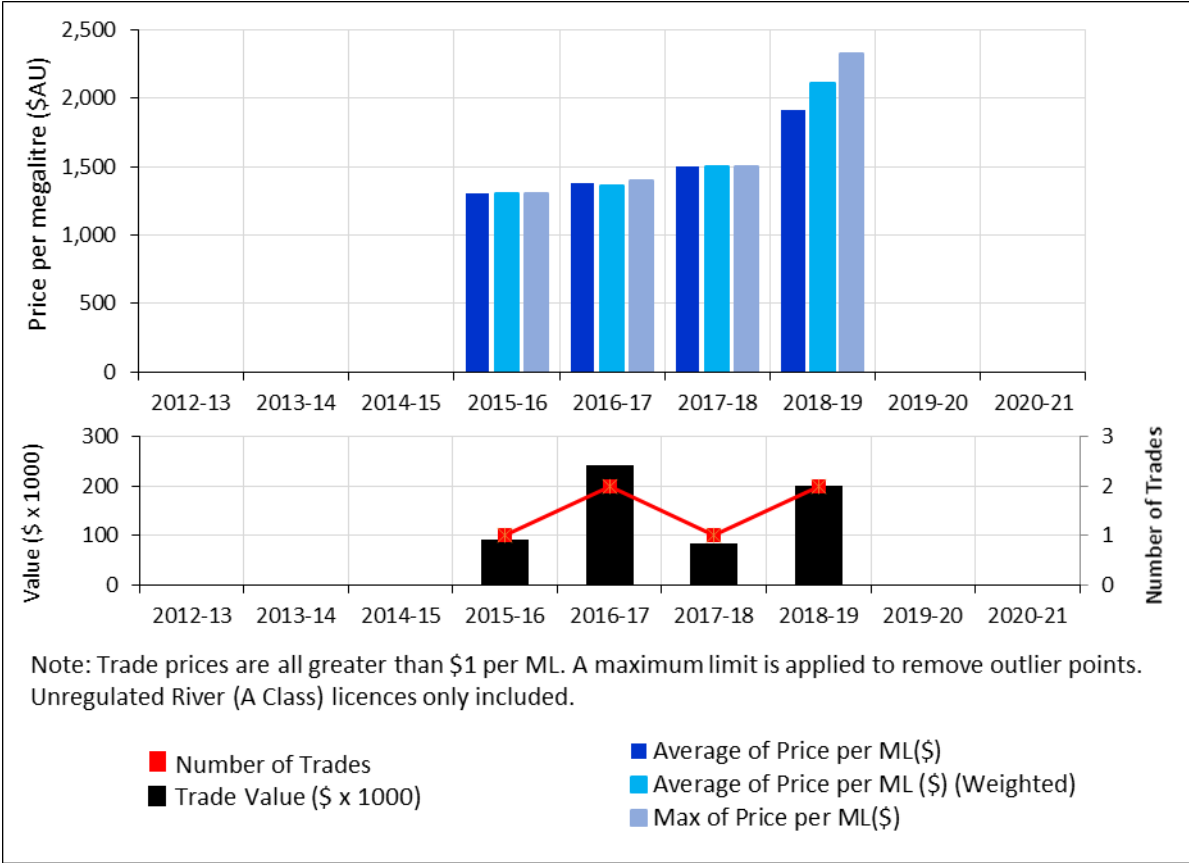


Figure 46: Share assignments commercial statistics – Unregulated River (B Class)

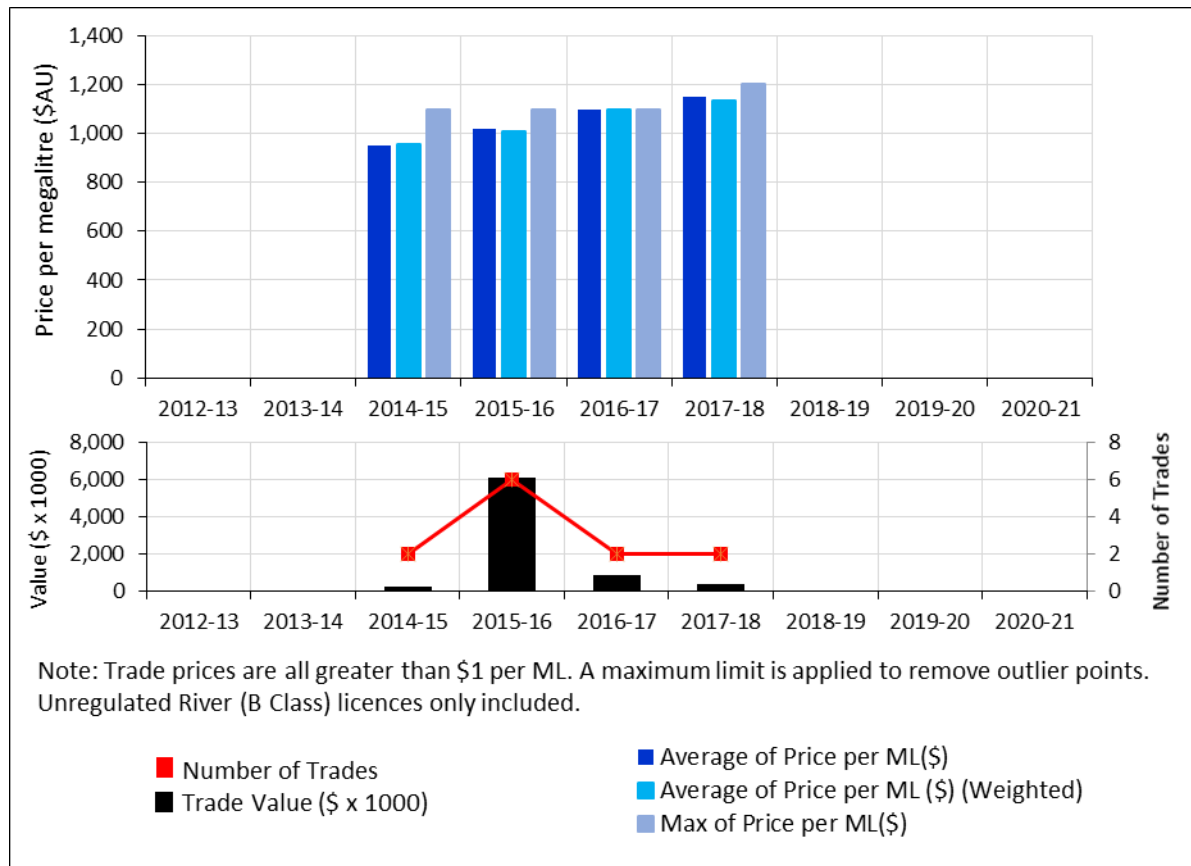
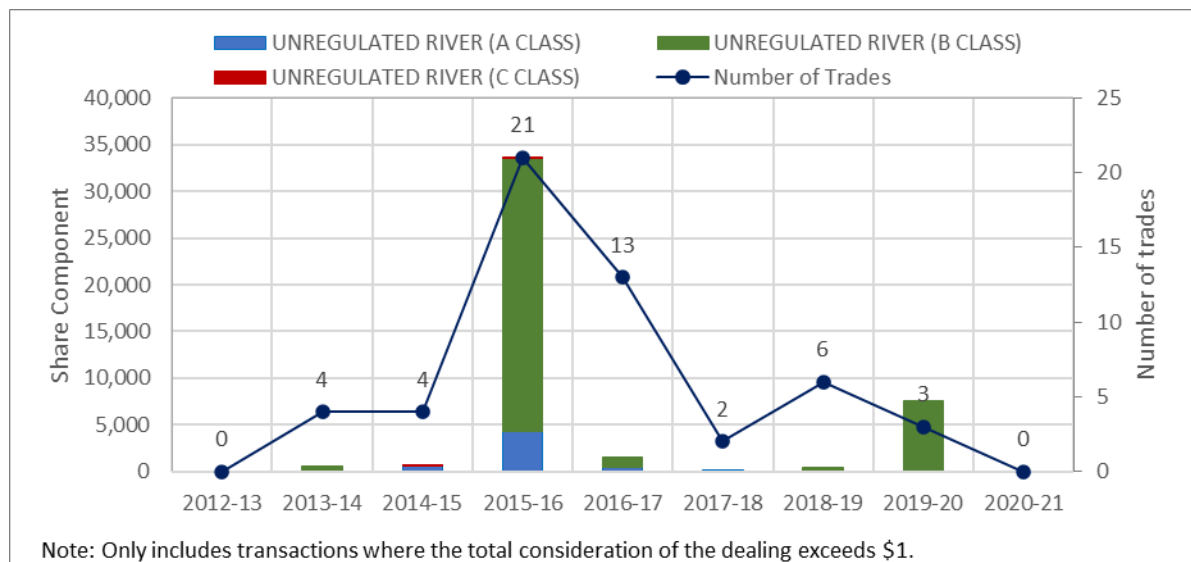


Figure 47: Change of holder commercial statistics



Held environmental water

- The held environmental water portfolio remained unchanged in the reporting period (Figure 48)
- A total of 30,361 shares (across all categories of access licence) were managed for environmental purposes as of 30 June 2021

- A total of 68,335 megalitres (usage) was debited against held environmental licences, for the reporting period (Figure 49). This is the first year where usages against held environmental licences have been registered.
- Further details on held environmental account water is available in Note 8 of this document, while detailed information on where the water was used and the benefits achieved is available on the NSW Department of Planning and Environment—Environment Energy and Science website.

Figure 48: Held environmental water share component in the Barwon Darling^{8,9}

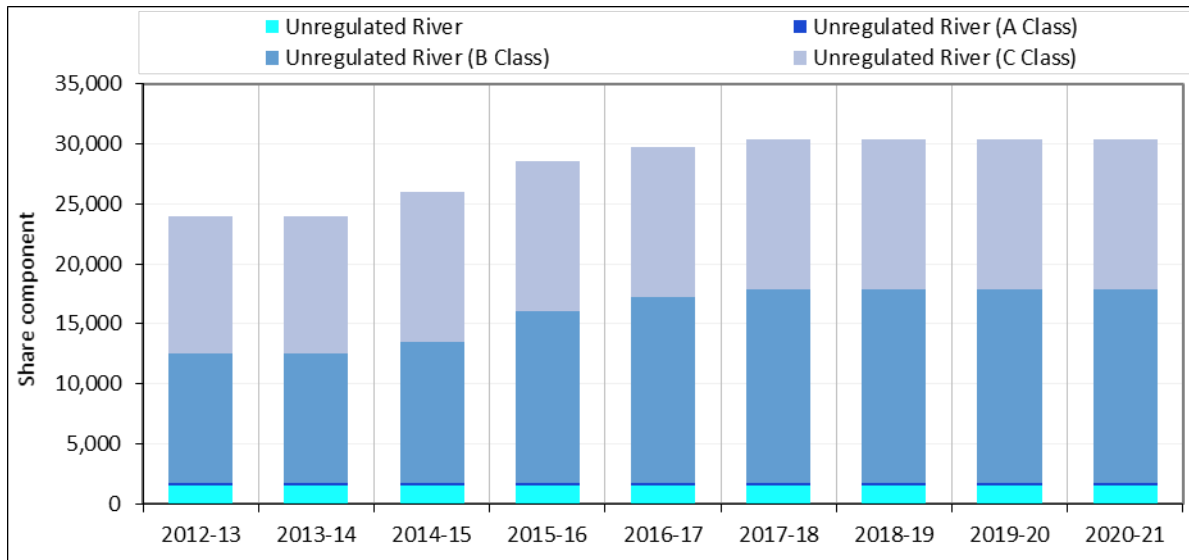
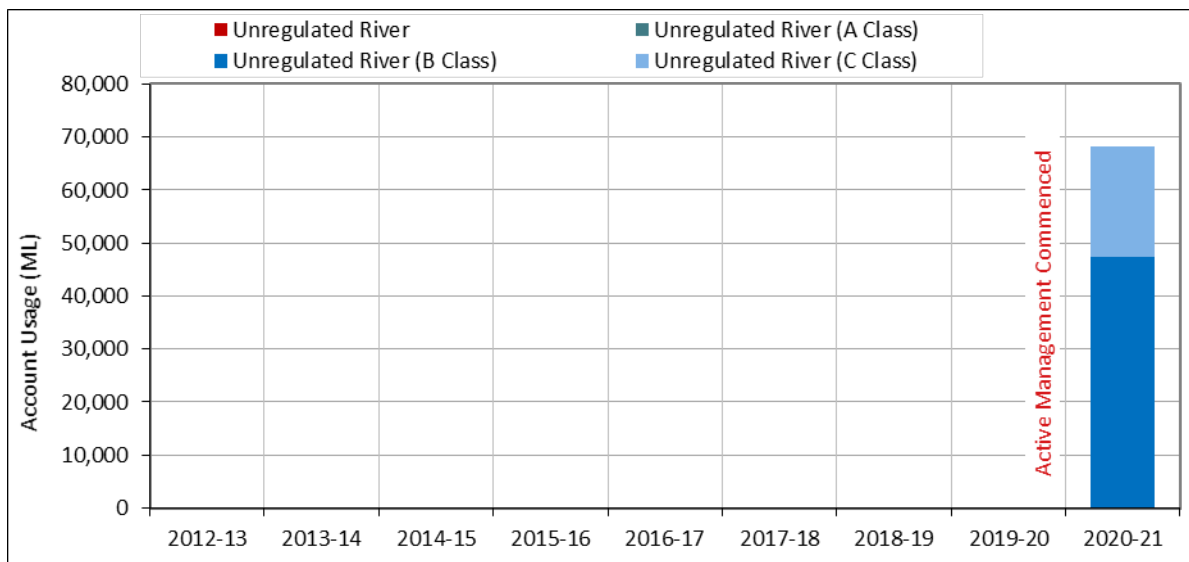


Figure 49: Held environmental water account usage in the Barwon Darling¹⁰



Planned environmental water

There was no Planned Environment Water supplied in 2020-21.

⁸ Figures represent share at the conclusion of the water year

⁹ In 2013-14 the number of shares on issue was increased while the maximum AWD was decreased.

¹⁰ Note that prior to active management no usage was recorded against held environmental licences.

Water Accounting Statements

Significant water accounting policies

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

The ‘Statement of Physical Flows’ has been excluded for this GPWAR as all transactions have been presented in the statements ‘Water Assets and Liabilities’ and ‘Changes in Water Assets and Water Liabilities’.

A physical flow diagram that represents the physical movements of water has been included in order to provide a clearer picture of this process.

For general information on how to interpret the Lands and Water, water accounting statements, refer to the Guide to General Purpose Water Accounting Reports available for download from the NSW Department of Planning and Environment website (dpie.nsw.gov.au/water).

Quantification of data

Data accuracy

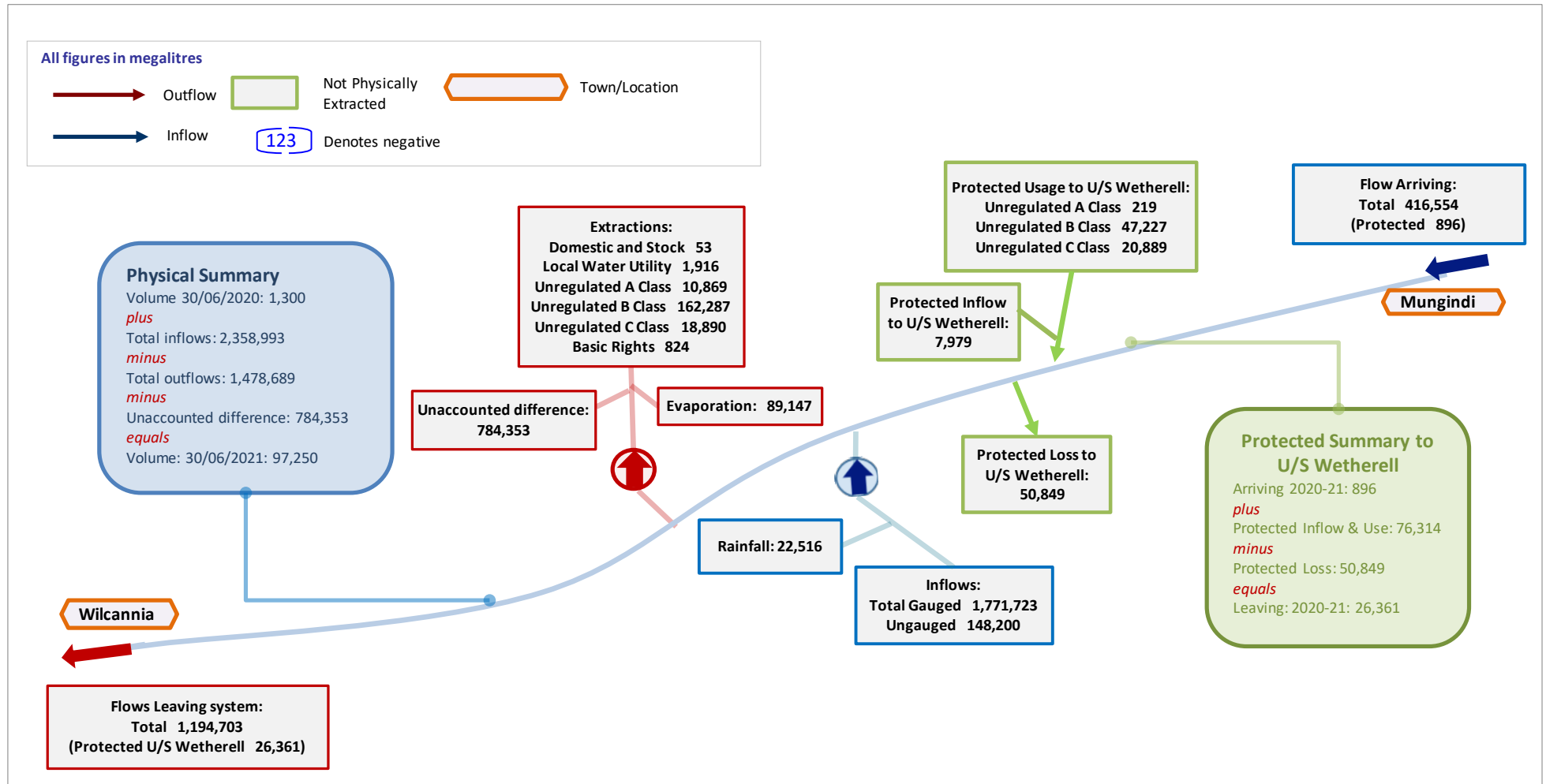
It is important to recognise that the data used to account for water movement and management in the reporting entity has been obtained from a variety of sources and systems. The data ranges from observed values where a high accuracy would be anticipated through to modelled results and estimates where 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, all figures in the water accounting statements will be accompanied by an assessment of accuracy (Table 13).

Table 13: Water account data accuracy estimates key

Accuracy	Description
A1 ¹¹	+/- 0%
A	+/- 10%
B	+/- 25%
C	+/- 50%
D	+/- 100%

¹¹ Non-physical administration items, such as available water determinations, trading and carryover volumes are assumed to have no inherent error for the purposes of this report. Items are reported as extracted from the Crown Lands and Water Division corporate database

Physical Flows Mass Balance Diagram (2020-21)



Water Assets and Water Liabilities

For the year ended 30 June 2021

Surface Water Assets

1. Surface Water Storage	Accuracy	Notes	30-Jun-21	30-Jun-20
River	B	9	97,250	1,300
Total Surface Water Storage (Asws)			97,250	1,300
<i>Change in Physical Surface Water Storage</i>			95,950	(1,300)

Surface Water Liabilities

2. Allocation Accounts	Accuracy	Notes	30-Jun-21	30-Jun-20
Local Water Utility	A1	1	(13)	(13)
Unregulated	A1	1	0	0
Unregulated River (A Class)	A1	1	67,106	68,338
Unregulated River (B Class)	A1	1	632,255	708,728
Unregulated River (C Class)	A1	1	375,074	369,107
Total Allocation Accounts (Lsws)			1,074,422	1,146,161
<i>Change in Allocation Account</i>			(71,739)	(47,109)

Surface Water Net Changes

3. Net Change	30-Jun-21	30-Jun-20
Net Surface Water Assets (Asws – Lsws)	(977,172)	(1,144,861)
<i>Change in Net Surface Water Assets</i>	167,689	45,809

Changes in Water Assets and Water Liabilities

For the year ended 30 June 2021 (1 of 2)



1. Changes in Surface Water Storage (Physical Water Balance)

Surface Water Storage Increases	Accuracy	Notes	2020–21	2019–20
River				
Rainfall	B	10	22,516	13,035
Gauged Tributaries	A	11	1,771,723	1,027,022
Ungauged Tributaries	C	12	148,200	77,500
Upstream Flow Arriving	A	13	416,554	79,161
Total Surface Water Storage Increases (Isws)			2,358,993	1,196,718
Surface Water Storage Decreases				
Surface Water Storage Decreases	Accuracy	Notes	2020–21	2019–20
River				
Evaporation	B	10	89,147	40,643
End of System Flow	A	14		
Wilcannia			1,194,703	670,120
Basic Rights Extraction	A	5	824	824
Extractions from River	C	15	194,016	237,513
Total Surface Water Storage Decreases (Dsws)			1,478,689	949,100
Unaccounted Volume (Balancing Item) (Usws)	A	16	784,353	248,918
Net Surface Water Storage Changes				
			2020–21	2019–20
<i>Net Surface Water Storage Inflow (Isws-Dsws-Usws)</i>			95,950	(1,300)

Changes in Water Assets and Water Liabilities

For the year ended 30 June 2021 (2 of 2)



2. Changes in Allocation Accounts

Allocation Account Increases	Accuracy	Notes	2020–21	2019–20
Available Water Determinations	A1	2		
Domestic and Stock			892	892
Domestic and Stock (Domestic)			8	6
Domestic and Stock (Stock)			7	7
Domestic and Stock (Town Water Supply)			63	63
Local Water Utility			5,373	5,373
Unregulated			1,488	1,488
Unregulated River (A Class)			9,856	9,856
Unregulated River (B Class)			133,069	133,069
Unregulated River (C Class)			45,746	45,746
Internal Trading - Buyers	A1	4	2,411	26,085
Prior Year Account Adjustments - Increase	A1	8	0	0
Total Allocation Increases (Iaa)			198,912	222,584

Allocation Account Decreases	Accuracy	Notes	2020–21	2019–20
Account Forfeiture	A1	1		
Domestic and Stock			838	854
Domestic and Stock (Domestic)			8	6
Domestic and Stock (Stock)			7	7

Allocation Account Decreases	Accuracy	Notes	2020–21	2019–20
Domestic and Stock (Town Water Supply)			63	63
Local Water Utility			3,457	2,190
Unregulated			1,488	2,976
Unregulated River (A Class)			0	0
Unregulated River (B Class)			0	0
Account Usage	A	3	0	0
Domestic and Stock			53	38
Domestic and Stock (Domestic)			0	0
Domestic and Stock (Stock)			0	0
Domestic and Stock (Town Water Supply)			0	0
Local Water Utility			1,916	3,051
Unregulated			0	0
Unregulated River (A Class)			11,088	1,053
Unregulated River (B Class)			209,514	188,287
Unregulated River (C Class)			39,779	45,083
Internal Trading - Sellers	A	4	2,411	26,085
Licence Cancelled	A1	1	0	0
Prior Year Account Adjustments - Decreases	A1	9	28	0
Total Allocation Decreases (Daa)			270,650	269,693

Net Change in Allocation Accounts	2020–21	2019–20
<i>Net Allocation Account Balance Increase (Iaa - Daa)</i>	(71,738)	(47,109)

3. Changes in Net Surface Water Assets

Net water asset increase	2020–21	2019–20
Isws-Dsws-Usws-Iaa+Daa	167,688	45,809

Note disclosures

Future prospect descriptions

This section contains future prospect descriptions for the Barwon-Darling unregulated river water source.

Availability of final datasets for reporting in the GPWAR which include field staff finalising meter readings inhibit the ability to publish the account in a timeframe to render a 12 month forecast from the reporting date useful to users of this report.

In lieu of this, provided below are links to latest water available information for the Barwon-Darling Unregulated Water Source.

Carryovers and available water determinations for 2021-22 at the time of reporting are presented at Table 15.

Latest Water Availability

Information on the latest water availability including water allocation statements, water allocations summaries and 2021-22 available water determinations are available on the NSW Department of Industry webpage at industry.nsw.gov.au/water/allocations-availability/allocations

You can also subscribe to receive the latest updates.

Significant events since 2020–21

The flow event being managed under Active Management on the 30 June 2021 continued into 2021-22 water year continuing to provide both access to flow classes and protecting environmental water. Table 14 below shows the additional protected water within zones and resultant protected flow arriving at Wilcannia as a result of Event 3's continuation after 30 June 2021 through till 5 October 2021.

Table 14: Protected Flow - continuation of Event 3

Item	Event 3	Event 3 Continuation	Active Management Since 1 December 2020
	20-May-2021 to 30-Jun-2021	30 June 2021 to 5 October	
	Mogil Mogil to Wilcannia	Mogil Mogil to Wilcannia	
	Protected Volume (ML)	Protected Volume (ML)	Total Protected (ML)
Protected In-stream - Barwon-Darling unregulated licences (HEW)			
Zone 2: Boomi confl. to u/s Mogil Weir Pool	3,758	2,152	13,345
Zone 4: d/s Mogil Weir to Collarenebri	20,153	16,331	64,976
Zone 8: d/s Macquarie confl. to Brewarrina	189	1,780	2749
Zone 11: Bourke to Louth	3,724	25,078	32,606
Total In-stream HEW Protected	27,627	45,341	113,479
Protected Inflows from connected systems (HEW)			
Border Rivers Arriving	0	0	896
Gil Gil Creek at Barwon Confluence	652	1,683	6,697
Mehi at Barwon Confluence	2,932	3,430	6,362
Namoi at Barwon Confluence	0	0	0
Macquarie at Barwon Confluence	0	0	646
Total HEW Inflows Protected	3,584	5,113	14,601
Protected Arriving at Wilcannia (HEW)	13,280	55,142	88,788

Carryovers and available water determinations 2021–22

Table 15: Barwon-Darling carryovers and available water determinations 2021-22 (as at December 2021)

Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
DOMESTIC AND STOCK											
1-Jul-21	Opening	883					0	0	0	0.0%	0.0%
1-Jul-21	AWD 100.0 %	883	883	883	100.0%	100.0%	883	0	883	100.0%	100.0%
DOMESTIC AND STOCK[DOMESTIC]											
1-Jul-21	Opening	9					0	0	0	0.0%	0.0%
1-Jul-21	AWD 100.0 %	9	9	9	100.0%	100.0%	9	0	9	100.0%	100.0%
DOMESTIC AND STOCK[STOCK]											
1-Jul-21	Opening	7					0	0	0	0.0%	0.0%
1-Jul-21	AWD 100.0 %	7	7	7	100.0%	100.0%	7	0	7	100.0%	100.0%
DOMESTIC AND STOCK[TOWN WATER SUPPLY]											
1-Jul-21	Opening	63					0	0	0	0.0%	0.0%

Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
1-Jul-21	AWD 100.0 %	63	63	63	100.0%	100.0%	63	0	63	100.0%	100.0%

LOCAL WATER UTILITY

1-Jul-21	Opening	5,373					(13)	0	(13)	(0.2)%	(0.2)%
1-Jul-21	AWD 100.0 %	5,373	5,373	5,373	100.0%	100.0%	5,373	0	5,373	99.8%	99.8%

UNREGULATED RIVER

1-Jul-21	Opening	1,488					0	0	0	0.0%	0.0%
1-Jul-21	AWD 1.0 ML per Share	1,488	1,488	1,488	100.0%	100.0%	1,488	0	1,488	100.0%	100.0%

UNREGULATED RIVER (A CLASS)

1-Jul-21	Opening	9,856					26,957	40,149	67,106	273.5 %	680.9 %
1-Jul-21	AWD 1.0 ML per Share	9,856	9,856	9,856	100.0%	100.0%	28,468	48,494	76,962	288.8 %	780.9 %

UNREGULATED RIVER (B CLASS)

1-Jul-21	Opening	133,069					338,829	293,427	632,257	254.6 %	475.1 %
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Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
1-Jul-21	AWD 1.0 ML per Share	133,069	133,069	133,069	100.0%	100.0%	371,896	393,430	765,326	279.5 %	575.1 %

UNREGULATED RIVER (C CLASS)

1-Jul-21	Opening	45,746					134,895	240,179	375,074	294.9 %	819.9 %
1-Jul-21	AWD 1.0 ML per Share	45,746	45,746	45,746	100.0%	100.0%	135,967	284,852	420,819	297.2 %	919.9 %

Detailed item notes

Note 1 - Allocation accounts

This note is reference for the volume held in the allocation accounts at the time of reporting but 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 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 therefore is inclusive of licences held by environmental holders (environmental holdings are specifically detailed in note 6)

Data type

Derived from measured data

Policy

Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012

Available on the Lands and Water website at www.industry.nsw.gov.au/water

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

Lands and Water

Data source

WaterNSW / NSW Department Planning and Environment – Water Accounting System (joint ownership)

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. Below is list of typical transactions that can apply to an allocation account:

- Available water determination (detailed in note 2)
- Licenced usage (detailed in note 3)
- Forfeiture due to:
 - Carryover rules

- Account spillage as a result of AWD
- Licence conversions
- Trade of allocation water between accounts (detailed in notes 4 and 5)
- Determined carryover volume

Additional information

Table 17 provides a balanced summary of the water allocation accounts for each category of access licence. Table 16 provides a description of each of the table components.

Table 16: Explanatory information for account summary in Table 17 and Table 23

Heading		Description
Share		This is the total volume of entitlement in the specific licence category.
Opening balance		The volume of water that has been carried forward from previous years allocation account.
AWD		The total annual volume of water added to the allocation account as a result of allocation assessments.
Licences	New	Increased in account water as a result of the issuing of a new licence.
	Cancelled	Decrease in account water as a result of a licence cancellation.
Assignments	In	Increase in account water as a result of Temporary Trade in.
	Out	Decrease in account water as a result of Temporary Trade out.
Account Usage		Volume of water that is extracted when pumping is permitted under the flow class access rules set out in the water sharing plan. The volume taken is debited against the appropriate access licence allocation account.
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 licence categories and various types of other licence dealings.
Available Balance		That part of the remaining account balance that is available to be taken at the conclusion of the water year.
Not Available Balance		That part of the remaining account balance that is not available to be taken at the conclusion of the water year.

Heading	Description
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.
Carry Forward	This represents the account water that is permitted to be carried forward into the next water year as determined by the carryover rules.

Table 17: Allocation account balance summary

Category	Share 30 June 2021	Opening balance	AWD	Licences		Assignments		Account usage	Forfeit During Year	End of year balance		End of year forfeit	Carry forward
				New	Cancell ed	In	Out			Available	Not Available		
Domestic and Stock	883	0	892	0	0	0	0	53	0	838	0	838	0
Domestic and Stock [Domestic]	9	0	8	0	0	0	0	0	0	8	0	8	0
Domestic and Stock [Stock]	7	0	7	0	0	0	0	0	0	7	0	7	0
Domestic and Stock [Town Water Supply]	63	0	63	0	0	0	0	0	0	63	0	63	0
Local Water Utility	5,373	(13)	5,373	0	0	0	0	1,916	0	3,444	0	3,457	(13)
Unregulated River	1,488	0	1,488	0	0	0	0	0	0	1,488	0	1,488	0
Unregulated River (A Class)	9,856	68,338	9,856	0	0	596	596	11,088	0	17,653	49,454	0	67,106
Unregulated River (B Class)	133,069	708,701	133,069	0	0	1,514	1,514	209,514	0	176,301	455,956	0	632,257
Unregulated River (C CLASS)	45,746	369,107	45,746	0	0	301	301	39,779	0	97,458	277,616	0	375,074

Note 2 - Available Water Determination (AWD) (allocation announcement)

This is the process by which the unregulated surface water asset available for potential use within the unregulated system is determined and shared. It determines the volume of water that is to be added to an individual's licence allocation account. Announcements of allocations are made on a seasonal basis at the commencement of the financial year. Under the *Water Management Act 2000* the announcements are termed available water determinations, while prior to this under the *Water Act 1912* this process was known as an allocation announcement.

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 Barwon-Darling Unregulated and Alluvial Water Sources 2012

- Part 6 – 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

Lands and Water.

Data source

WaterNSW/ NSW Department of Planning and Environment – Water Accounting System (Joint ownership of system).

Available Water Determination Register - Lands and Water website at www.industry.nsw.gov.au/water

Methodology

The AWD procedure for unregulated river water sources is simplistic in that no assessment of available water assets and system commitments is required. Generally an announcement equivalent of 100% of share on at the start of the financial year for all categories of licence. An announcement of less than 100% may be made in accordance with the water sharing plan rules around long-term extraction limits. The associated volume of water is then credited to the allocation accounts.

Additional information

The following pages contain the annual allocation summary report. Below is a table containing report notes to help interpret the report.

Table 18: Allocation summary report descriptions

Table Headings	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.
Announced Volume	Volume of water credited to accounts within a licence category as a result of the announcement made.
Cumulative Volume	Cumulative total of the announced volumes for the water year and licence category.
Percent of Share Component (Entitlement)	This is the announced volume expressed as a percentage of the entitlement applicable on the particular date.
Balance Made Available	Sum of water available in allocation accounts that has been made available to be taken during the season.
Non Available Balance	Water allocated that is not accessible at this point in time.
All licence categories	Water that is not a stored source of water and is only made available if an uncontrolled flow event occurs.

Table 19: Barwon-Darling Unregulated River Available Water Determination announcements for reporting period

Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
DOMESTIC AND STOCK											
1-Jul-20	Opening	892	-	-	-	-	0	0	0	0.0%	0.0%
1-Jul-20	AWD 100.0 %	892	892	892	100.0%	100.0%	892	0	892	100.0%	100.0%
DOMESTIC AND STOCK[DOMESTIC]											
1-Jul-20	Opening	6	-	-	-	-	0	0	0	0.0%	0.0%
1-Jul-20	AWD 100.0 %	6	6	6	100.0%	100.0%	6	0	6	100.0%	100.0%
DOMESTIC AND STOCK[STOCK]											
1-Jul-20	Opening	7	-	-	-	-	0	0	0	0.0%	0.0%
1-Jul-20	AWD 100.0 %	7	7	7	100.0%	100.0%	7	0	7	100.0%	100.0%
DOMESTIC AND STOCK[TOWN WATER SUPPLY]											
1-Jul-20	Opening	63	-	-	-	-	0	0	0	0.0%	0.0%

Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
1-Jul-20	AWD 100.0 %	63	63	63	100.0%	100.0%	63	0	63	100.0%	100.0%

LOCAL WATER UTILITY

1-Jul-20	Opening	5,373	-	-	-	-	(13)	0	(13)	(0.2)%	(0.2)%
1-Jul-20	AWD 100.0 %	5,373	5,373	5,373	100.0%	100.0%	5,373	0	5,373	99.8%	99.8%

UNREGULATED RIVER

1-Jul-20	Opening	1,488	-	-	-	-	0	0	0	0.0%	0.0%
1-Jul-20	AWD 1.0 ML per Share	1,488	1,488	1,488	100.0%	100.0%	1,488	0	1,488	100.0%	100.0%

UNREGULATED RIVER (A CLASS)

1-Jul-20	Opening	9,856	-	-	-	-	27,926	40,413	68,338	283.3%	693.4%
1-Jul-20	AWD 1.0 ML per Share	9,856	9,856	9,856	100.0%	100.0%	28,741	49,454	78,194	291.6%	793.4 %

Date	Individual announcement	Share component	Allocation volume (ML)	Cumulative volume (ML)	Allocation volume (%)	Cumulative volume (%)	Balance available (ML)	Balance not available (ML)	Balance total (ML)	Balance available (%)	Balance total (%)
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UNREGULATED RIVER (B CLASS)

1-Jul-20	Opening	133,069	-	-	-	-	362,228	346,474	708,701	272.2%	532.6 %
1-Jul-20	AWD 1.0 ML per Share	133,069	133,069	133,069	100.0%	100.0%	385,815	455,956	841,771	289.9%	632.6 %

UNREGULATED RIVER (C CLASS)

1-Jul-20	Opening	45,746	-	-	-	-	137,039	232,069	369,107	299.6%	806.9 %
1-Jul-20	AWD 1.0 ML per Share	45,746	45,746	45,746	100.0%	100.0%	137,237	277,616	414,853	300.0%	906.9 %

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 Barwon-Darling Unregulated and Alluvial Water Sources 2012

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

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

Lands and Water

Data source

WaterNSW / NSW Department of Planning and Environment – Water Accounting System (Joint ownership of system).

Methodology

Usage information is determined by either on-farm meters that measure extraction, gauges on diversion works or expression of interest (EOI)/request 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. Below is a description of these:

Based on periods of announcement – during periods of flow class announcements extractions can be debited against specific flow class water licences.

Usage based on EOI/request – usages are debited against accounts in proportion to the orders placed.

Licence category apportionment – if no other means are available water extraction/account usage is apportioned against categories of access licence in order of priority as set out in the

Table 20. The prioritising is based on the nature of and rules around each of the licence categories.

Table 20 provides the order in which extractions are apportioned to access licence categories in the water accounting system. There are also various subcategories of licence associated with some of the categories.

Table 20: Licence category metered usage apportionment table

Priority	Surface water
1	Domestic and Stock
2	Unregulated River
3	Unregulated River A Class
4	Unregulated River B Class
5	Unregulated River C Class
6	Local Water Utility

Table 21: Account usage summary

Category	Account usage
DOMESTIC AND STOCK	53
DOMESTIC AND STOCK[DOMESTIC]	0
DOMESTIC AND STOCK[STOCK]	0
DOMESTIC AND STOCK[TOWN WATER SUPPLY]	0
LOCAL WATER UTILITY	1,916
UNREGULATED RIVER	0
UNREGULATED RIVER (A CLASS)	11,088
UNREGULATED RIVER (B CLASS)	209,514
UNREGULATED RIVER (C CLASS)	39,779

Note 4 - Allocation assignments (internal trading)

This represents the temporary trading (allocation assignments) of water between allocation accounts within the Barwon-Darling Unregulated River water source.

Data type

Administration

Policy

Water Management Act 2000

- Dealings with access licences (Division 4)
- 71T Assignment of water allocations between access licences

Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012

- Part 10 Access licence dealing rules

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

Data source

WaterNSW/ NSW Department of Planning and Environment —Water Accounting System (joint ownership of system)

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).

Additional information

Table 22 presents the internal trading figures between licence categories. All figures represent a volume in megalitres.

Table 22: Total allocation assignments in the Water Source for the reporting period

From Barwon-Darling Unregulated River Water Source	To Barwon-Darling Unregulated River Water Source			
Licence Category	Unregulated (A Class)	Unregulated (B Class)	Unregulated (C Class)	TOTAL
Unregulated (A Class)	596	0	0	596
Unregulated (B Class)	0	1,514	0	1,514
Unregulated (C Class)	0	0	301	301
TOTAL	596	1,514	301	2,411

Note 5 - 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 Barwon-Darling Unregulated and Alluvial Water Sources 2012

Part 5 Requirements for water

Clause 19 Domestic and stock rights

Available on the NSW Department of Planning 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 Barwon-Darling Unregulated and Alluvial Water Sources 2012

Methodology

The estimation of domestic and stock rights uses a series of estimates for 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 Barwon-Darling Unregulated and Alluvial Water Sources 2012**. This figure is 825 megalitres.

Note 6 - Held environmental water

This represents that environmental water that is held as part of a licensed volumetric entitlement. 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.

Access to water only when announcements are made.

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. On occasion the environmental benefit is achieved by trading the water as opposed to ordering and recording the subsequent usage against the licence.

Data type

Measured

Policy

Water Management Act 2000

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 Barwon-Darling Unregulated and Alluvial Water Sources 2012

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

Lands and Water

Data source

WaterNSW / NSW Department of Planning and Environment – Water Accounting System (Joint ownership of System).

Available Water Determination Register - NSW Department of Planning and Environment website at

www.industry.nsw.gov.au/water

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. Below is list of typical transactions that can apply to an environmental allocation account:

- 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
- 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 23 provides a summary of held environmental water for the reporting period. Table 24 provides the changes to environmental licences in terms of shares and number. Definitions for the processes represented in the summary are defined in Table 16.

Table 23: Environmental Regulated River account summary¹²

Category	Share 30 June 2021	Opening balance	AWD	Licences		Assignments		Account usage	Forfeit During Year	End of year balance		End of year forfeit	Carry forwar d
				New	Cancell ed	In	Out			Available	Not Available		
Unregulated River	1,488	0	1,488	0	0	0	0	0	0	1,488	0	1,488	0
Unregulated River (A Class)	262	3,658	262	0	0	0	0	219	0	573	3,128	0	3,701
Unregulated River (B Class)	16,111	135,347	16,111	0	0	0	0	47,227	0	1,106	103,125	0	104,231
Unregulated River (C Class)	12,498	147,390	12,498	0	0	0	0	20,889	0	16,605	122,394	0	138,999

Table 24: Annual change summary for environmental licences and environmental holding adjustments

Category	Share 30 June 2020	Share 30 June 2021	Volume change	No. licences 30 June 2020	No. licences 30 June 2021	No. licence change
Unregulated River	1,488	1,488	0	1	1	0

¹² The account balance summary includes all licences where the registered holder or part holder is a Government department and the held component is wholly managed for environmental benefit. Water that has been purchased from consumptive users, but yet to be moved out to a government holding is not identified in this summary. Generally in the situation the water is temporarily traded out to an environmental licence until the settlement has been finalised.

Category	Share 30 June 2020	Share 30 June 2021	Volume change	No. licences 30 June 2020	No. licences 30 June 2021	No. licence change
Unregulated River (A Class)	262	262	0	5	5	0
Unregulated River (B Class)	16,111	16,111	0	7	7	0
Unregulated River (C Class)	12,498	12,498	0	2	2	0

No environmental trade occurred in 2020-21.

Note 7 – Planned environmental water provisions

These were introduced as part of the water sharing plans with the aim of committing water to enhancing either fundamental ecosystem health or specified environmental purposes, that cannot be taken or used for any other purpose.

Below is a brief description of these:

Flow Class Access Rules: The rules in the Water Sharing Plan that set flow rates or flow levels below which the taking of water is not permitted. Some limited exemptions apply. See Note 18 for additional details.

Long-Term Average Annual Extraction Limit: Restricts the long term average extracting of water to be compliant with the long-term average annual extraction limit and long-term average sustainable diversion limit.

Uncommitted Water: Water that is not committed after the commitments to basic landholder rights and for sharing and extraction once any other rights have been met.

For additional details on this refer to the planned environmental rules in the water sharing plan.

Data type

Derived from Measured Data

Policy

Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012

- Part 4 Planned environmental water provisions

Available from the Lands and Water website at www.industry.nsw.gov.au/water

Data accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

WaterNSW

Data source

CARM – WaterNSW

Methodology

Methods for evaluating the environmental provisions can be found in the water sharing plan.

Additional Information

No planned environmental water impacts the accounting components of this report.

Note 8 - Prior year account adjustment

This is a line item that is used to correct balances in the accounts. 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 when an error is identified in prior year reporting or when a process that had previously been reported is unable to be supplied and the associated asset or liability must be removed to maintain the integrity of the statements. This is different to the unaccounted difference component which is a physical volume required to achieve mass balance after all the known processes have been accounted.

Data type

Calculated

Accuracy

A1 – Nil inaccuracy +/- 0%

Providing agency

Lands and Water.

Data source

Not applicable

Methodology

A journal transaction is placed at the closing of the previous water year to either increase or decrease and account balance to align with the correct opening balances of the reporting year.

Additional Information

A prior year adjustment was required for the reporting period. This figure being a decrease in the opening balance for the Unregulated River B Class licence category of 28 megalitres.

Note 9 - River channel storage

The volume of water stored in the river channel on the day of reporting.

Policy

Not applicable

Data type

Derived from measured data

Data accuracy

B—Estimated in the range +/- 25%

Providing agency

NSW Department of Planning and Environment

Data sources

NSW Department of Planning and Environment : HYDSTRA, CAIRO

Methodology

For each river section S(n):

$$V = Q \times T$$

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

$$\text{River channel storage} = \sum S(n) V$$

Table 25: Summary of river channel storage calculation components

Symbol	Variable	Data source	Unit
Q	average flow in the river section, calculated by averaging the daily flows at the upstream and downstream river gauges	HYDSTRA	ML/day
V	volume in each river section	Calculated	ML
T	average travel time for a parcel of water to travel through the river section	Derived	days

Assumptions and approximations:

- Travel times are estimated to the nearest day.
- We assume that daily flow change between gauging sites is linear.

Note 10 - 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 26: 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 11 - Gauged tributary inflow

The inflow into the unregulated river that occurs from the start to the end of the river system that is measured at known gauging stations.

Policy

Not applicable

Data type

Measured data

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

Lands and Water

Data sources

Lands and Water: HYDSTRA

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. The tributaries that contribute to a particular water source are then combined to produce a gauged inflow for the each of the water sources.

Additional information

The total gauged inflow for the reporting period is the sum of the inflows for the contributing water sources as identified in the table below. Some tributary inflows were modelled using upstream river gauges and correlations with other related river gauges.

Table 27: Summary of gauged inflow

Contributing Water source	River contributing	Method
Border Rivers	Barwon River	Gauged
	Boomi River	Modelled from Gauged U/S Site
	Whalan Creek	Gauged
	Gil Gil Creek	Gauged

Contributing Water source	River contributing	Method
	Moonie River	Gauged
Gwydir	Gwydir River	Gauged
	Moomin Creek	Gauged
	Mehi River	Gauged
	Thalaba Creek	Gauged
Namoi	Namoi River	Gauged
	Pian Creek	Gauged
Macquarie	Macquarie River	Gauged
	Castlereagh River	Gauged
	Marthaguy Creek	Gauged
	Marra Creek	Gauged
	Bogan River	Gauged
	Little Bogan River	Modelled – provided by WaterNSW
Bokhara	Bokhara River	Gauged
Culgoa	Culgoa River	Gauged
	Birrie River	Gauged
Warrego	Warrego River	Gauged
Paroo	Paroo River	Modelled from Gauged U/S Site and correlations

Figure 50: Gauged tributary inflows by water source for the reporting period (Plot 1)

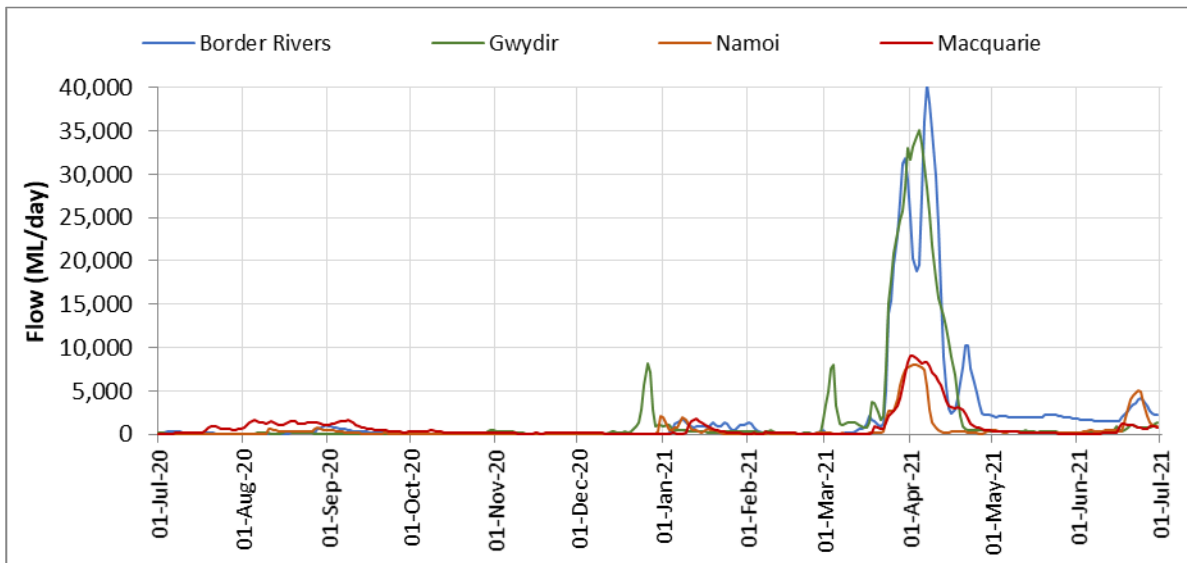
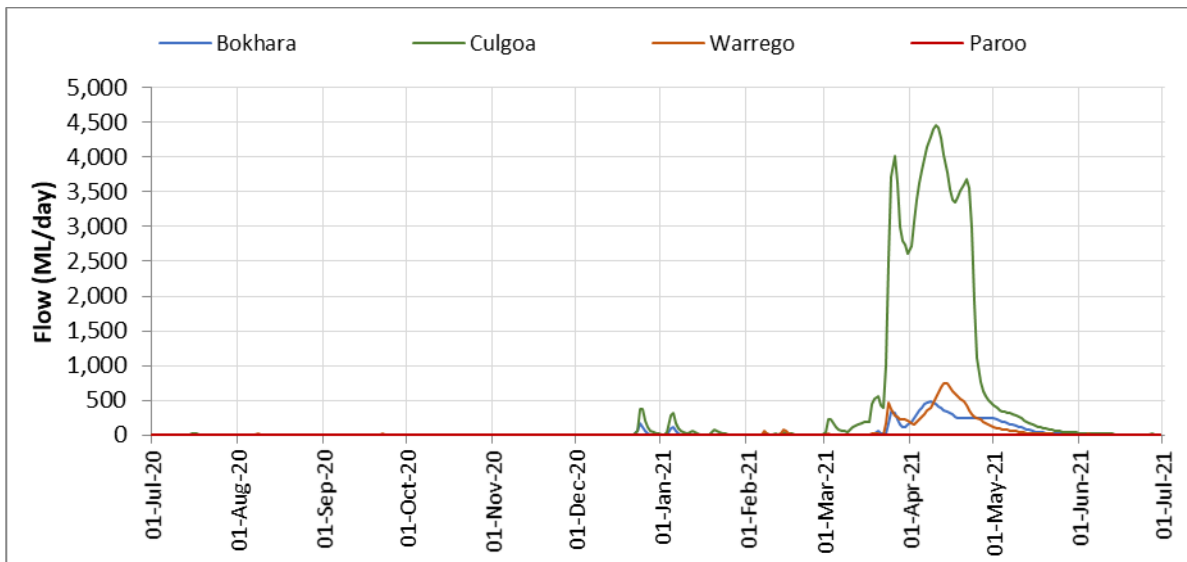


Figure 51: Gauged tributary inflows by water source for the reporting period (Plot 2)



Note 12 - Ungauged tributary inflow

Also known as ungauged runoff estimate, this is the inflow into the river that occurs from the start to the end of the river system that is not measured by gauging stations.

Policy

Not applicable

Data type

Estimated

Data accuracy

C – Estimated in the range +/- 50%

Providing agency

NSW Department of Planning and Environment

Data sources

NSW Department of Planning and Environment, WaterNSW: CARM

Methodology

To derive an estimate a simple mass balance approach was adopted whereby known inflows and outflows were combined with an assumed loss factor.

$$U_{\text{Inflow}} = L\% (G_{\text{Mungindi}} + G_{\text{Inflow}}) + G_{\text{Wilcannia}} - G_{\text{Mungindi}} + U_{\text{extraction}} - G_{\text{Inflow}}$$

Where:

U_{Inflow} = Ungauged Inflow estimate for Barwon Darling

G_{Mungindi} = Gauged flow entering Barwon-Darling at Mungindi

$G_{\text{Wilcannia}}$ = Total flow passing Wilcannia

G_{Inflow} = Total gauged inflow for Barwon Darling

$U_{\text{extraction}}$ = Total extractions from Barwon Darling

$L\%$ = Estimate of percentage loss of flows in Barwon Darling. Assumed to be 30% for reporting period.

Note 13 – Upstream Flow Arriving

This refers to flow that arrives at the top of the entity.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

Lands and Water

Data source

WaterNSW – HYDSTRA

Methodology

Summation of flows at gauging station measuring the volume of water that enters the entity. For the Barwon-Darling reporting entity this is represented by the following gauge:

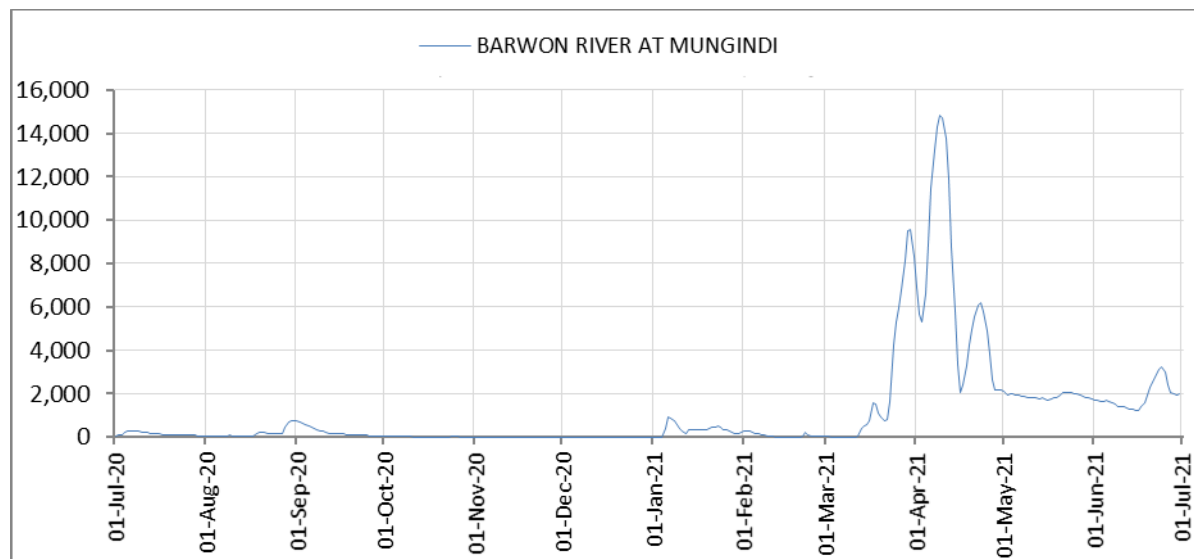
- 416001 Barwon River at Mungindi

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

Additional Information

Figure 52 provides detail of the daily flows at Mungindi gauge.

Figure 52: Upstream Flow Arriving Mungindi



Note 14 - End of system flow

This refers to flow that leaves the entity and does not return.

Data type

Derived from measured data

Policy

Not applicable

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

Lands and Water

Data source

WaterNSW – HYDSTRA

Methodology

Summation of flows at gauging station/s measuring the volume of water that leaves the entity. For the Barwon-Darling reporting entity this is represented by the following gauges:

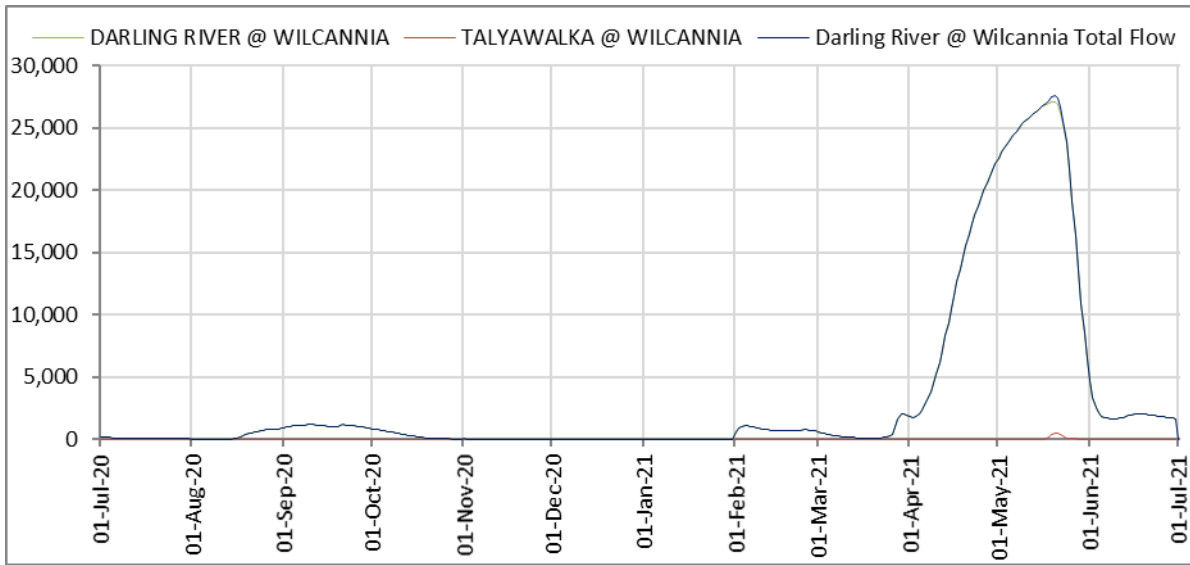
- 425008 Darling River at Wilcannia
- 425018 Talyawalka Creek at Wilcannia

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

Additional Information

Figure 53 provide details of the daily flows at the gauges including the total flow being their sum.

Figure 53: End of system flow at Wilcannia



Note 15 - Extractions from river

For surface water this refers to the actual volume of water directly pumped or diverted from the unregulated river by licence holders. Occasionally (generally in the case of environmental water) volumes are requested against a licence account for in-stream benefits or for end of system flow events. As such the volume reported to be physically extracted from the river will not always be equal to the amount of water debited to accounts for usage, which has been reported in detail in Note 3. The figure also excludes basic rights extractions, which is reported as a separate line item and detailed in Note 22.

Data type

Measured data

Policy

Not applicable

Data accuracy

A – Estimated in the range +/- 10%

Providing agency

Lands and Water

Data source

WaterNSW / NSW Department of Planning and Environment – Water Accounting System (Joint ownership of system).

NSW Department of Planning and Environment – Water Ordering and Usage database

Methodology

For the purposes of this GPWAR extraction from the river is considered to be the total volume metered and debited to the allocation accounts minus any 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. Extractions from river included that diverted to an irrigation corporation for distribution.

Additional information

Table 28 provides a reconciliation of the accounted usage against access licences compared to the extraction from river volume presented in the water accounting statements.

Table 28: Reconciliation of physical extraction¹³ to account usage

¹³ Excludes basic rights extractions (estimated in a separate item)

	Volume (ML)
Extractions from river ¹⁴	194,016
Licensed flow leaving accounting extent ¹⁵	0
In stream protected usage ¹⁶	68,335
Total account usage against access licences ¹⁷	262,351

¹⁴ Estimate of direct licenced extractions from the river but excluding basic rights usage.

¹⁵ Water requested to leave the accounted Barwon Darling extent (into Menindee Lakes).

¹⁶ Water requested and protected for used within the system (not extracted from the river).

¹⁷ The total amount of water debited against the allocation accounts.

Note 16 - Unaccounted volume

Also known as unaccounted difference, in theory, if all the processes of a water balance were accurately accounted for the unaccounted difference would be zero. In reality due to the large accuracy uncertainties in many of the volumes presented in the accounts, the various sources and methods from which the data has been obtained and the fact that not all processes of the water cycle have been accounted for in detail, 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 relatively, this figure should reduce in future accounts.

Data type

Not applicable

Policy

Not applicable

Data accuracy

D – Estimated in the range +/- 100% (this refers to the fact the unaccounted volume is a result of a range of processes estimated using different methodologies and accuracies. The accuracy around the number itself, that is required to achieve mass balances is A1 – Nil accuracy).

Providing agency

Not applicable

Data source

Not applicable

Methodology

The unaccounted difference is equal to the amount required to obtain the correct physical volume in river at the end of the reporting period, after all the known physical inflows and outflows have been accounted. The accounting process of this GPWAR 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 11.

Surface Water Unaccounted difference

$$UV_{SW} = Rs - Rc + Ri - Ro$$

Where:

UV_{SW} = 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. gauged inflow, ungauged inflow)

Note 17 – River and Groundwater Interaction

This note refers to water that has been identified as either flowing from the connected alluvium to the accounted river extent (increase in water asset), or alternatively from the accounted river extent to the alluvium aquifer (decrease in water asset).

ATTENTION: There is no groundwater flow model available for the Barwon-Darling Region and an assessment to estimate surface-groundwater interaction without a groundwater model is not possible.

However, subject to any variation under subclause (4) of the Legislation *Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*, the long-term average annual extraction limit for the Upper Darling Alluvial Groundwater Source is 17,120 ML/year.

Notes.

1. The long-term average annual extraction limit for the Upper Darling Alluvial Groundwater Source is equal to the estimated long-term average annual rainfall recharge minus the amount of rainfall recharge reserved as planned environmental water under clause 17 (1) (b) (ii).
2. The long-term average annual extraction limit for the Upper Darling Alluvial Groundwater Source results in unassigned water estimated to be 11,319 ML at the commencement of this Plan.

Note 18 – Flow Class Announcements

This note is reference to level of access to water that is determined each day in line with the rules as set out in the water sharing plan. Daily flow class levels are announced each daily for each management zone in the river.

Data type

Derived from measured data

Policy

Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012

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

WaterNSW

Data source

WaterNSW – CARM Barwon Darling

Methodology

WaterNSW operate a river operations system (CARM) to implement Active Management in the Barwon-Darling River. This system provides flow forecasts, the ability to protect environmental water that requires protecting, and therefore the water that is available in excess of the protected water that can be distributed amongst licence holders. From this daily announcement can be made during the event providing details of flow class by management zone.

Additional information

Table 17 provides details of the Flow Class Thresholds for each management zone for A, B and C Class access licences. It should be noted that the No Flow condition is defined when 0 ML/Day is recorded at the reference gauges while the Low Flow condition occurs when flows are between 0 ML/Day and the A Class Threshold.

Table 16 provides a description of each of the table components.

Table 29: Explanatory information for Flow Class Thresholds summary

Heading	Description
Management Zone	This is the total volume of entitlement in the specific licence category.

Heading	Description
Flow Class	The level of access permitted each day based on the water sharing plan rules. These can be No Access, Low Flow Class, A Class, B Class, C Class
Flow Class Threshold	These are the derived river flows within specific management zones that are used to determine the daily flow class when assessed against the daily flow at the reference point.
Flow Reference Point	These are the reference river flow gauges used to assess the flow class thresholds against in order to determine the flow class.

Table 30: Flow class thresholds summary

River Section 1			
Management Zone	Flow class	Flow class thresholds (ML/day) as at 9:00 am	Flow reference point
1. Mungindi to Boomi River Confluence Management Zone	A Class	1. More than 198 ML/day at Mungindi gauge and more than 176 ML/day at Presbury gauge, and	Barwon River at Mungindi gauge (416001) and Barwon River upstream of Presbury Weir gauge (416050)
		2. Less than or equal to 270 ML/day at Presbury gauge	
	B Class	1. More than 230 ML/day at Mungindi gauge and more than 270 ML/day at Presbury gauge, and	
		2. Less than or equal to 1,500 ML/day at Presbury gauge	
	C Class	More than 230 ML/day at Mungindi gauge and more than 1,500 ML/day at Presbury gauge	
	2. Boomi River Confluence to Upstream Mogil Mogil Weir Pool Management Zone	A Class	
2. Less than or equal to 270 ML/day at Presbury gauge or less than or equal to 230 ML/day at Mogil Mogil gauge			
B Class		1. More than 270 ML/day at Presbury gauge and more than 230 ML/day at Mogil Mogil gauge, and	

River Section 1			
		2. Less than or equal to 1,800 ML/day at Mogil Mogil gauge	
	C Class	More than 270 ML/day at Presbury gauge and more than 1,800 ML/day at Mogil Mogil gauge	
3. Mogil Mogil Weir Pool Management Zone	A Class	More than 220 ML/day and less than or equal to 570 ML/day	Barwon River at Mogil Mogil gauge (422004)
	B Class	More than 570 ML/day and less than or equal to 1,800 ML/day	
	C Class	More than 1,800 ML/day	
Management Zone	Flow class	Flow class thresholds (ML/day) as at 9:00 am	Flow reference point
4. Downstream Mogil Mogil to Collarenebri Management Zone	A Class	1. More than 220 ML/day at Mogil Mogil gauge and more than 317 ML/day at Collarenebri gauge, and	Barwon River at Mogil Mogil (422004) and Barwon River at Collarenebri Main Channel gauge (422003)
		2. Less than or equal to 570 ML/day at Mogil Mogil gauge or less than or equal to 500 ML/day at Collarenebri gauge	
	B Class	1. More than 570 ML/day at Mogil Mogil gauge and more than 500 ML/day at Collarenebri gauge, and	
		2. Less than or equal to 2,900 ML/day at Collarenebri gauge	

River Section 1			
	C Class	More than 570 ML/day at Mogil Mogil gauge and more than 2,900 ML/day at Collarenebri gauge	
5. Collarenebri to Upstream Walgett Weir Pool Management Zone	A Class	1. More than 317 ML/day at Collarenebri gauge and more than 100 ML/day at Tara gauge, and	Barwon River at Collarenebri Main Channel gauge (422003) and Barwon River at Tara gauge (422025)
		2. Less than or equal to 500 ML/day at Collarenebri gauge or less than or equal to 430 ML/day at Tara gauge	
	B Class	1. More than 500 ML/day at Collarenebri gauge and more than 430 ML/day at Tara gauge, and	
		2. Less than or equal to 3,050 ML/day at Tara gauge	
	C Class	More than 500 ML/day at Collarenebri gauge and more than 3,050 ML/day at Tara gauge	
	6. Walgett Weir Pool Management Zone	A Class	
B Class		More than 900 ML/day and less than or equal to 5,650 ML/day	
C Class		More than 5,650 ML/day	

River Section 2			
Management Zone	Flow class	Flow class thresholds (ML/day) as at 9:00 am	Flow reference point
7. Downstream Walgett to Boorooma Management Zone	A Class	1. More than 600 ML/day at Dangar Bridge gauge and more than 400 ML/day at Boorooma gauge, and	Barwon River at Dangar Bridge gauge (422001) and Barwon River at Boorooma gauge (422026)
		2. Less than or equal to 900 ML/day at Dangar Bridge gauge or less than or equal to 870 ML/day at Boorooma gauge	
	B Class	1. More than 900 ML/day at Dangar Bridge gauge and more than 870 ML/day at Boorooma gauge, and	
		2. Less than or equal to 5,500 ML/day at Boorooma gauge	
	C Class	More than 900 ML/day at Dangar Bridge gauge and more than 5,500 ML/day at Boorooma gauge	
	8. Boorooma to Brewarrina Management Zone	A Class	
2. Less than or equal to 870 ML/day at Geera gauge or less than or equal to 840 ML/day at Brewarrina gauge			

River Section 2			
	B Class	1. More than 870 ML/day at Geera gauge and more than 840 ML/day at Brewarrina gauge, and	
		2. Less than or equal to 6,800 ML/day at Brewarrina gauge	
	C Class	More than 870 ML/day at Geera gauge and more than 6,800 ML/day at Brewarrina gauge	

River Section 3			
Management Zone	Flow class	Flow class thresholds (ML/day) as at 9:00 am	Flow reference point
9. Brewarrina to Culgoa River Junction Management Zone	A Class	1. More than 550 ML/day at Brewarrina gauge and more than 570 ML/day at Beemery gauge, and	Barwon River at Brewarrina gauge (422002) and Barwon River at Beemery gauge (422028)
		2. Less than or equal to 840 ML/day at Brewarrina gauge or less than or equal to 760 ML/day at Beemery gauge	
	B Class	1. More than 840 ML/day at Brewarrina gauge and more than 760 ML/day at Beemery gauge, and	
		2. Less than or equal to 8,250 ML/day at Beemery gauge	
C Class	More than 840 ML/day at Brewarrina gauge and more than 8,250 ML/day at Beemery gauge		
10. Culgoa River Junction to Bourke Management Zone	A Class	1. More than 645 ML/day at Warraweena gauge and more than 605 ML/day at Bourke Town gauge, and	Darling River at Warraweena gauge (425039) and Darling River at Bourke Town gauge (425003)
		2. Less than or equal to 1,330 ML/day at Warraweena gauge or less than or equal to 1,250 ML/day at Bourke Town gauge	

River Section 3			
	B Class	1. More than 1,330 ML/day at Warraweena gauge and more than 1,250 ML/day at Bourke Town gauge, and	
		2. More than 1,330 ML/day at Warraweena gauge and more than 1,250 ML/day at Bourke Town gauge, and	
	C Class	More than 1,330 ML/day at Warraweena gauge and more than 11,000 ML/day at Bourke Town gauge	

River Section 4			
Management Zone	Flow class	Flow class thresholds (ML/day) as at 9:00 am	Flow reference point
11. Bourke to Louth Management Zone	A Class	1. More than 605 ML/day at Bourke Town gauge and more than 555 ML/day at Louth gauge, and	Darling River at Bourke Town gauge (425003) and Darling River at Louth gauge (425004)
		2. Less than or equal to 1,250 ML/day at Bourke Town gauge or 1,130 ML/day at Louth gauge	
	B Class	1. More than 1,250 ML/day at Bourke Town gauge and more than 1,130 ML/day at Louth gauge, and	
		2. Less than or equal to 11,150 ML/day at Louth gauge	
C Class	More than 1,250 ML/day at Bourke Town gauge and more than 11,150 ML/day at Louth gauge		
12. Louth to Tilpa Management Zone	A Class	1. More than 555 ML/day at Louth gauge and more than 505 ML/day at Tilpa gauge, and	Darling River at Louth gauge (425004) and Darling River at Tilpa gauge (425900)
		2. Less than or equal to 1,130 ML/day at Louth gauge or less than or equal to 1,010 ML/day at Tilpa gauge	

River Section 4			
	B Class	1. More than 1,130 ML/day at Louth gauge and more than 1,010 ML/day at Tilpa gauge, and	
		2. Less than or equal to 11,000 ML/day at Tilpa gauge	
	C Class	More than 1,130 ML/day at Louth gauge and more than 11,000 ML/day at Tilpa gauge	

Management Zone	Flow class	Flow class thresholds (ML/day) as at 9:00 am	Flow reference point
13. Tilpa to Wilcannia Management Zone	A Class	1. More than 505 ML/day at Tilpa gauge and more than 455 ML/day at Wilcannia gauge, and	Darling River at Tilpa gauge (425900) and Darling River at Wilcannia Main Channel gauge (425008)
		2. Less than or equal to 1,010 ML/day at Tilpa gauge or less than or equal to 850 ML/day at Wilcannia gauge	
	B Class	1. More than 1,010 ML/day at Tilpa gauge and more than 850 ML/day at Wilcannia gauge, and	
		2. Less than or equal to 12,000 ML/day at Wilcannia gauge	
C Class	More than 1,010 ML/day at Tilpa gauge and more than 12,000 ML/day at Wilcannia gauge		
14. Wilcannia to Upstream Lake Wetherell Management Zone	A Class	More than 455 ML/day and less than or equal to 850 ML/day	Darling River at Wilcannia Main Channel gauge (425008)
	B Class	More than 850 ML/day and less than or equal to 12,000 ML/day	
	C Class	More than 12,000 ML/day	

References

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

Thoms M.C., Sheldon F., Roberts J., Harris J. and Hillman T.J. 1996, *Scientific panel assessment of environmental flows for the Barwon-Darling River*. Report to Technical Services Division of NSW Department of Land and Water Conservation, May 1996.