



GENERAL PURPOSE WATER ACCOUNTING REPORT

## Gwydir Catchment

---

2018–19



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# Contents

<b>Director’s foreword</b> .....	<b>1</b>
<b>Contextual statement</b> .....	<b>2</b>
Accounting extent.....	3
Snapshot.....	5
Climate.....	5
Dam inflows and volume .....	9
Inflows .....	9
Storage volume.....	10
Major flow events .....	11
Surface water resources and management .....	12
Legislation .....	12
Access rights .....	12
Access licence account management.....	13
Extreme events stage and temporary water restrictions.....	14
Temporary water restrictions.....	15
Water availability.....	15
Account usage.....	17
Utilisation and inactive share .....	17
Temporary trading (allocation assignments).....	18
Permanent trading (assignment of share and transfer of licence).....	20
Replenishment flows.....	22
Held environmental water.....	22
Planned environmental water—environmental contingency allowance.....	23
Planned environmental water—other.....	23
<b>Water Accounting Statements</b> .....	<b>26</b>
Significant water accounting policies .....	27
Quantification of data.....	27
Data accuracy.....	27
2018–19 Gwydir physical flows mass balance diagram.....	28
Statement of water assets and water liabilities .....	29
Changes in water assets and water liabilities .....	30
<b>Note Disclosures</b> .....	<b>33</b>
Reconciliation and future prospect descriptions.....	34
Note 1—Allocation accounts.....	38
Note 2—Available water determination (AWD) (allocation announcement).....	41
Note 3—Allocation account usage.....	45
Note 4—Internal trading (allocation assignments) .....	47
Note 5—Held environmental water .....	48

Note 6—Environmental provisions.....	52
Note 7—Surface water storage .....	54
Note 8—River channel storage.....	55
Note 9—Storage inflow—Copeton.....	56
Note 10—Storage evaporation and storage rainfall .....	57
Note 11—River evaporation and river rainfall .....	58
Note 12—Gauged tributary inflow.....	60
Note 13—Ungauged runoff estimate .....	62
Note 14—Dam releases, river inflow from dam releases .....	63
Note 15—End-of-system flow/flow to wetlands/replenishments .....	64
Note 16—Extractions from river.....	66
Note 17—Basic rights extractions.....	68
Note 18—Supplementary extractions .....	69
Note 19—Unaccounted difference.....	71
Note 20—River and groundwater interaction .....	73
Note 21—Water order debiting .....	74
Note 22—Adjusting entry.....	75
<b>References .....</b>	<b>76</b>

## Abbreviations

Abbreviation	Description
ARCGIS	mapping and spatial analysis platform for designing and managing solutions through the application of geographic knowledge
AWAS 1	Australian Water Accounting Standard 1
AWD	available water determination
BoM	Bureau of Meteorology
CAIRO	computer-aided improvements to river operations
ECA	environmental contingency allowance
GIS	geographic information system
GPWAR	general purpose water accounting report
IQQM	integrated quantity and quality model
MDBA	Murray–Darling Basin Authority
ML	megalitres (1,000,000 litres)
ML/d	megalitres per day
MODFLOW	modular, three-dimensional, finite-difference groundwater flow model
SILO	climatic data provision system run by the Queensland Government for the provision of both measured and modeled data
WASB	Water Accounting Standards Board
WaterNSW	WaterNSW is a New South Wales Government–owned statutory corporation that is responsible for supplying the state’s bulk water needs, and operating the state’s river systems and dams
WSP	water sharing plan

## Glossary

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

Term	Meaning
end of system	the last defined point in a catchment where water information can be measured and/or reported
environmental water	<p>water allocated to support environmental outcomes and other public benefits</p> <p>Environmental water provisions recognise the environmental water requirements and are based on environmental, social and economic considerations, including existing user rights.</p>
evaporation	<p>the process by which water or another liquid becomes a gas</p> <p>Water from land areas, bodies of water, and all other moist surfaces is absorbed into the atmosphere as a vapour.</p>
evapotranspiration	the process by which water is transmitted as a vapour to the atmosphere as the result of evaporation from any surface and transpiration from plants
extraction	<p>the pumping or diverting of water from a river or aquifer by licensed users for a specific purpose (irrigation, stock, domestic, towns, etc.)</p> <p>The volume is measured at the point of extraction or diversion (river pump, diversion works, etc.).</p>
general purpose water accounting report (GPWAR)	<p>a report prepared according to the Australian Water Accounting Standard</p> <p>It comprises a number of components including a contextual statement, a statement of water assets and water liabilities, a statement of change in water assets and water liabilities, a statement of physical water flows, notes and disclosures, and an assurance and accountability statement.</p>
general-security licence	<p>a category of water access licence implemented under the <i>Water Management Act 2000</i></p> <p>This forms the bulk of the water access licence entitlement volume in NSW and is a low-priority entitlement (i.e. it only receives water once essential and high-security entitlements are met in the available water determination process).</p>
groundwater	water location beneath the ground in soil pore spaces and in the fractures of rock formations
high-security licence	<p>a category of water access licence implemented under the <i>Water Management Act 2000</i></p> <p>It receives a higher priority than general-security licences but less priority than essential requirements in the available water determination process.</p>
HYDSTRA database	a database used by NSW Department of Planning, Industry and Environment to store continuous, time-series data such as river flow, river height, and water quality
inflows	surface water runoff and deep drainage to groundwater (groundwater recharge) and transfers into the water system (both surface and groundwater) for a defined area
inter-valley trade	trade of licence holder allocation account water via allocation assignment from one catchment to another catchment (or state)
intra-valley trade	trade of licence holder allocation account water via allocation assignment within the same catchment
median	the middle point of a distribution, separating the highest half of a sample from the lowest half

Term	Meaning
non-physical transaction	an accounting transaction representing a process that is not a component of the water cycle (e.g. an available water determination)
physical transaction	an accounting transaction representing a process of the water cycle (e.g. an extraction)
regulated river	<p>a river system where flow is controlled via one or more major man-made structures such as dams and weirs</p> <p>For the purposes of the <i>Water Management Act 2000</i>, a regulated river is one that is declared by the minister to be a regulated river. Within a regulated river system, licence holders can order water against a held entitlement.</p>
share component	<p>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</p> <p>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.</p>
storage	a state-owned dam, weir or other structure that is used to regulate and manage river flows in the catchment and the water bodies impounded by these structures
storage reserve	proportion of water in a storage reserved in the resource assessment process for future essential or high-security requirements (e.g. town water)
storage volume	the total volume of water held in storage at a specified time
supplementary water	unregulated river flow available for extraction under a supplementary licence
surface water	all water that occurs naturally above ground including rivers, lakes, reservoirs, creeks, wetlands and estuaries
tributary	<p>a smaller river or stream that flows into a larger river or stream</p> <p>Usually several smaller tributaries merge to form a river.</p>
ungauged catchment	<p>a catchment without a flow gauge to accurately record stream flows</p> <p>Modelled estimates must be used to approximate the contribution of ungauged catchments to the main river.</p>
water accounting	the systematic process of identifying, recognising, quantifying, reporting, assuring and publishing information about water, the rights or other claims to that water, and the obligations against that water
water assets	the physical water held in storage, as well as any claims to water that are expected to increase the future water resource (e.g. external water entering the system through inter-valley trading)
water liabilities	claims on the water assets of the water report entity, including water that has been allocated to licence holder accounts or environmental accounts, yet to be taken at the end of the reporting period
water sharing plan	a water management plan that defines the rules for sharing of water within a region under the <i>Water Management Act 2000</i>



## Director's foreword

This is the eighth annual release of the general purpose water accounting report (GPWAR) for the Gwydir Regulated River Water Source. It has been prepared for the accounting period 1 July 2018 to 30 June 2019 (reporting period), under the Australian Water Accounting Standard 1 (WASB, 2012).

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

Included in the GPWAR are:

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

Where possible quantification of the physical groundwater interactions with the regulated river water source are provided however detailed groundwater accounting information is not included in this GPWAR.

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

- the information presented in these accounts as a faithful representation of the management and operation of the Gwydir Regulated River Water Source for the reporting period
- all data presented in this report is based on the best available information at the time of publication
- NSW Department of Planning, Industry and Environment 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, Industry and Environment

## Contextual statement

The Gwydir River is part of the Murray–Darling drainage basin in northern NSW. Covering an area of 26,600 square kilometres, the catchment extends 670 kilometres from the Great Dividing Range to the Barwon River near Collarenebri. It is separated from the Border Rivers catchment to the north by the Mastermans Range and from the Namoi catchment to the south by the Nandewar Range.

From its headwaters near Guyra and Uralla, around 1,200 metres above sea level, the Gwydir River flows north-west through steep-sided valleys. It is joined by the Horton River, the largest tributary flowing north from the Nandewar Range, before it enters the alluvial plains near Gravesend. West of Pallamallawa, the valley widens into an almost completely flat floodplain where the elevation is generally less than 200 metres. Through this flat landscape, the Gwydir flows slowly westward between low natural levee banks towards the Barwon River.

Downstream of Moree is an alluvial fan covering 200 square kilometres, where extensive floodplain wetlands known as the Lower Gwydir Wetlands have developed. These wetlands provide valuable habitat for waterbirds and are listed as a site of international significance under the Ramsar Convention on Wetlands of International Importance.

The lower half of the basin is characterised by numerous anabranches and effluents, the most significant being the Mehi River and Moomin Creek to the south, and the Carole-Gil Gil Creek system to the north.

The dominant land uses in the valley are livestock grazing and dryland agriculture, which together cover 90% of the catchment. The self-mulching black soils of the lower valley have been extensively developed for irrigated agriculture. Around 1,000 square kilometres is used to grow crops such as cotton, cereals and oilseeds.

Most of the summer crops such as cotton are irrigated, while much of the winter demand is met by rainfall. Irrigation water, town water supplies for Bingara and Gravesend and environmental releases for the Lower Gwydir wetlands are supplied from Copeton Dam, the major storage in the valley. Most irrigation diversions occur below Pallamallawa, facilitated by a network of weirs and regulators on the Gwydir River and its effluents.

The Gwydir catchment is part of the lands originally occupied by the Kamilaroi people. There are now over 26,000 people living within the catchment. The largest town is Moree (8,000 people), which is the main commercial centre for the surrounding agricultural areas. It is also a major transport and tourism hub, being located at the junction of the Gwydir and Newell highways. There are a number of smaller towns of 1,000–2,000 people—Uralla and Guyra in the New England tablelands, and Bingara and Warialda in the middle of the catchment. Smaller villages include Bundarra, Delungra, Pallamallawa and Tingha, which have populations of 300–700 people.

## Accounting extent

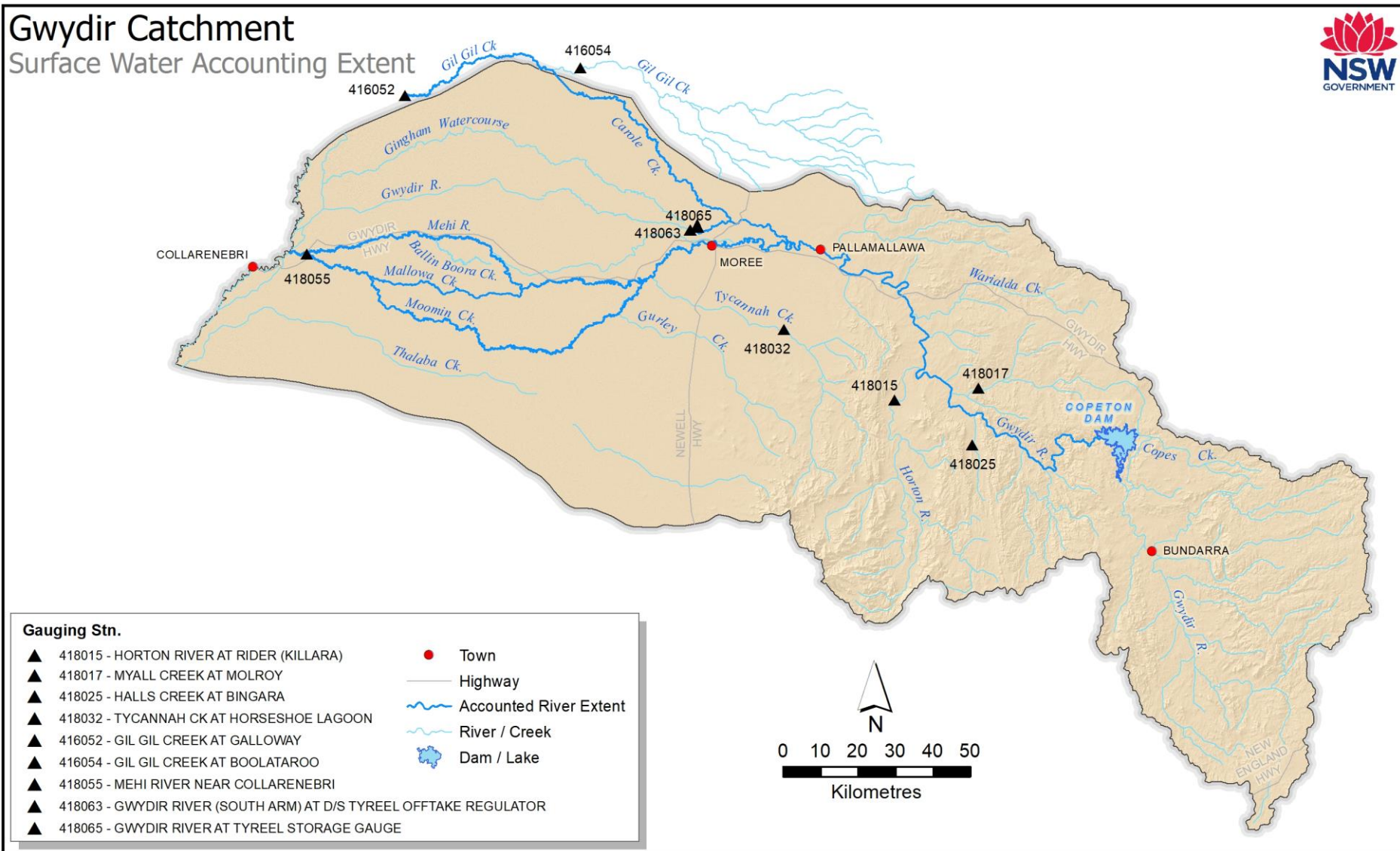
The accounting extent for surface water is illustrated in Figure 1. The accounted river extent is the Gwydir River from downstream of Copeton Dam to Millewa, the Mehi River from its initial effluent with the Gwydir River to near Collarenebri, Mallowa Creek, Moomin Creek, Carole Creek and Gil Gil Creek from its junction with Carole Creek to Gil Gil Creek at Galloway. Note that the accounted component of Gil Gil Creek extends beyond the surface water catchment boundary of the Gwydir and into the Border Rivers catchment, as orders in this section are met using resources from the Gwydir.

All licences managed under the *Water Sharing Plan for the Gwydir Regulated River Water Source* are considered. While physical groundwater volumes that interact with the regulated river are included in GPWAR statements where possible<sup>1</sup> (and any interactions not directly estimated form part of the unaccounted difference) all other groundwater flows and groundwater management are excluded from the GPWAR.

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<sup>1</sup> Groundwater modelling information on river fluxes for 2018–19 was unavailable at the time of publication and has not been quantified for the reporting period. The process therefore forms a component of the stated unaccounted difference within the physical flow balance of the river. Figures will updated retrospectively in future releases of the GPWAR.

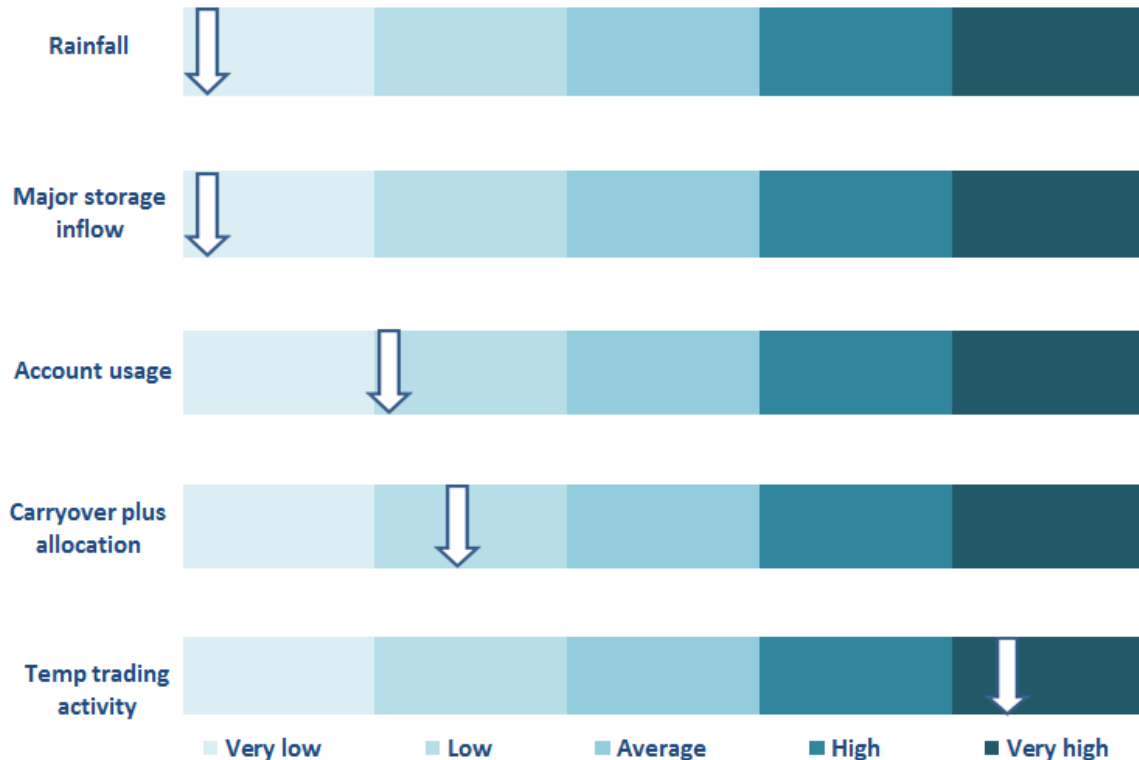
Figure 1: Surface water geographical extent of the accounts



## Snapshot

The key indicators for 2018–19 relative to other years under water sharing plan management conditions are presented in Figure 2. Both rainfall and major storage inflow were the lowest on record. Temporary trading activity was very high with demand for the limited resources increasing.

Figure 2: 2018–19 summary indicators



## Climate

At Pallamallawa (central catchment), 330 mm of rainfall was recorded in the reporting period (Table 1). Comparatively this volume of rainfall is:

- 55% of the long-term historical median rainfall for this location
- 29% of the highest volume on record at the location.

The majority of rainfall fell in November 2018 (64 mm) and March 2019 (75 mm) (Figure 3 and Figure 4).

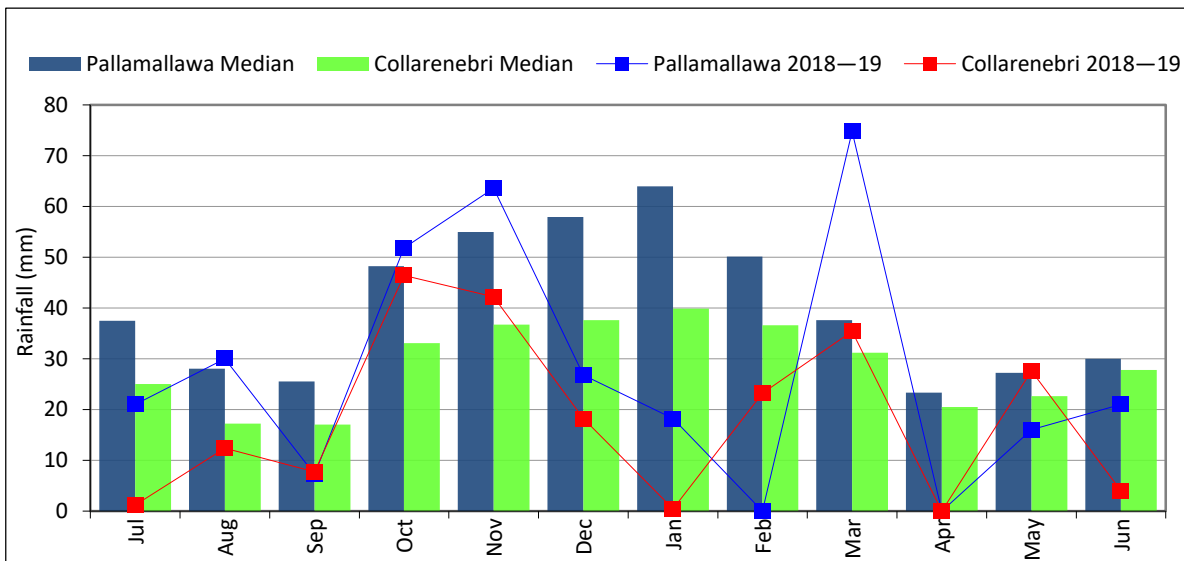
At Collarenebri (lower catchment), 219 mm of rainfall was recorded in the reporting period. Comparatively this volume of rainfall is:

- 47% of the long-term historical median rainfall for this location
- 20% of the highest volume on record at the location.

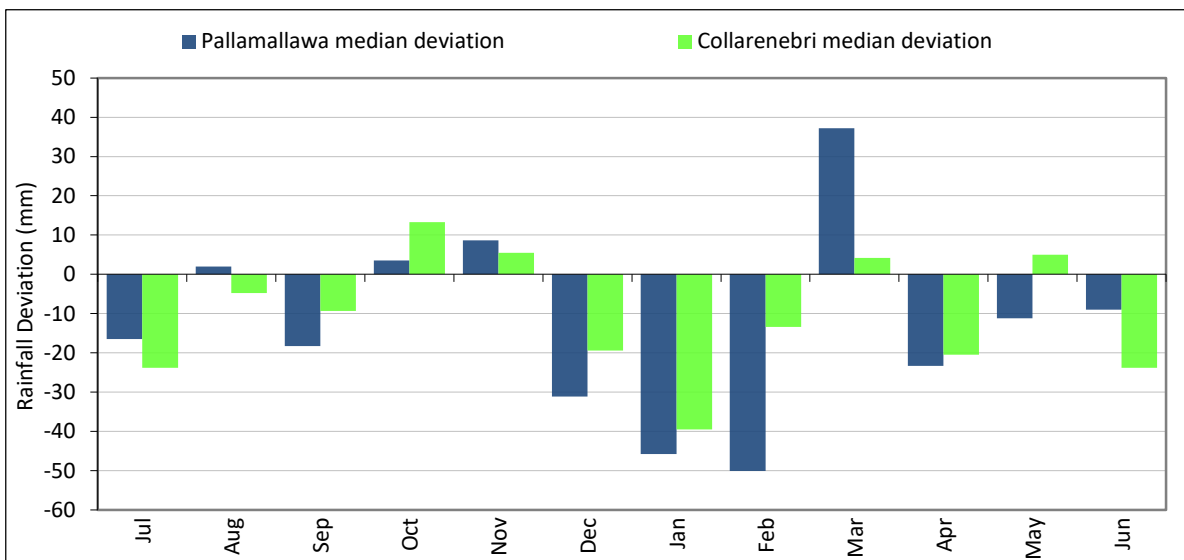
The majority of rainfall fell in October (46 mm) and November (42 mm) of 2018 (Figure 3 and Figure 4)

Spatially, it was extremely dry average relative to average conditions, across the entire extent of the catchment (Figure 5 and Figure 6)

**Figure 3: Monthly rainfall at Collarenebri and Pallamallawa for the reporting period against historical median**



**Figure 4: Monthly rainfall, deviation of the reporting period compared to historical median**



**Table 1: Monthly rainfall at Pallamallawa for the reporting period (mm)<sup>2</sup>**

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
<b>2018–19</b>	21.0	30.0	7.2	51.8	63.6	26.8	18.2	0.0	74.8	0.0	16.0	21.0	330.4

**Table 2: Historical monthly rainfall statistics at Pallamallawa (mm)<sup>2</sup>**

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
<b>Mean</b>	43.3	33.4	34.2	51.0	65.6	69.2	80.3	73.3	52.9	34.4	38.9	37.8	612.6
<b>Median</b>	37.5	28.1	25.5	48.3	55.0	58.0	64.0	50.1	37.6	23.3	27.2	30.0	596.3
<b>Lowest</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	303.9
<b>Highest</b>	250.8	159.7	182.2	210.3	271.0	256.9	323.9	320.9	250.4	203.6	176.8	203.8	1128.2
<b>Highest year</b>	1949-50	1965-66	1969-70	1953-54	2010-11	1969-70	1945-46	1975-76	1981-82	1987-88	1912-13	2004-05	2011-12

**Table 3: Monthly rainfall at Collarenebri for the reporting period (mm)<sup>2</sup>**

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
<b>2017–18</b>	1.2	12.4	7.7	46.4	42.2	18.2	0.4	23.2	35.4	0.0	27.6	4.0	218.7

**Table 4: Historical monthly rainfall statistics at Collarenebri (mm)<sup>2</sup>**

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
<b>Mean</b>	34.5	26.6	25.9	38.0	47.9	52.7	67.1	55.9	48.1	33.7	34.5	35.0	496.2
<b>Median</b>	25.0	17.2	17.0	33.1	36.8	37.6	39.9	36.6	31.2	20.5	22.6	27.8	468.3
<b>Lowest</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.7
<b>Highest</b>	159.7	135.0	157.3	167.1	241.2	216.4	508.4	351.4	254.2	356.0	216.2	148.1	1113.8
<b>Highest year</b>	1949-50	1917-18	1905-06	1933-34	1999-00	1990-91	1973-74	1975-76	1893-94	1989-90	1982-83	2004-05	1973-74

<sup>2</sup> Long term statistics are from the Bureau of Meteorology – climate data online, using the climatic stations ‘48031— Collarenebri (Albert St)’ and ‘53033— Pallamallawa Post Office’. Historical record statistics commence at 1913 for Pallamallawa and 1885 Collarenebri.



Figure 5: Gwydir annual rainfall for 2018–19

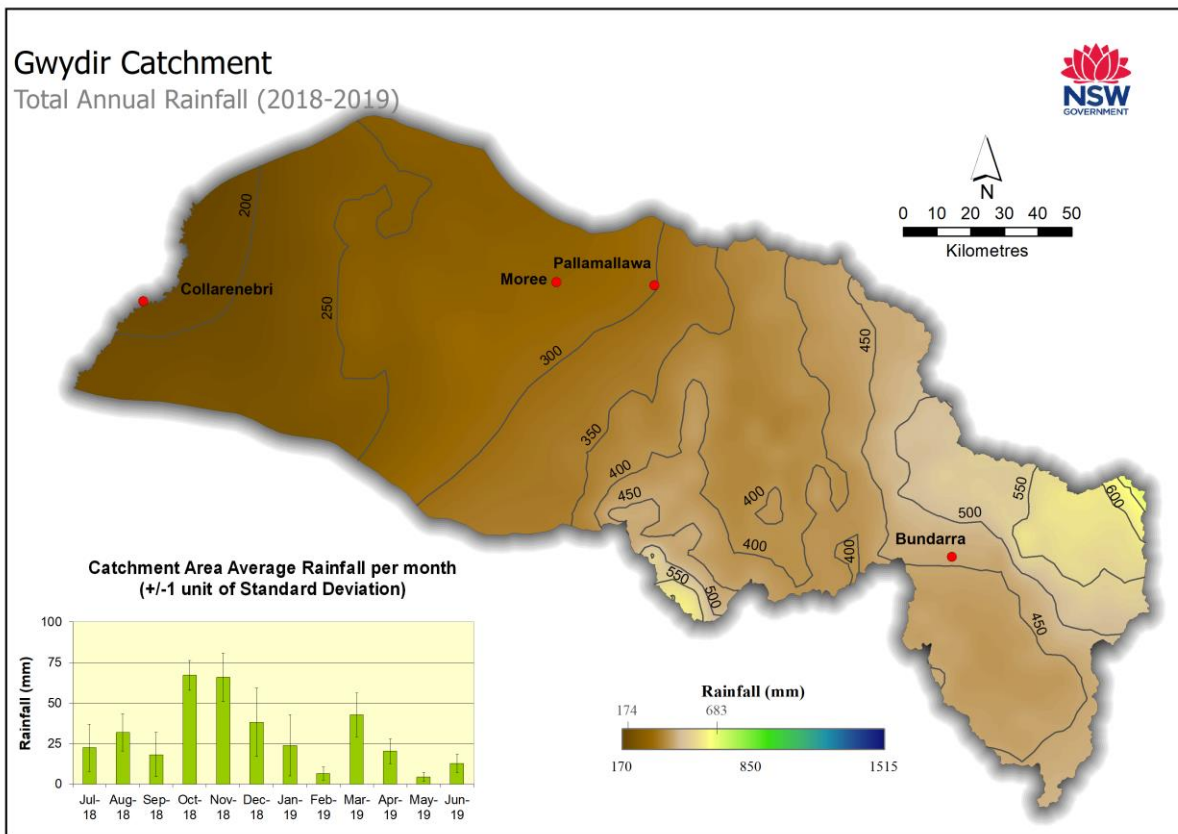
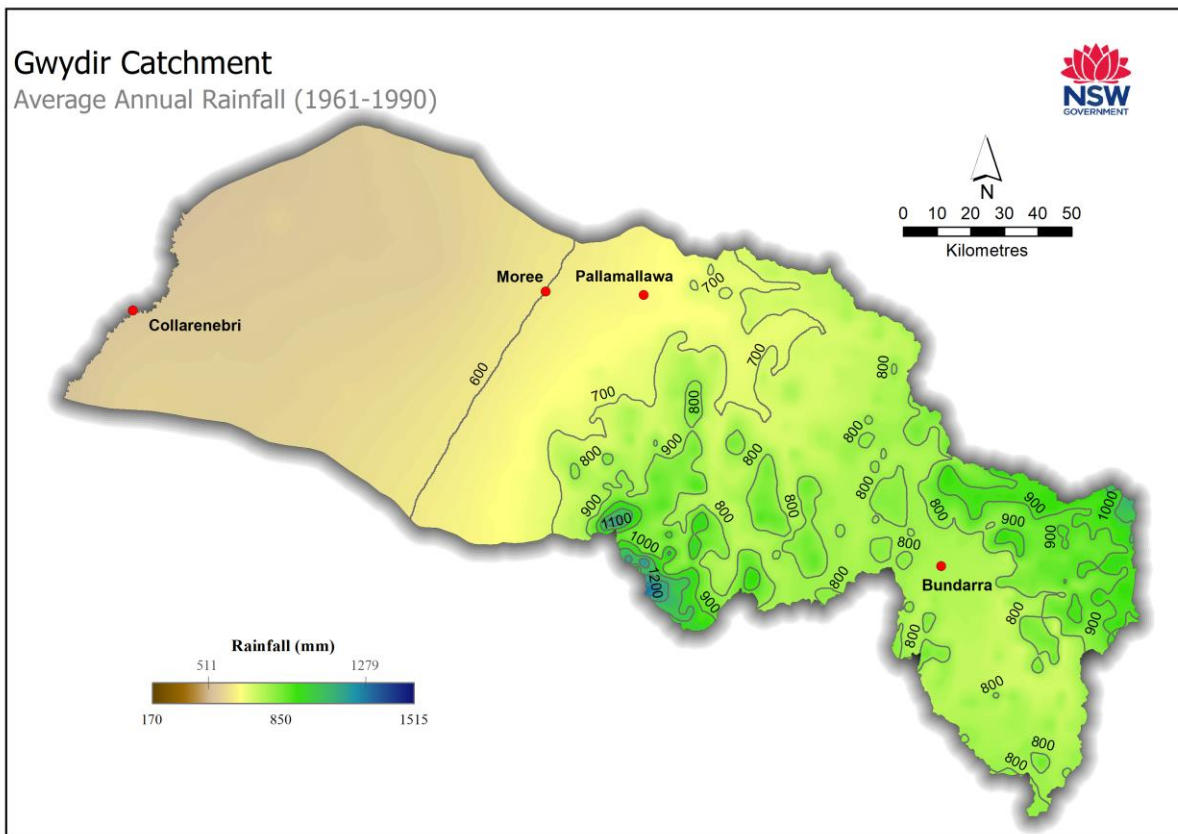


Figure 6: Average annual rainfall in the Gwydir catchment (1961–90)





# Dam inflows and volume

## Inflows

Historically, the long-term average annual inflow<sup>3</sup> at the Copeton storage site has varied significantly, cycling through prolonged periods of wet and dry flow regimes. Broadly, the data (Figure 7) illustrates predominately:

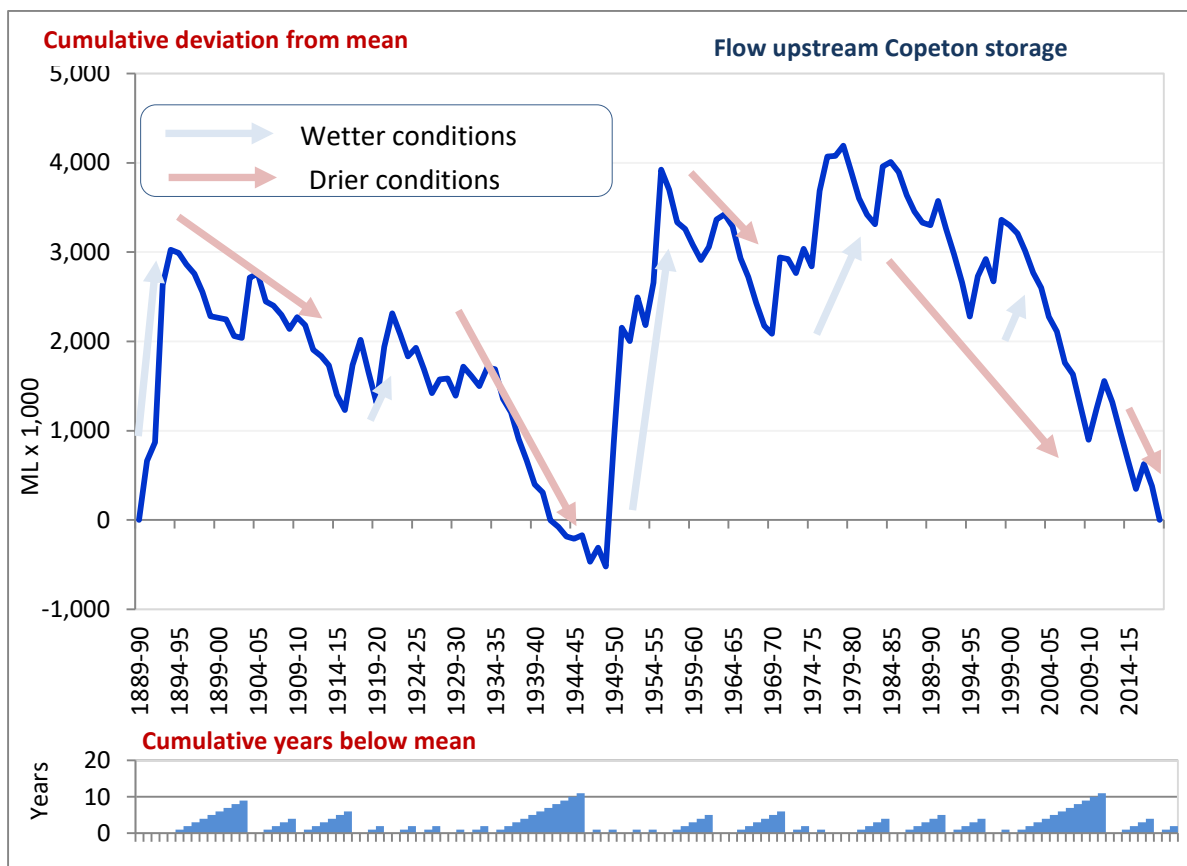
- dry conditions from 1900 to 1950
- wet conditions from 1950 to 1980
- dry conditions from 1980 to present.

For the reporting period, inflow to Copeton dam (Figure 8) was 20,890 megalitres, which is:

- 5% of the long-term average annual inflow (401,984 megalitres per year)
- very low relative to the historical record, exceeding zero % of years on record (1890–91 to 2018–19) (lowest on record)
- the second consecutive year of below average inflow.

The highest inflows in the reporting period occurred in November 2018, where a maximum inflow rate of 437 megalitres per day was reached (Figure 9).

**Figure 7: Long-term annual flow upstream of Copeton Dam cumulative deviation from mean**



<sup>3</sup> Inflows are back-calculated storage inflow for period from storage construction and gauged or rainfall runoff model for the prior period

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

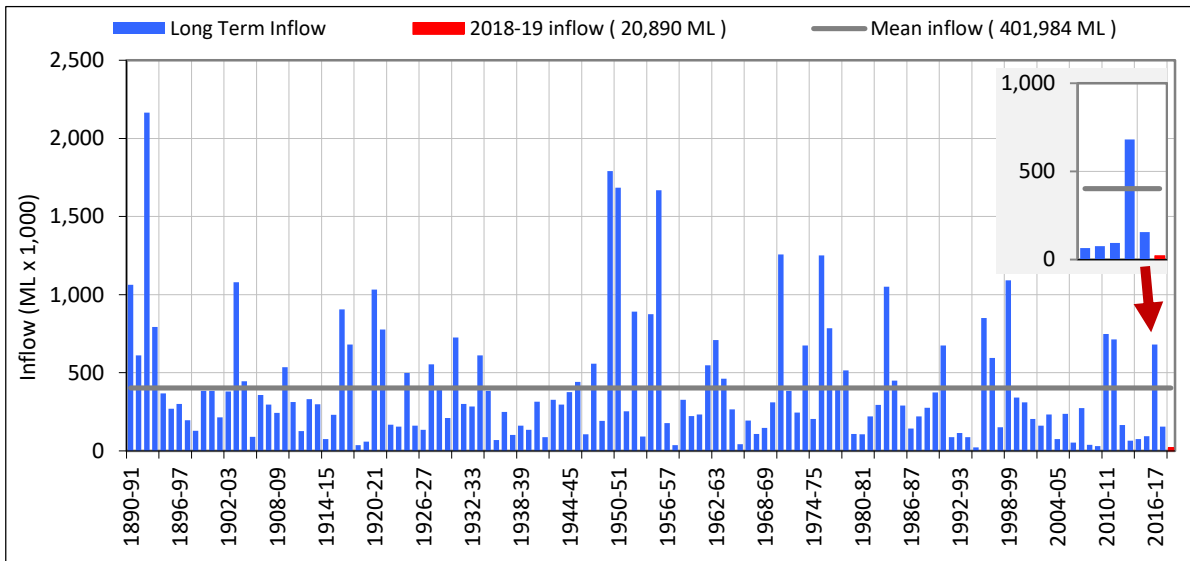
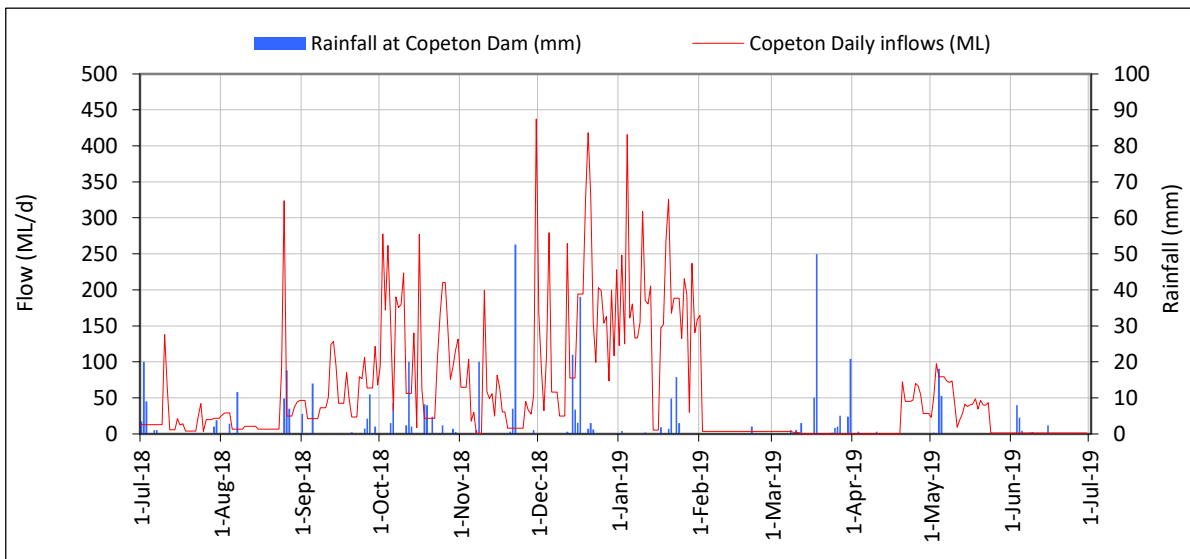


Figure 9: Daily inflows and rainfall at Copeton Dam

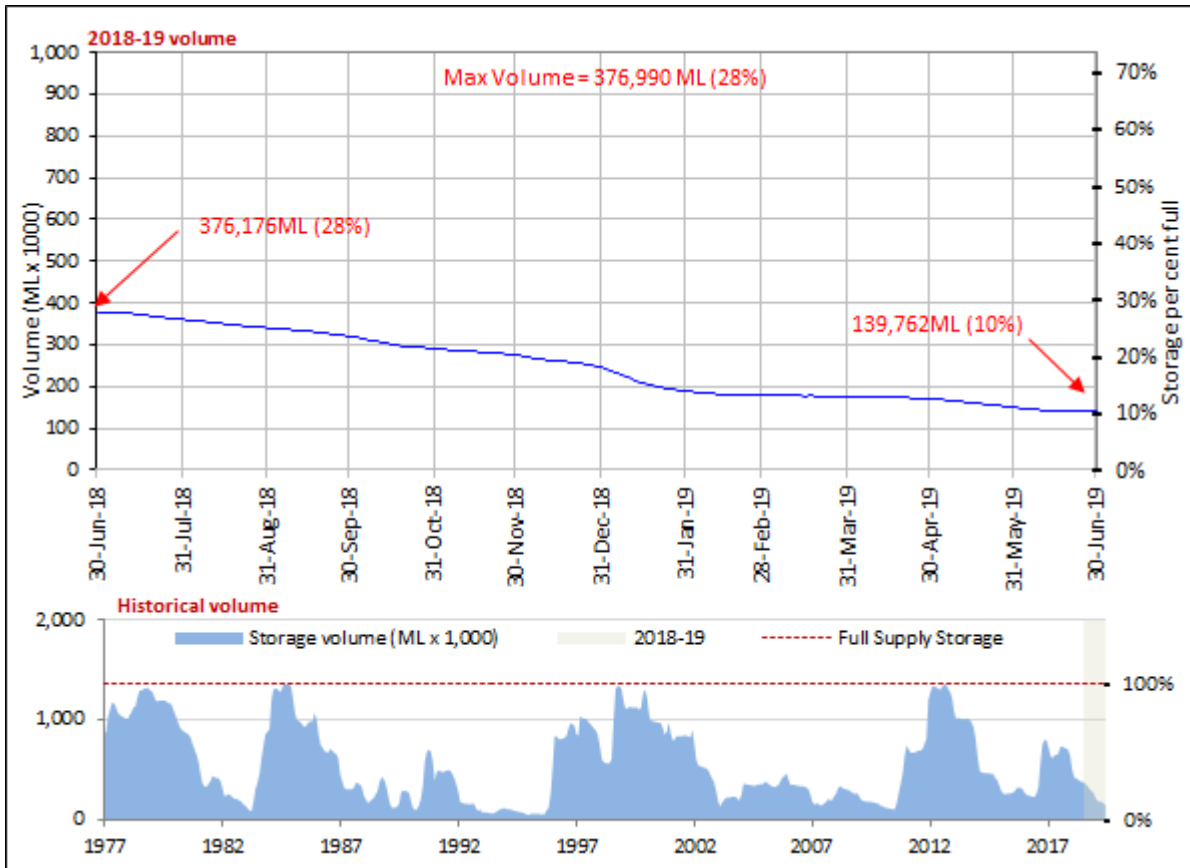


### Storage volume

Copeton Dam is the main supply storage in the regulated Gwydir system. The storage was completed in 1972 and has a full supply capacity of 1,361,720 megalitres. During the reporting period the:

- volume held in storage commenced at 376,176 megalitres or 28% of full supply capacity (Figure 10)
- volume held in storage at the end of the reporting period was 139,762 megalitres or 10% of full supply capacity, a decrease of 17% for the year
- maximum volume held during the reporting period was 376,990 megalitres or 28% of full supply capacity on 2 July 2018.

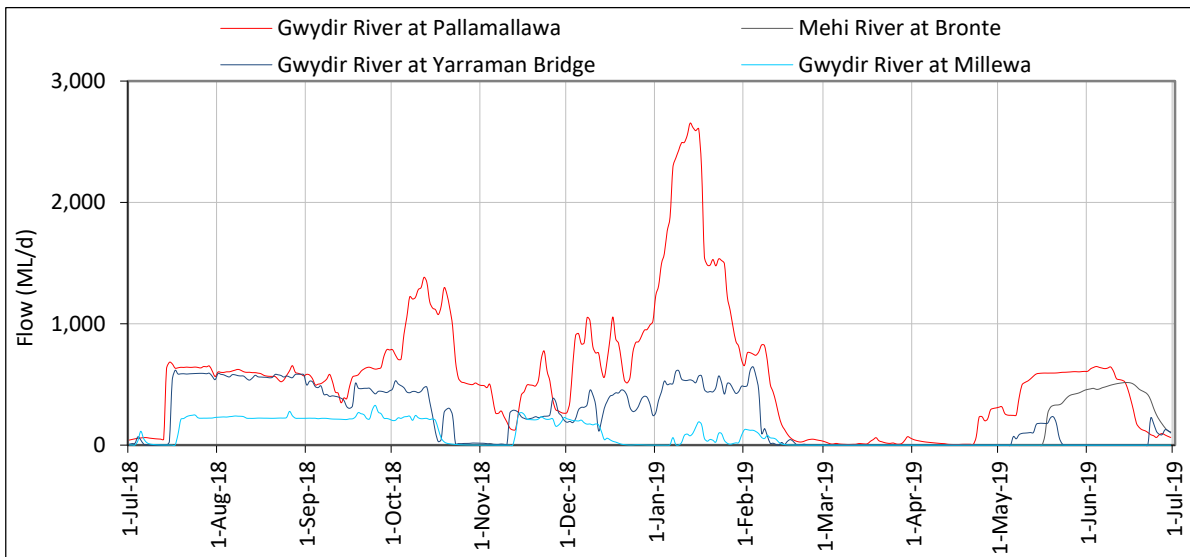
Figure 10: Copeton Dam volume and percentage of full supply volume 2018–19



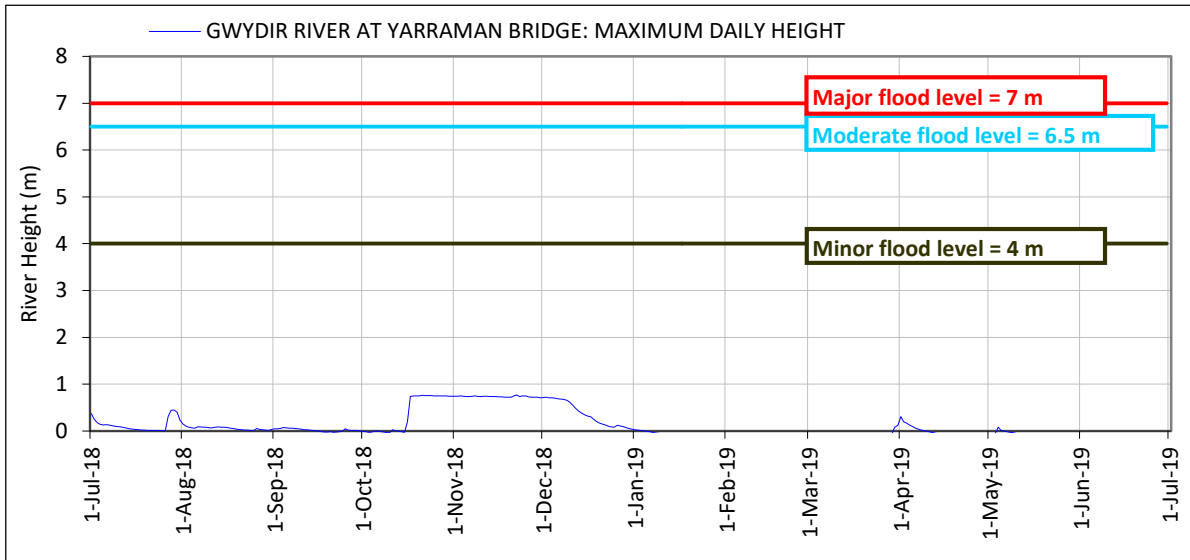
## Major flow events

- There were no major flow events in the Gwydir River during 2018–19. Instream volumes were associated with regulated releases from Copeton storage.
- The peak average daily flow rate at Pallamallawa was 2,654 megalitres per day and occurred on 13 January 2019 (Figure 11).
- River height did not exceed the minor flood level at Yarraman Bridge gauging station during the reporting period (Figure 12). Height remained below 1 metre for the entirety of the reporting period.

Figure 11: Gwydir flow events for reporting period



**Figure 12: Gwydir River at Yarraman Bridge maximum daily river height against flood risk intervals**



## Surface water resources and management

### Legislation

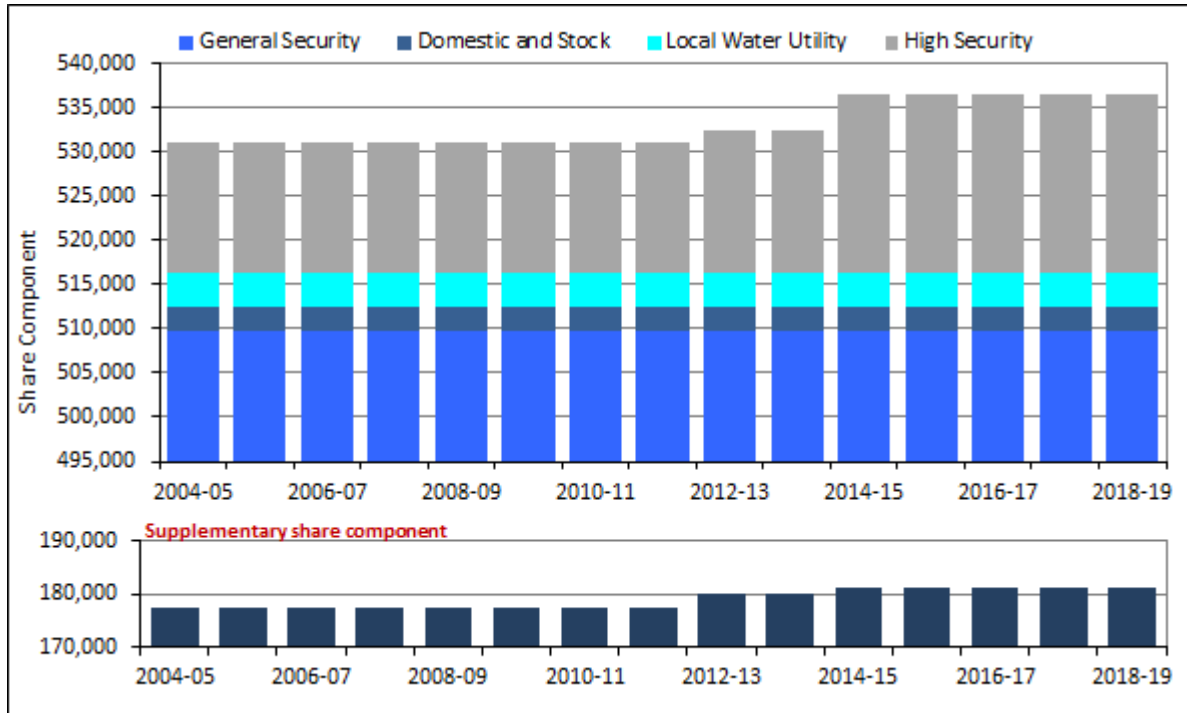
The water source was managed under rules and requirements set out in the *Water Sharing Plan for the Gwydir Regulated River Water Source 2016*. This water sharing plan started on 1 July 2016 and will remain active until 30 June 2026. The water sharing plan was produced to meet the water management principles outlined in the *NSW Water Management Act 2000*.

### Access rights

Excluding basic landholder rights (see Note 17), the right to a share of the water supply is controlled through the issue and management of water access licences.

- Access licence share components remained unchanged in the reporting period (Figure 13).
- Total issued share component on 30 June 2019 was 717,982 including 181,398 of supplementary shares.

Figure 13: Total issued share component, including held environmental water



### Access licence account management

We use a continuous accounting procedure in this water source that allows for general security licensees holding and carrying over up to 1.5 megalitres per issued share. The total annual account usage plus assignments out cannot exceed more than 3 megalitres per issued share plus assignments in. Additionally, the three-year rolling usage plus allocations assignments out in those three years cannot exceed three megalitres per issued share plus the volume of assignments in. All other categories have an account limit of 100% per megalitre per share and cannot carryover water between water years. The access licence accounting rules are summarised in Table 5.

Table 5: Gwydir licensed allocation accounting rules

Licence category	Account limit	Carryover limit	Annual use limit	3-year use limit	Maximum AWD
Domestic and Stock	100%	0%	N/A	N/A	100%
Domestic and Stock [Domestic]	100%	0%	N/A	N/A	100%
Domestic and Stock [Stock]	100%	0%	N/A	N/A	100%
Local Water Utility	100%	0%	N/A	N/A	100%
Regulated River (General Security)	1.5 ML/Share	1.5 ML/Share	3 ML/Share <sup>4</sup>	3 ML/Share <sup>4</sup>	N/A
Regulated River (High Security)	1 ML/Share	0 ML/Share	N/A	N/A	1 ML/Share
Regulated River (High Security) (Research)	1 ML/Share	0 ML/Share	N/A	N/A	1 ML/Share
Supplementary	N/A	0 ML/Share	N/A	N/A	1.25 ML/Share <sup>5</sup>

<sup>4</sup> The annual and 3-year use limit for general security is assessed including allocation assignments (temporary trading), whereby usage plus trade out are compared to the relative limit plus allocation assignments in

## Extreme events stage and temporary water restrictions

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

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

Table 6 outlines the conditions that may be associated with different stages of criticality for surface water quality. Further information is available at [industry.nsw.gov.au/water/what-we-do/legislation-policies/eep](http://industry.nsw.gov.au/water/what-we-do/legislation-policies/eep)

**Table 6: Determination of stages of criticality for surface water quantity**

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

### Extreme events stage

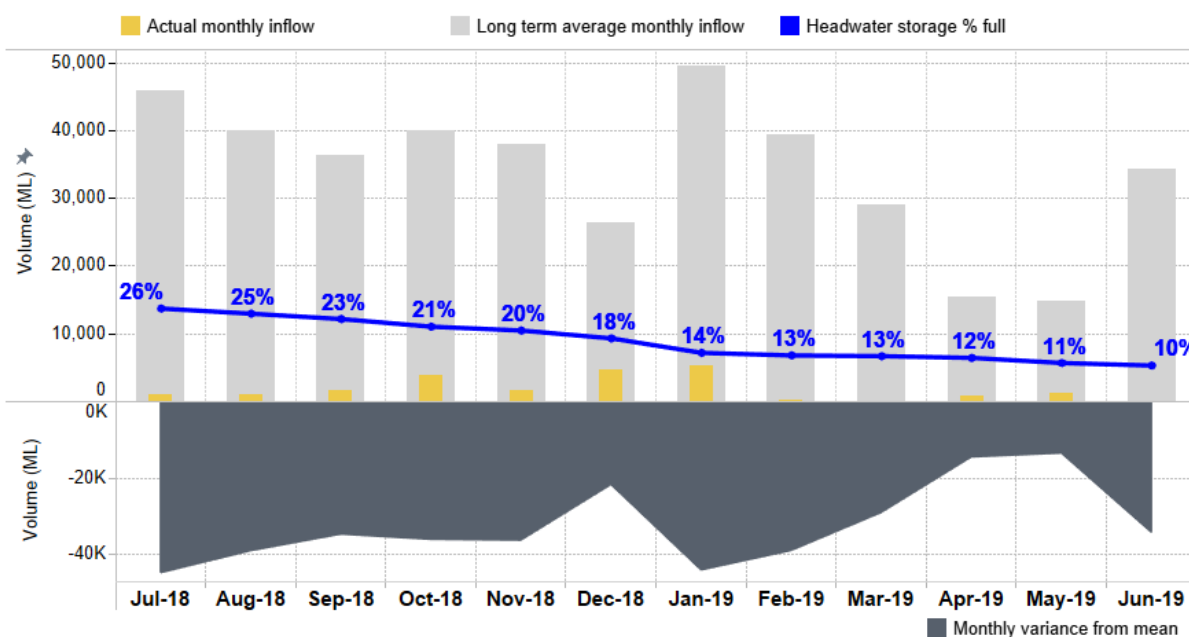
- Following release of the NSW Extreme Events Policy in October 2018, the Gwydir regulated river was declared as being in Stage 2. This escalated to Stage 3 in May 2019.
- WaterNSW utilised block releases as an efficiency measure for the delivery of the relatively low remaining account volumes of general security irrigation throughout 2018/19.
- Releases were made from Copeton Dam to provide water into the Barwon-Darling system under the northern rivers fish flow environmental watering program (<https://www.environment.gov.au/water/cewo/catchment/northern-fish-flow-2019>)
- The 2 year inflow sequence to Copeton Dam reached a deficit of 646,058 megalitres relative to long term average 2 year inflows, however did not exceed the worst 2 year inflow sequence on record (2008-09 to 2009-10) (Figure 14).

<sup>5</sup> 2016–17, 2017–18, 2018–19 only and then reverts to 1 megalitre per share

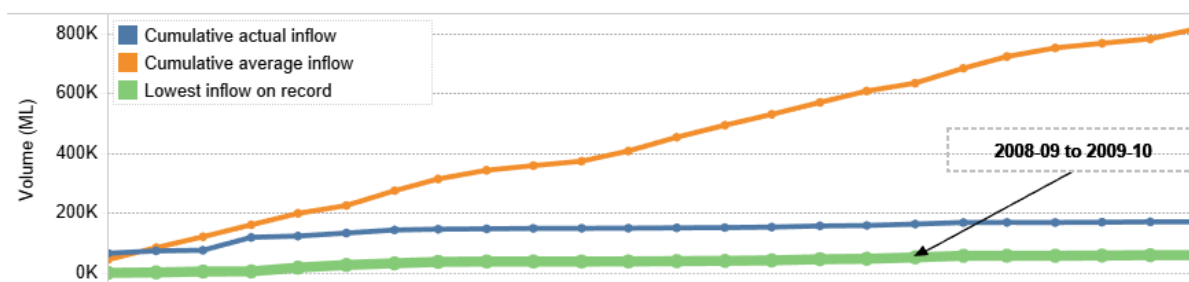
Figure 14: Drought stage for the reporting period referenced with monthly headwater storage inflows, monthly storage inflow variance from mean and two-year cumulative inflow sequence

Drought stage	NA	NA	NA	2	2	2	2	2	2	2	2	3	3
---------------	----	----	----	---	---	---	---	---	---	---	---	---	---

Storage Inflow and volumes - 1 July 2018 to 30 June 2019



2 year storage inflow - 1 July 2017 to 30 June 2019



### Temporary water restrictions

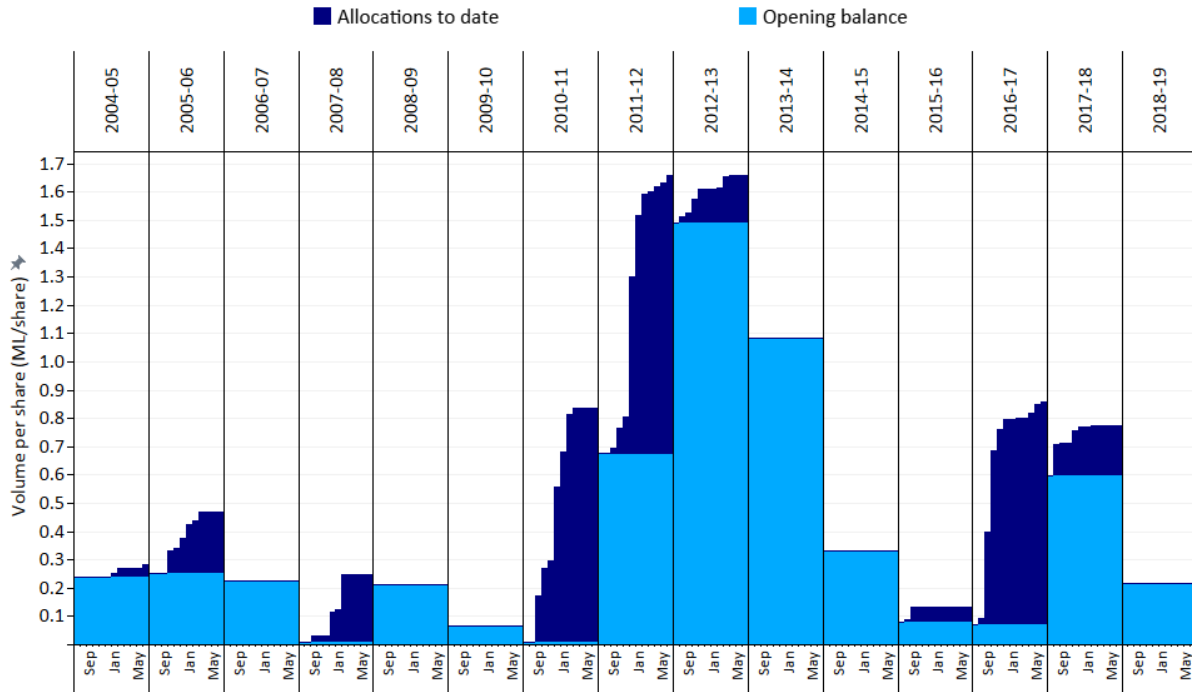
No restrictions on access licences occurred in the reporting period.

### Water availability

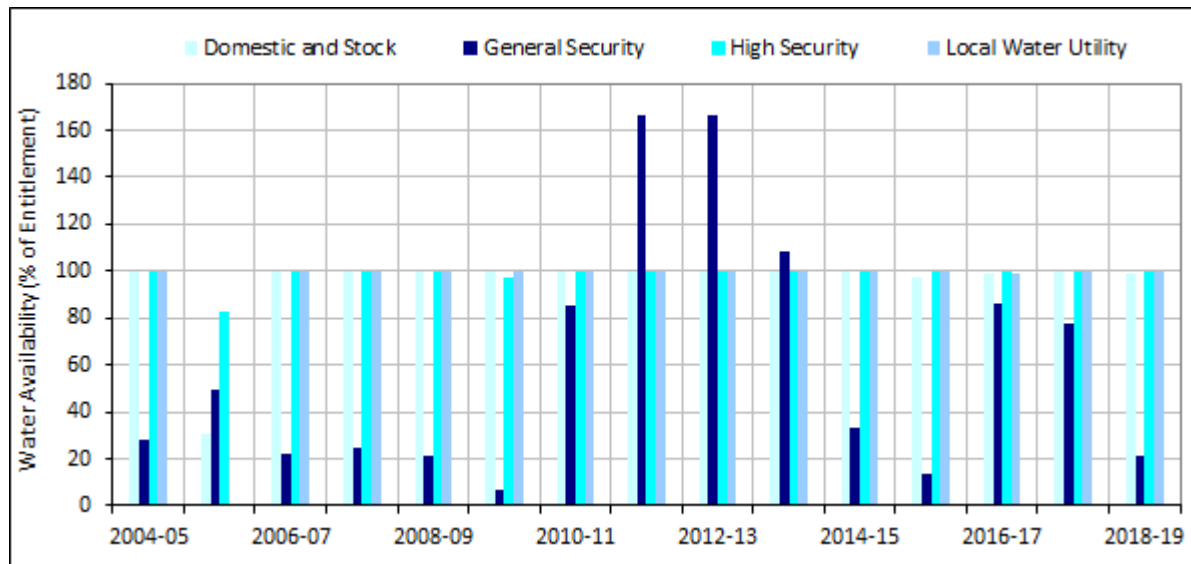
- Domestic and Stock, Local Water Utility and High Security access licences (including sub-categories) received an opening available water determination (AWD) of 100%, the maximum allowable under the water sharing plan.
- Supplementary access licences received an opening AWD of 1.25 megalitres per share, the maximum allowable under the water sharing plan<sup>5</sup>.
- General Security access licences had a carryover of 110,521 megalitres into the reporting period, equating to 22% of total issued general security share.
- General Security access licences received an opening AWD of zero megalitres per share.
- No further announcements were made to this category for the reporting period due to lack of available resources (Figure 15).

- Water availability<sup>[6][7][8]</sup> for general security was down significantly relative to the prior reporting period (Figure 16) and the lowest since 2015–16. Over the 15-year period (2004-05 to 2018–19) of water sharing plan management conditions it was the 4<sup>th</sup> lowest water availability (equal with 2006-07).

**Figure 15: Incremental available water determination and carryover volumes for ‘General Security’ as a proportion of share component**



**Figure 16: Gwydir account water availability (carryover plus AWDs)**



<sup>6</sup> Supplementary licences in the Gwydir have been excluded. Each year of the plan this licence category is granted an available water determination of 100% (125% in initial 3 years of plan), however access to this water is contingent on high flow events available. Actual usage information against this category of licence is available in Note 1 and Note 18 of this GPWAR.

<sup>7</sup> At the commencement of the water sharing plan (2004-05) water held in general security accounts was allowed to be brought forward as an opening balance.

<sup>8</sup> Includes all access licences issued under the water sharing plan and therefore held environmental water.

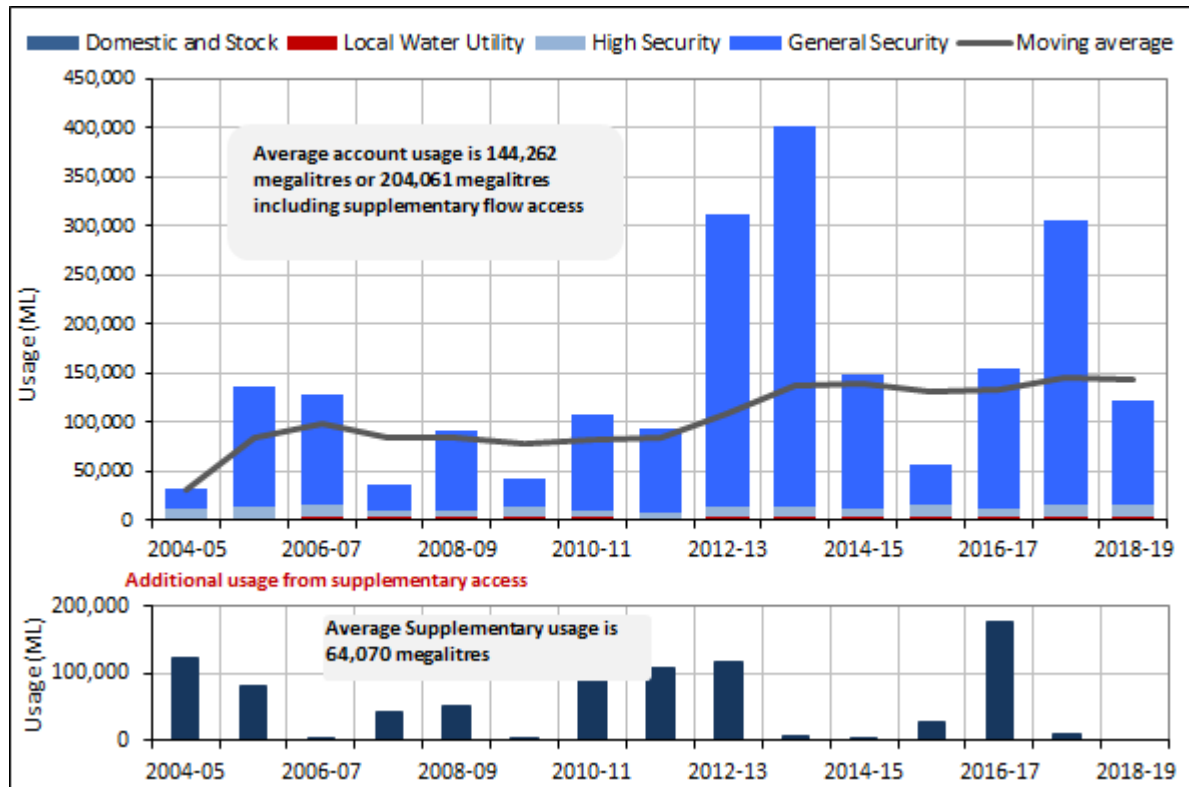


## Account usage

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

- Account usage from the regulated supply totalled 121,130 megalitres for the reporting period, 16% below average and the lowest since 2016–17 (Figure 17).
- Zero megalitres was accessed from high-flow supplementary events.
- Average usage (all licence categories) is 204,061 megalitres (2004–05 to 2018–19).
- Refer to disclosure Note 3 for further usage details.

**Figure 17: Access licence account usage**



## Utilisation and inactive share

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

For the reporting period:

- 14% of general security share component was inactive for the reporting period (70,061 unit shares), up from 2% in the prior reporting period (Table 7)
- minimal (100 shares) high security share component was inactive (equal to the prior reporting period)
- a total of 1,381 shares of domestic and stock (and subcategories) were inactive (49% of issued share)
- while no supplementary water was available in the reporting period 25 licences were active in the temporary trade market (77% of share inactive)
- utilisation of available water from regulated supplies (excludes 'Supplementary') increased for the third consecutive year to 88%, the second highest under water sharing plan management conditions (Figure 18).

Figure 18: Gwydir account utilisation

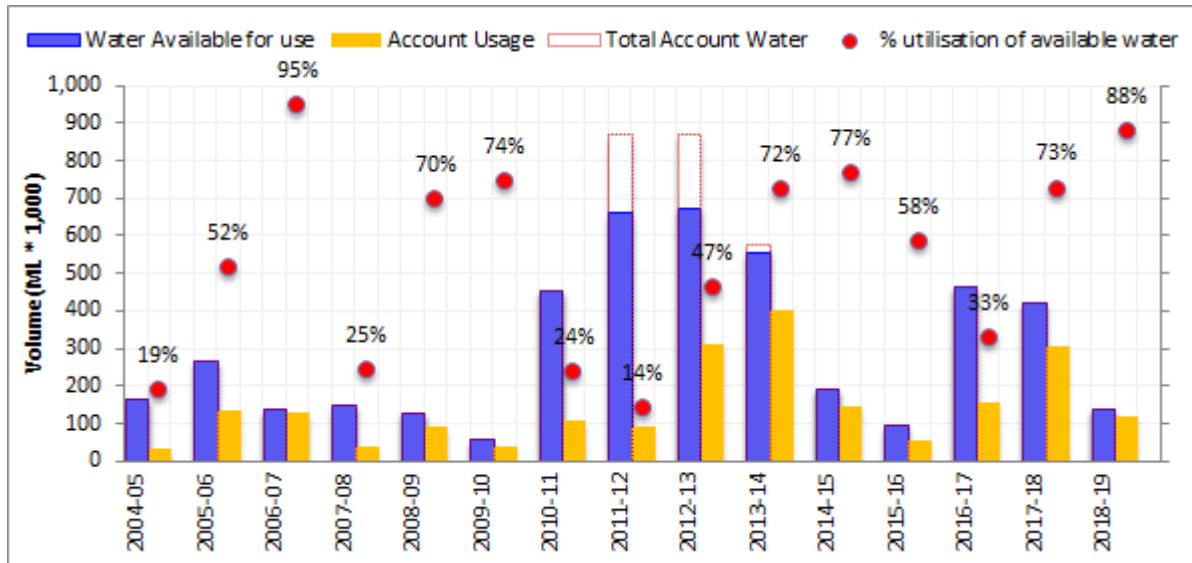


Table 7: Gwydir inactive licence summary for the reporting period

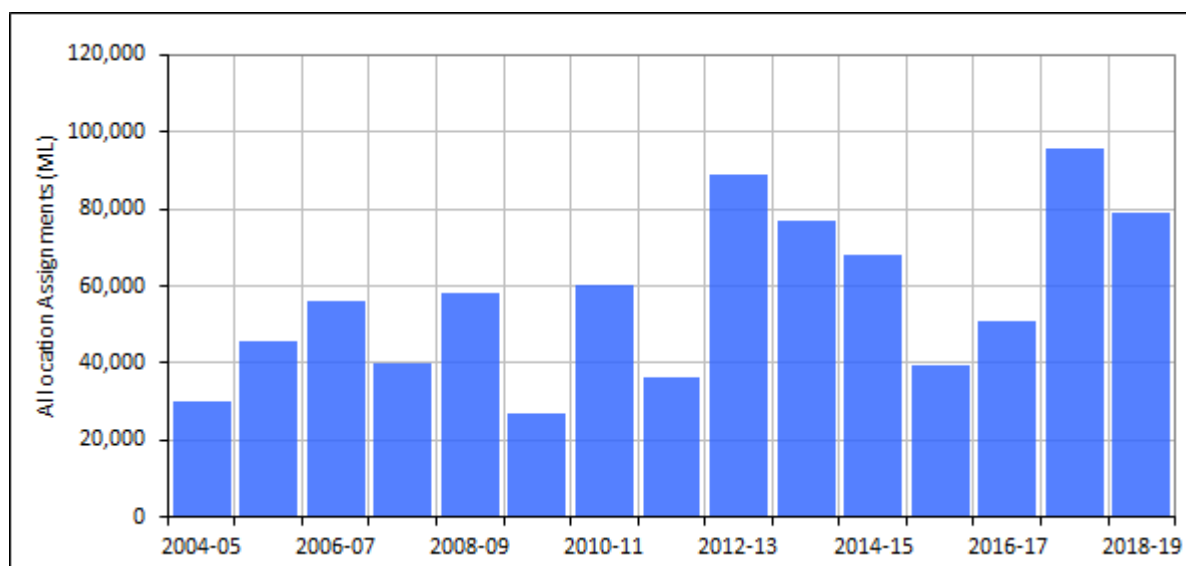
Licence category	Inactive licences (number)	Inactive share component	Inactive share % of total	Inactive share % of total prior year (2017–18)
Domestic and Stock	44	1,148	46%	48%
Domestic and Stock [Domestic]	4	88	100%	97%
Domestic and Stock [Stock]	18	145	63%	59%
Local Water Utility	0	0	0%	0%
Regulated River (General Security)	85	70,061	14%	2%
Regulated River (High Security)	5	100	0%	0%
Regulated River (High Security) [Research]	1	60	100%	100%
Total regulated supply	157	71,602	13%	2%
Supplementary Water	131	139,085	77%	46%

### Temporary trading (allocation assignments)

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

The total volume transferred under allocation assignments (78,872 megalitres) in the reporting period was 18 per cent lower than the prior reporting period however was the 3<sup>rd</sup> highest under water sharing plan management conditions (2004–05) (Figure 19).

Figure 19: Allocation assignment total volumes

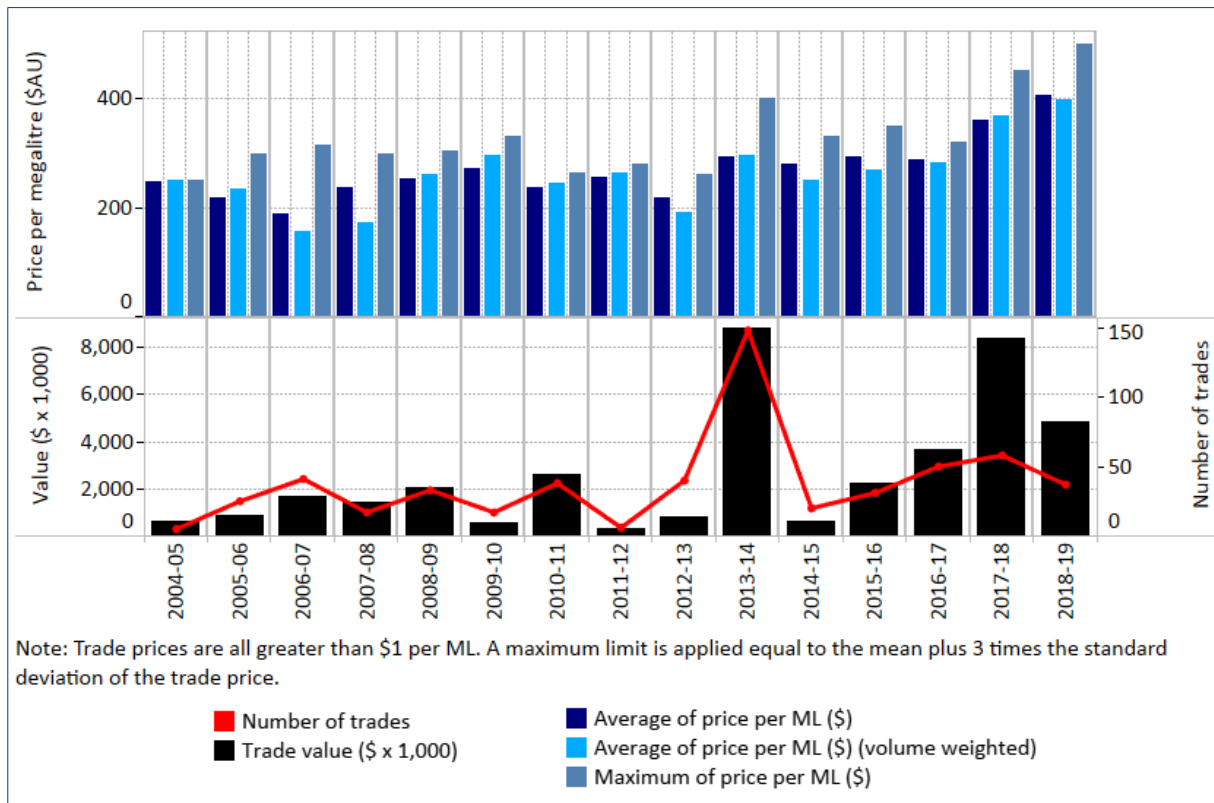


### Commercial temporary trading statistics

- A total of 37 assignments were processed for commercial consideration,<sup>9</sup> transferring 12,141 megalitres of water between holder accounts.
- The average price in the reporting period was \$406 per megalitre (\$399 volume weighted), which was the highest since operation under water sharing plan management conditions (Figure 20).
- Total trade value for the reporting period (\$4,839,000) was significantly lower than the prior reporting period reflecting the lower quantities being traded with diminishing resources.
- Further details on allocation assignments for the reporting period are available in Note 4 of this GPWAR.

<sup>9</sup> Trades were tagged as commercial if the consideration per megalitre exceeded \$1. A maximum limit was also applied to eliminate outliers from the dataset.

Figure 20: Allocation assignments commercial statistics



### Permanent trading (assignment of share and transfer of licence)

- The permanent trading market remains relatively inactive.
- During the reporting period:
  - one General Security share assignment was processed for a total of 2,916 shares at \$2,374 per share (Figure 21)
  - zero share assignments occurred with other categories of access licence
- No commercial exchange of high security share has occurred via share assignment transactions under *Water Management Act 2000* conditions.
- No environmental share assignments have occurred since 2010–11 (Figure 22).
- An additional 12,008 shares were exchanged for monetary consideration (greater than \$1 per share) through change of holder licence dealings (Figure 23).

Figure 21: Share assignment price statistics for 'General Security'

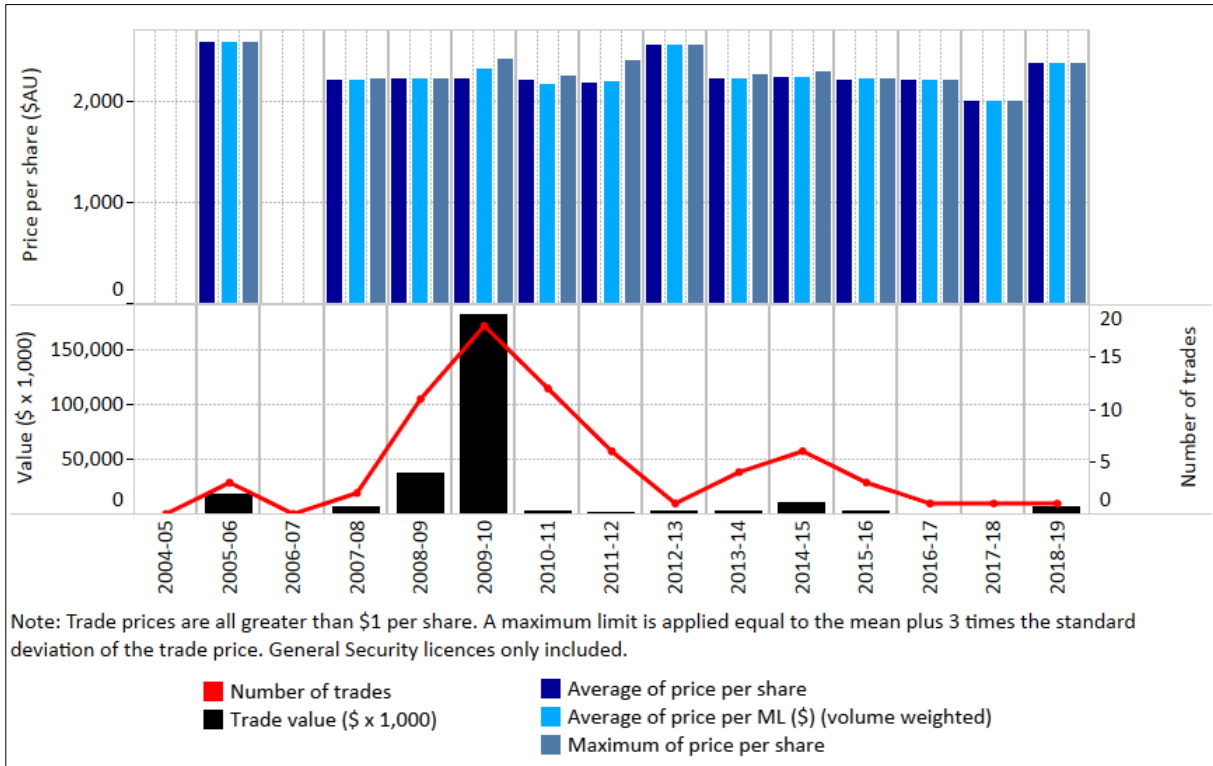


Figure 22: Share assignment trades for environmental and non-environmental licence holders

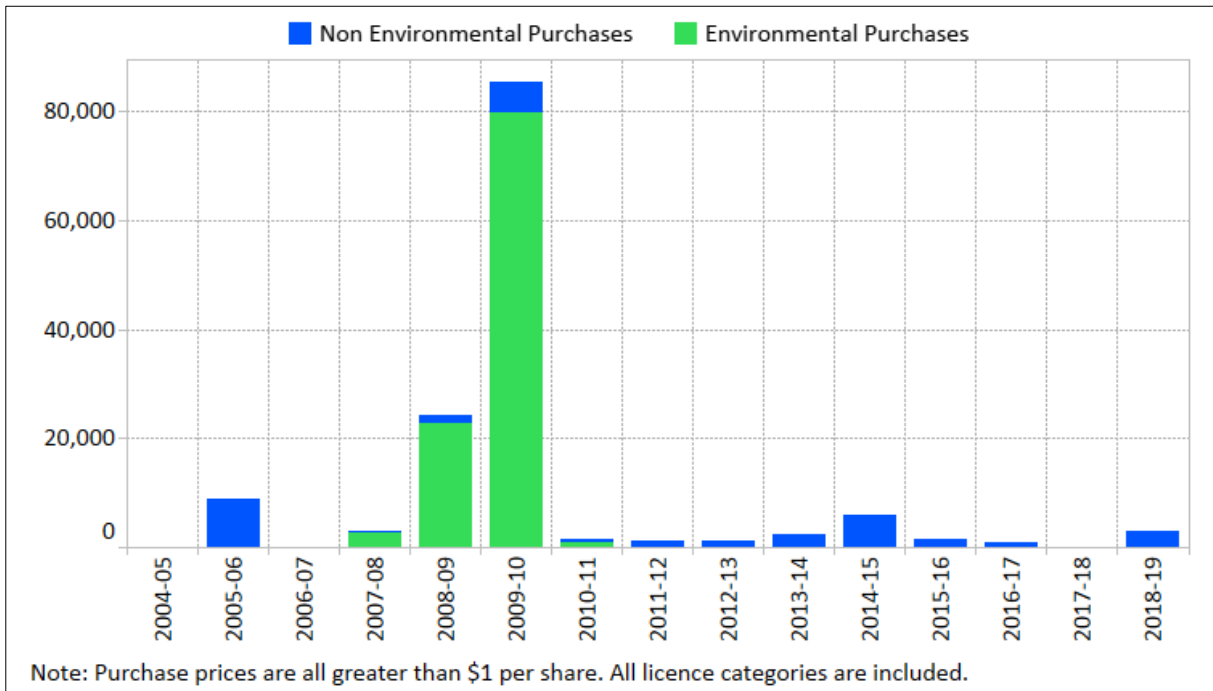
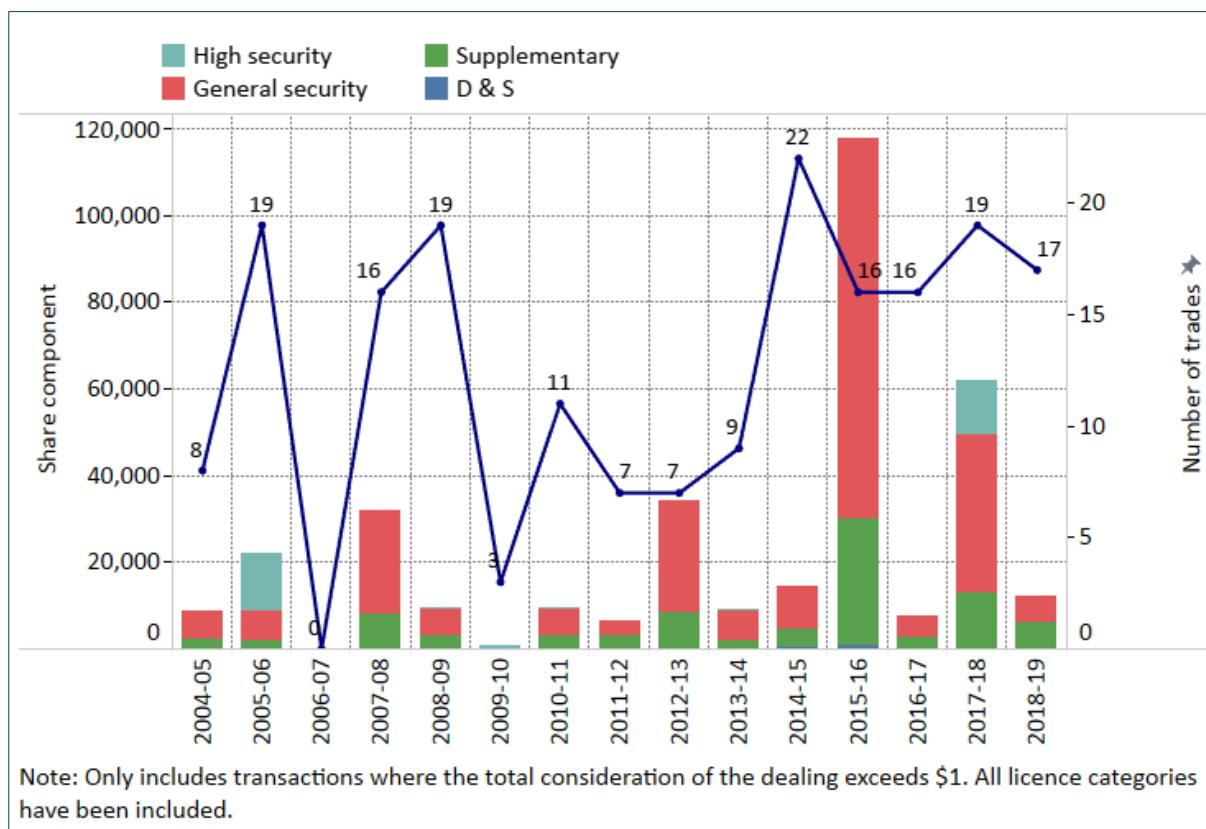


Figure 23: Access licence holder transfer summary



## Replenishment flows

Replenishment flow requirements of the water sharing plan are detailed in Note 15 of this GPWAR. For the reporting period, 2,135 megalitres was delivered to Thalaba Creek for basic landholder rights replenishment supplies.

## Held environmental water

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

- There was no change to held environmental water holdings for the reporting period (Figure 24).
- 135,965 shares were held by environmental managers as of 30 June 2019.
- Held environmental usage totalled 61,550 megalitres from the regulated supply (Figure 25), which was the highest annual usage under water sharing plan management conditions. There was no usage associated with supplementary licence holdings.
- Utilisation of available account water increased by 44% to 80%, the highest rate under water sharing plan management conditions (Figure 26)
- Details on held environmental accounting for the reporting period are available in Note 5 of this GPWAR.

## Planned environmental water—environmental contingency allowance

Planned environmental water refers to a range of environmental allowances and provisions that are implemented under the water sharing plan to improve environmental outcomes.

- The environmental contingency allowance (ECA) had an opening balance of 75,330 megalitres.
- zero megalitres was credited to the ECA for the reporting period
- 52,000 megalitres of ECA was delivered (Figure 27).
- The ECA has a closing balance of 23,330 megalitres
- Further details are available in Note 6 of this GPWAR.

## Planned environmental water—other

- All minimum flow targets were considered met for the reporting period.
- zero megalitres of supplementary access events was reserved for environmental benefits (no supplementary announcements in the reporting period).
- Further details are available in Note 6 of this GPWAR.

**Figure 24: Held environmental water share component in the Gwydir**

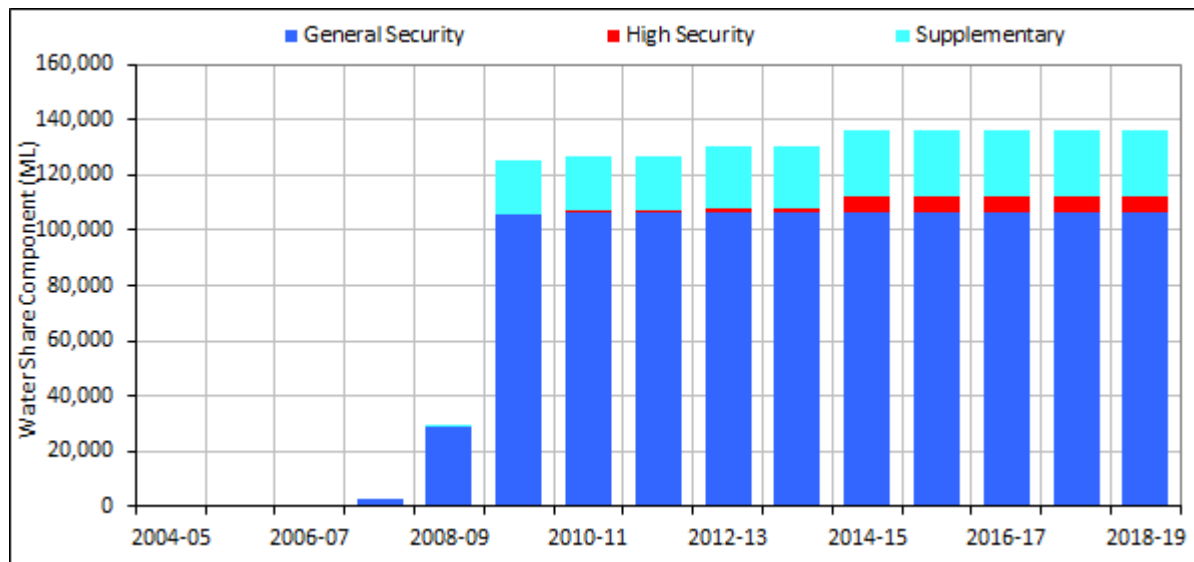


Figure 25: Held environmental account usage

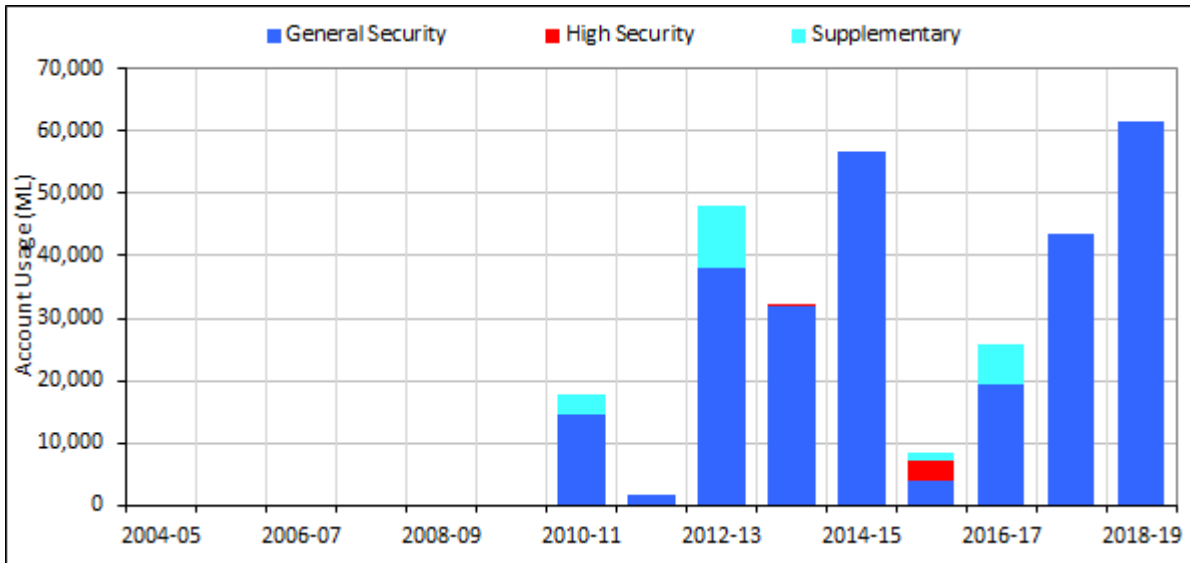


Figure 26: Held environmental account utilisation

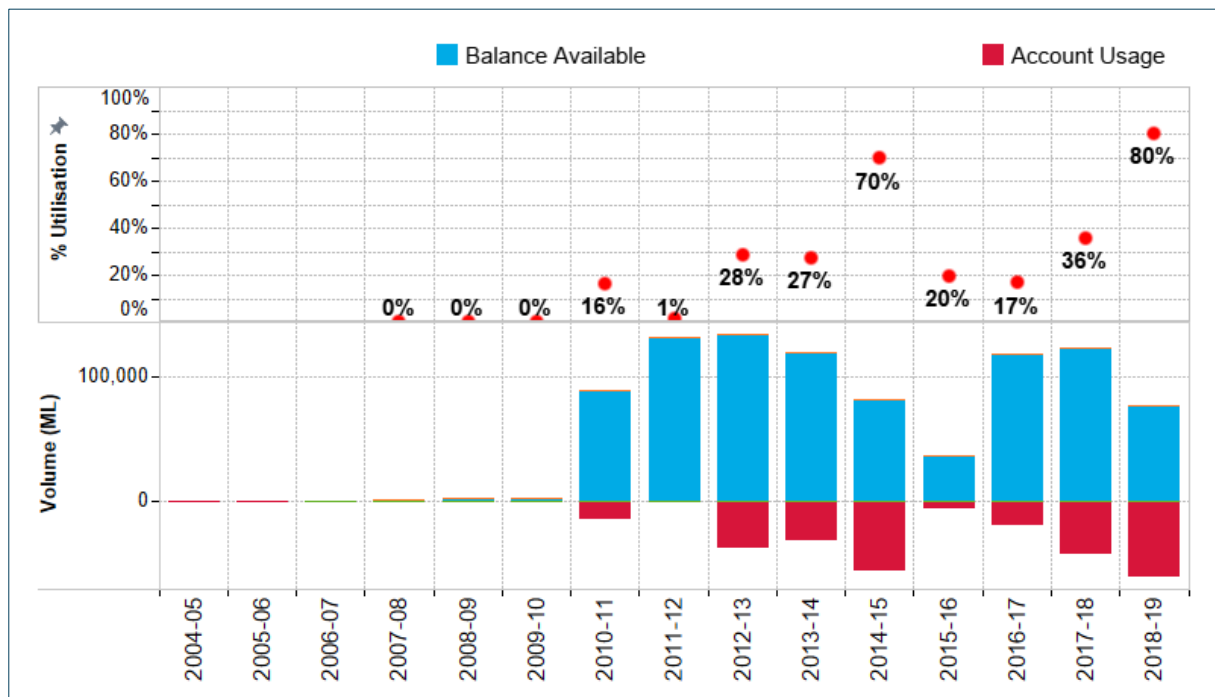
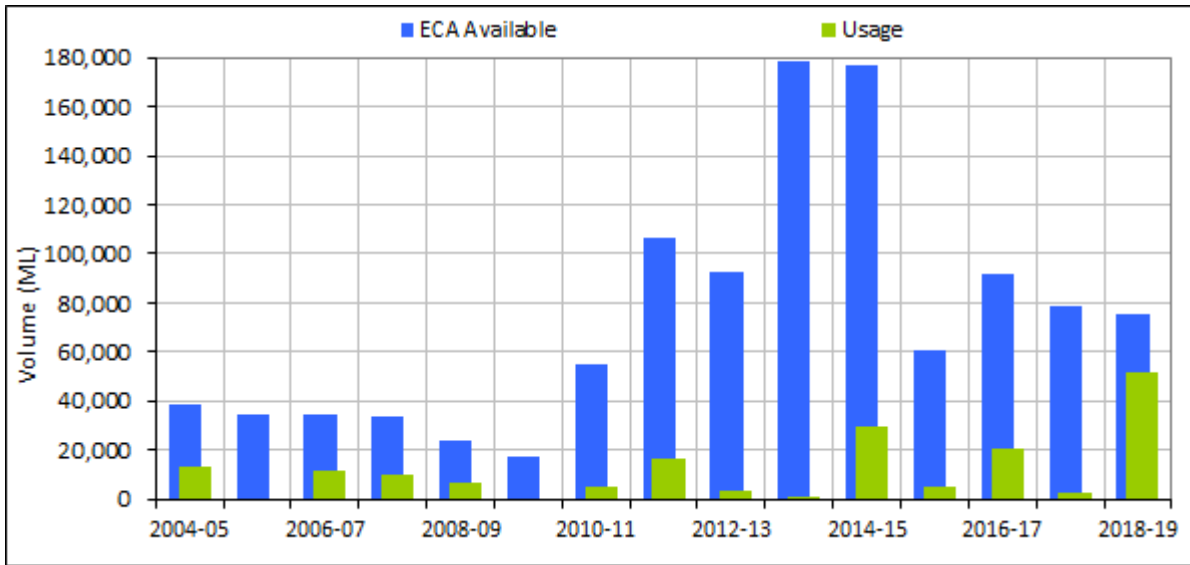




Figure 27: Environmental contingency allowance summary



# Water Accounting Statements

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## Significant water accounting policies

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

We have excluded the 'Statement of Physical Flows' from this GPWAR as all transactions have been presented in the statements 'Water Assets and Liabilities' and 'Changes in Water Assets and Water Liabilities'. We have included a physical flow diagram that represents the physical movements of water to more clearly depict those accounting processes associated with physical flow movement.

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

## Quantification of data

### Data accuracy

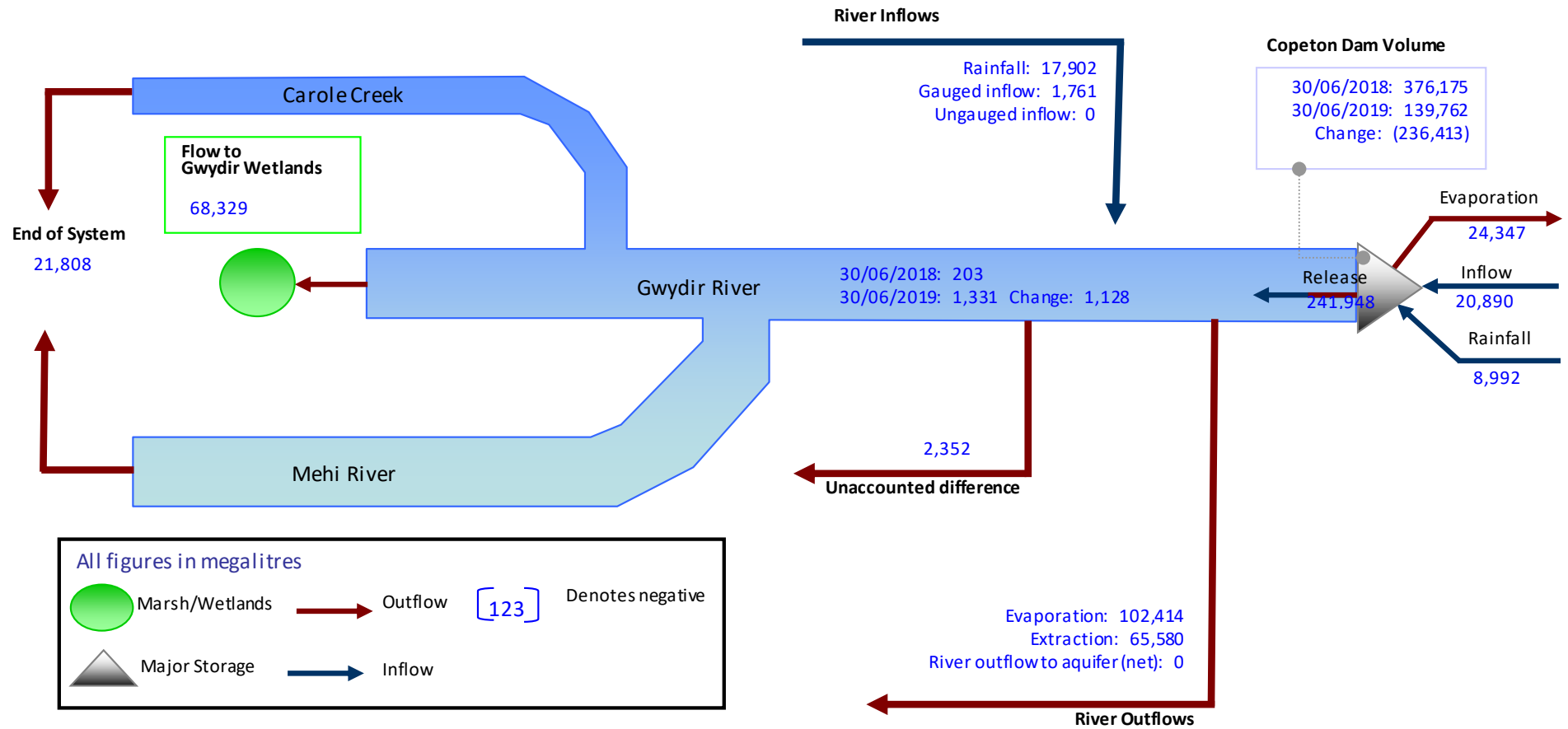
The data used to account for water movement and management in the reporting entity has been obtained from a variety of sources and systems. The data ranges from observed values where we anticipate high accuracy through to modelled results and estimates where accuracy can be highly variable, depending on a range of factors. To improve accuracy and prevent misuse of the data in the accounts, we have added an accuracy assessment to all figures in the water accounting statements (Table 8).

**Table 8: Water account data accuracy estimates key**

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

<sup>10</sup> 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 NSW Department of Planning, Industry and Environment corporate database.

## 2018–19 Gwydir physical flows mass balance diagram



# Statement of water assets and water liabilities

For the year ended 30 June 2019

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

## Surface water assets

1.Surface water storage	Accuracy	Notes	30 June 2019	30 June 2018
Copeton Dam	A	7	139,762	376,175
River	B	8	1,331	203
<b>Total surface water storage (Asws)</b>			<b>141,093</b>	<b>376,378</b>
<i>Change in physical surface water storage</i>			<b>(235,285)</b>	<b>(289,627)</b>

## Surface water liabilities

2.Allocation account balance	Accuracy	Notes	30 June 2019	30 June 2018
Domestic and Stock	A1	1	(16)	(42)
High Security (HS)	A1	1	(1)	(9)
Local Water Utility	A1	1	0	0
General Security	A1	1	13,387	110,521
<b>Total allocation account balance (Lsws)</b>			<b>13,371</b>	<b>110,470</b>
<i>Change in allocation account balance</i>			<b>(97,099)</b>	<b>(193,609)</b>

3. Environmental contingency allowance (ECA) Balance	Accuracy	Notes	30 June 2019	30 June 2018
ECA	A1	6	23,330	75,330
<b>Total ECA Balance (ECA)</b>			<b>23,330</b>	<b>75,330</b>
<i>Change in ECA balance</i>			<b>(52,000)</b>	4,922

## Surface water net changes

4. Net changes				
<b>Net surface water assets (Asws – Lsws – ECA)</b>			<b>104,392</b>	190,578
<i>Change in net surface water assets</i>			<b>(86,186)</b>	<b>(100,940)</b>

# Changes in water assets and water liabilities

For the year ended 30 June 2019 (1 of 3)

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

Surface water storage increases	Accuracy	Notes	2018-2019	2017-2018
Copeton Dam				
Inflow	A	9	20,890	155,001
Rainfall	B	10	8,992	14,269
River				
Rainfall	C	11	17,902	27,068
Inflow from Copeton releases	A	14	241,948	412,700
Tributary inflow				
Gauged tributaries	A	12	1,761	25,590
Ungauged runoff estimate	C	13	0	120,000
<b>Total surface water storage increases (Isws)</b>			<b>291,493</b>	<b>754,628</b>

Surface water storage decreases	Accuracy	Notes	2018-2019	2017-2018
Copeton				
Storage release	A	14	241,948	412,700
Evaporation	B	10	24,347	43,350
River				
Evaporation	C	11	102,414	111,432
End-of-system flow: Other	A	15	19,673	44,256
End-of-system flow: Replenishment	A	15	2,135	4,000
End-of-system flow: Flow to wetlands	A	15	68,329	50,323
Net river outflow to aquifer	D	20	0	23,550
Extractions				
Basic rights extractions	C	17	6,000	6,000
Other river extractions	A	16	59,580	271,304
<b>Total surface water storage decreases (Dsws)</b>			<b>524,426</b>	<b>995,915</b>
<b>Unaccounted volume (balancing item) (Usws)</b>			<b>2,352</b>	<b>78,340</b>

Net surface water storage changes	2018-2019	2017-2018
<b>Net surface water storage inflow (Isws-Dsws-Usws)</b>	<b>(235,285)</b>	<b>(289,627)</b>

# Changes in water assets and water liabilities

For the year ended 30 June 2019 (2 of 3)

## 2. Changes in allocation accounts

Allocation account increases	Accuracy	Notes	2018-2019	2017-2018
Available water determinations	A1	2		
Domestic and Stock			2,824	2,824
General Security			0	89,577
High Security			20,200	20,200
High Security (Research)			60	60
Local Water Utility			3,836	3,836
Internal trade—buyers	A1	4	65,694	85,146
Supplementary demand	A	18	0	8,862
<b>Total allocation account increases (Iaa)</b>			<b>92,614</b>	<b>210,505</b>

Allocation account decreases	Accuracy	Notes	2018-2019	2017-2018
Account usage	A	3		
Domestic and Stock			1,429	1,410
General Security			106,151	291,130
High Security			10,422	10,627
Local Water Utility			3,128	2,955
Supplementary			0	8,862
Account forfeiture	A1	1		
Domestic and Stock			1,355	1,448
General Security			0	16
High Security			518	1
High Security (Research)			60	60
Local Water Utility			708	907
Over order	A1	21		
Domestic and Stock			14	9
General Security			234	1,533
High Security			0	10
Internal trade—sellers	A1	4	65,694	85,146
Account balance adjustment	A1	22	0	0
<b>Total allocation account decreases (Daa)</b>			<b>189,713</b>	<b>404,114</b>

Net change in allocation accounts	2018-2019	2017-2018
<b>Net allocation account balance increase (Iaa – Daa)</b>	<b>(97,099)</b>	<b>(193,609)</b>

## Changes in water assets and water liabilities

For the year ended 30 June 2019 (3 of 3)

### 3. Change in environmental contingency allowance (ECA)

ECA account increases	Accuracy	Notes	2018-2019	2017-2018
Account increase due to General Security AWD	A1	6	0	7,922
Account balance—adjustment (ECA Increase)				0
<b>Total ECA increase (Ieca)</b>			<b>0</b>	<b>7,922</b>

ECA account decreases	Accuracy	Notes	2018-2019	2017-2018
Account usage	A	6	52,000	3,000
Account balance—adjustment (ECA decrease)			0	0
<b>Total ECA decrease (Deca)</b>			<b>52,000</b>	<b>3,000</b>

Net environmental provisions changes	2018-2019	2017-2018
<b>Net environmental contingency allowance increase (Ieca – Deca)</b>	<b>(52,000)</b>	4,922

### 4. Overall changes

Surface water assets	2018-2019	2017-2018
<b>Change in net surface water assets (Isws–Dsws–Usws–Iaa+Daa–Ieca+Deca)</b>	<b>(86,186)</b>	<b>(100,940)</b>



# Note Disclosures

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## Reconciliation and future prospect descriptions

Reconciliation of change in net water asset to net change in physical water storage <sup>11</sup>	2018–19 ML	2017–18 ML
<b>Change in net surface water assets</b>	<b>(86,186)</b>	<b>(100,940)</b>
<b>Non-physical adjustments</b>		
Net change in allocation accounts	<b>(97,099)</b>	<b>(193,609)</b>
Net change in claims to water: ECA	<b>(52,000)</b>	<b>4,922</b>
<b>Net change in physical surface water storage</b>	<b>(235,285)</b>	<b>(289,627)</b>

Reconciliation of closing water storage to total surface water assets	30 June 2019	30 June 2018
<b>Closing water storage</b>		
Surface water storage	<b>139,762</b>	<b>376,378</b>
Additional surface water assets	<b>N/A</b>	<b>N/A</b>
<b>Total surface water assets</b>	<b>139,762</b>	<b>376,378</b>

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

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

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

<sup>11</sup> All figures can be derived from or found directly in the Water Accounting Statements of the General Purpose Water Accounting Report. All figures are in megalitres.

## Latest water availability

You can find the latest information on water availability, including water allocation statements, water allocations summaries and 2019-20 available water determinations, on the NSW Department of Planning, Industry and Environment webpage at [industry.nsw.gov.au/water/allocations-availability/allocations](http://industry.nsw.gov.au/water/allocations-availability/allocations)

You can also subscribe to receive the latest updates.

## Allocations



### How water is allocated

Water sharing plans are developed in consultation with the community to determine how much water can be extracted and set aside.



### Summary of current water allocations

A listing of current water allocation for major regulated rivers.



### Water allocation statements

Water allocation statements are issued to announce an increase in an allocation for a specific water source and licence category.



### Available water determinations

Available water determinations inform licensed water users how much water they can extract. They are issued on 1 July and periodically throughout the year.



### Outlook & forecasts

Read about how our yearly forecasting and outlook report for the southern basins.

## Latest storage volumes

See real-time information on current storage volumes at [realtimedata.waternsw.com.au](http://realtimedata.waternsw.com.au)

## Significant events since reporting period

System inflows have continued to track well below historical averages since the end of the reporting period. At the time of writing (February 2020) Copeton storage volume was at 9% of full supply capacity (rising trend). A temporary water restriction on general security access licence holders was enacted in February 2020, protecting a first flush runoff event and allowing flows to be passed to the Barwon Darling.

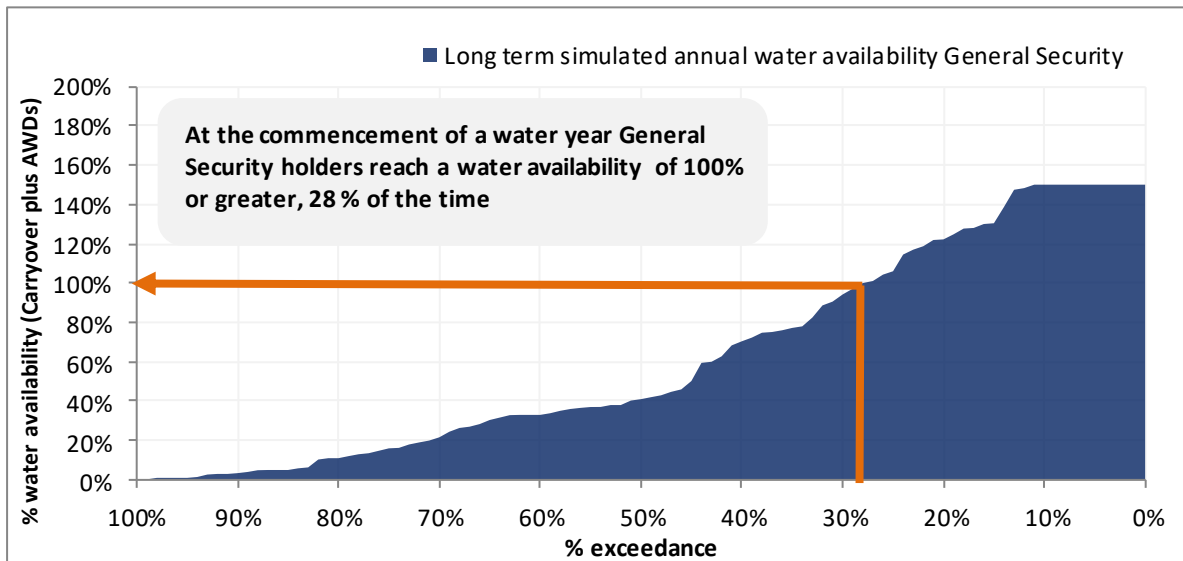
## System reliability

The latest long-term planning model (IQQM) reflecting a water sharing plan management scenario in the Gwydir provides indicative system reliability information for the start and end of a watering season<sup>12</sup>.

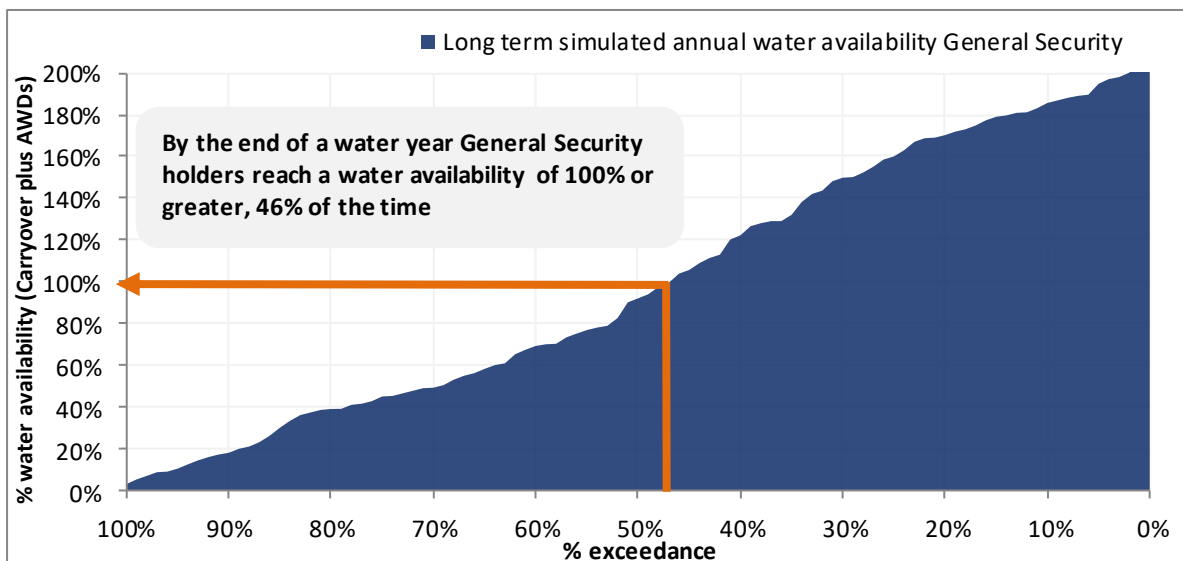
In any given year, the simulation indicates High Security entitlements are likely to have full allocation 100% of the time.

At the start of the water year, the simulation indicates that General Security licence holders receive an equivalent allocation of 100% or greater 28% of the time (Figure 28). Availabilities significant increase throughout the water year when usages have started and the storage is supplemented from new inflow. By the end of the water year, the simulation results indicate a water availability of 100% or greater, 46% of the time (Figure 29).

**Figure 28: Start of water year simulated availability for General Security access licences**



**Figure 29: End of water year simulated availability for General Security access licences**



<sup>12</sup> Modelled data simulated as July to June water year. Simulation period 1 June 1892 to 30 June 2016

## Carryovers and available water determinations 2018–19

Table 9: Gwydir carryovers and available water determinations 2018–19 (as of March 2019)

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-19	Opening	2,506			0.0%	0.0%	(14)	0	(14)	(0.6)%	(0.6)%
1-Jul-19	AWD 100.0 %	2,506	2,506	2,506	100.0%	100.0%	2,492	0	2,492	99.4%	99.4%
Domestic and Stock[Domestic]											
1-Jul-19	Opening	88			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 100.0 %	88	88	88	100.0%	100.0%	88	0	88	100.0%	100.0%
Domestic and Stock[Stock]											
1-Jul-19	Opening	230			0.0%	0.0%	(2)	0	(2)	(0.7)%	(0.7)%
1-Jul-19	AWD 100.0 %	230	230	230	100.0%	100.0%	228	0	228	99.3%	99.3%
Local Water Utility											
1-Jul-19	Opening	3,836			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 100.0 %	3,836	3,836	3,836	100.0%	100.0%	3,836	0	3,836	100.0%	100.0%
Regulated River (General Security)											
1-Jul-19	Opening	509,665			0.0%	0.0%	13,839	0	13,387	2.7%	2.6%
1-Jul-19	AWD 0.0 ML per Share	509,665	0	0	0.0%	0.0%	13,839	0	13,387	2.7%	2.6%
Regulated River (High Security)											
1-Jul-19	Opening	20,200			0.0%	0.0%	(1)	0	(1)	0.0%	0.0%
1-Jul-19	AWD 1.0 ML per Share	20,200	20,200	20,200	100.0%	100.0%	20,199	0	20,199	100.0%	100.0%
Regulated River (High Security)[Research]											
1-Jul-19	Opening	60			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 100.0 %	60	60	60	100.0%	100.0%	60	0	60	100.0%	100.0%
Supplementary Water											
1-Jul-19	Opening	181,397			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-19	AWD 1.0 ML per Share	181,397	181,398	181,398	100.0%	100.0%	181,398	0	181,398	100.0%	100.0%

## Note 1—Allocation accounts

This note is a reference for the volume held in the allocation accounts at the time of reporting and is also relevant for the various processes that 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. It represents that volume of water that can be carried forward to the next water year as dictated by the carryover rules in place for that year or required under the water sharing plan.

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

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

The accounting presented is relevant to licence category and is therefore inclusive of licences held by environmental holders (these are also detailed separately in Note 5).

### Data type

Derived from measured data

### Policy

*Water Sharing Plan for the Gwydir Regulated River Water Source 2016*

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A1—Nil inaccuracy +/- 0%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

WaterNSW/NSW Department of Planning, Industry 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 (AWD) (detailed in Note 2)
- allocation account usage (detailed in Note 3)
- over-order debits
- forfeiture due to:
  - no carryover being permitted (end-of-year forfeit)
  - allocation account limits
- licence conversion
- trade of allocation water between accounts (detailed in Note 4)
- carryover rules.

## Additional information

Table 11 summarises the water allocation accounts for each category of access licence. Table 10 describes each of the table components. All figures are in megalitres.

**Table 10: Explanatory information for allocation account summary**

Heading		Description
<b>Share</b>		This is the total volume of entitlement in the specific licence category.
<b>Opening balance</b>		The volume of water that has been carried forward from the previous year's allocation account
<b>AWD—available water determination</b>		The total annual volume of water added to the allocation account as a result of allocation assessments. This figure includes additional AWD made as a result of a storage spill reset as defined in the water sharing plan.
<b>Licences</b>	<b>New</b>	Increase in-account water as a result of issuing a new licence
	<b>Cancelled</b>	Decrease in account water as a result of a licence cancellation where account balance has not been traded to another licence
<b>Assignments</b>	<b>In</b>	Increase in account water as a result of temporary trade in
	<b>Out</b>	Decrease in account water as a result of temporary trade out
<b>Account usage</b>		Volume of water that is extracted or diverted from the river and is accountable against the access licence allocation
<b>Over-order debit</b>		Volume of water ordered that exceeded the recorded usage for the corresponding periods. In licence categories where water order debiting applies, any orders in excess of usage are accountable against the licence.
<b>Forfeits</b>	<b>During year</b>	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.
	<b>End-of-year forfeit</b>	Account water that is forfeited at the end of the water year as a result of carryover rules that restrict the carry forward volume
<b>End-of-year balance</b>	<b>Available</b>	Account balance that is available to be taken at the conclusion of the water year
	<b>Not available</b>	That part of the remaining account balance that is not available to be taken at the conclusion of the water year. This is water in accounts that is in excess of the annual take limit.
<b>Carry forward</b>		This represents the account water that is permitted to be carried forward into the next water year, as determined by the carryover rules.

Table 11: Allocation account balance summary (reporting period)

Category	Share	Opening balance	AWD	Licences		Assignments		Account usage	Over order debit	Forfeit During Year	End of year balance		End of year forfeit	Carry forward
				New	Cancelled	In	Out				Available	Not Available		
Domestic and Stock	2,506	(40)	2,506	0	0	0	0	1,355	10	0	1,101	0	1,115	(14)
Domestic and Stock [Domestic]	88	0	88	0	0	0	0	0	0	0	88	0	88	0
Domestic and Stock [Stock]	230	(2)	230	0	0	0	0	74	4	0	150	0	152	(2)
Local Water Utility	3,836	0	3,836	0	0	0	0	3,128	0	0	708	0	708	0
General Security	509,665	110,521	0	0	0	65,567	56,315	106,151	234	0	13,387	0	0	13,387
High Security	20,200	(9)	20,200	0	0	127	9,378	10,422	0	0	517	0	518	(1)
High Security (Research)	60	0	60	0	0	0	0	0	0	0	60	0	60	0
Supplementary Water	181,398	0	226,748	0	0	13,178	13,178	0	0	0	226,748	0	226,748	0



## Note 2—Available water determination (AWD) (allocation announcement)

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

### 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 Gwydir Regulated River Water Source 2016*

- Part 8—Limits to the availability of water
  - Division 1—Long-term extraction limit
  - Division 2—Available water determinations.

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A1—Nil inaccuracy +/- 0%

### Providing agency

NSW Department of Planning, Industry and Environment

### Methodology

In the Gwydir Regulated Water Source, available water determinations (AWDs) are calculated based on a concept of continuous accounting that assesses the water contained in the headwater storages, periodically updating projections and distributing the stored resource available. All projections are for two years from the date of the assessment. Under continuous accounting, the AWDs are based on the actual volume of water in storage at the time of the resource assessment. This does not account for sequences of future inflows.

The process firstly involves assessing effective storage, which is the available storage volume after storage losses are accounted for. Storage losses cannot be controlled by a management rule, so they must be provided for first. After this, existing commitments are taken into account. Next, any uncommitted water is first committed to essential supplies. Then it is added to the delivery loss account to target a volume equivalent to a maximum of 30% of the deliverable General Security volume and then to the ECA account. Any remaining uncommitted water is then shared in proportion to the amount of entitlement in the remaining resource categories.

The essential supplies mentioned above consist of items such as:

- Stock and Domestic requirements
- Local Water Utilities (for example, town water supplies, industrial use)

- High Security (permanent plantings such as orchards and vineyards)
- end-of-system flow requirement resulting from the system operation
- minimum storage releases.

The volume of water distributed to licence categories is expressed as either a volume per share or as a percentage of share component, depending on the category of licence. The following table details each licence category and how it is announced.

**Table 12: Access licence category announcement type**

Licence category	AWD priority
General Security	Volume per share
High Security	Volume per share
Domestic and Stock <sup>13</sup>	Per cent of share component
Local Water Utility	Per cent of share component

The AWD for Supplementary licence accounts is a separate process and is not dependent on the water asset available. It is made once at the start of the year and unless there is a management change because of the growth in use strategy, it is maintained at the maximum value prescribed in the plan, which is generally 1 megalitre per share (equivalent to 100% of entitlement). Therefore, it is not considered to create a liability on the system and is only considered in terms of an extraction that reduces the water asset.

## Additional information

Table 14 summarises allocations for the reporting period. Table 13 describes each component presented in the summary.

**Table 13: Allocation summary report notes**

Heading	Description
Date	Date that available water determination was announced and water was credited to accounts
Opening (ML)	Remaining allocation account balances at the conclusion of the previous season that is allowed to be carried forward to this season
Individual announcement	Actual available water determination announcement made to each licence category
Share component (entitlement)	Sum of the licensed volume of water within the licence category on the announcement date
Allocation volume (ML)	Volume of water credited to accounts within a licence category as a result of the announcement made
Cumulative volume (ML)	Cumulative total of the announced volumes for the water year and licence category
Allocation volume (%)	This is the announced volume expressed as a percentage of the share applicable on the particular date
Cumulative volume (%)	This is the cumulative volume expressed as a percentage of the entitlement applicable on the particular date
Balance available (ML)	Sum of water in allocation accounts that has been made available to be taken during the season
Balance not available (ML)	Water allocated that is not accessible at this point in time
Balance total (ML)	Sum of the total volume of account water in accounts
Balance available (%)	Balance available expressed as a percentage of the share component

<sup>13</sup> Domestic and Stock is further broken down into three sub categories: Domestic and Stock, Domestic and Stock (Domestic) and Domestic and Stock (Stock). For the purposes of this report and the general purpose water account they were all treated as Domestic and Stock.

Heading	Description
Balance total (%)	Total account balance expressed as a percentage of the share component.

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Table 14: Allocation announcements during the reporting period for Gwydir regulated river water source

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-18	Opening	2,506			0.0%	0.0%	(40)	0	(40)	(1.6)%	(1.6)%
1-Jul-18	AWD 100.0 %	2,506	2,506	2,506	100.0%	100.0%	2,466	0	2,466	98.4%	98.4%
Domestic and Stock[Domestic]											
1-Jul-18	Opening	88			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	88	88	88	100.0%	100.0%	88	0	88	100.0%	100.0%
Domestic and Stock[Stock]											
1-Jul-18	Opening	230			0.0%	0.0%	(2)	0	(2)	(1.0)%	(1.0)%
1-Jul-18	AWD 100.0 %	230	230	230	100.0%	100.0%	228	0	228	99.0%	99.0%
Local Water Utility											
1-Jul-18	Opening	3,836			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	3,836	3,836	3,836	100.0%	100.0%	3,836	0	3,836	100.0%	100.0%
Regulated River (General Security)											
1-Jul-18	Opening	509,665			0.0%	0.0%	110,766	0	110,521	21.7%	21.7%
1-Jul-18	AWD 0.0 ML per Share	509,665	0	0	0.0%	0.0%	110,766	0	110,521	21.7%	21.7%
Regulated River (High Security)											
1-Jul-18	Opening	20,200			0.0%	0.0%	(9)	0	(9)	0.0%	0.0%
1-Jul-18	AWD 1.0 ML per Share	20,200	20,200	20,200	100.0%	100.0%	20,191	0	20,191	100.0%	100.0%
Regulated River (High Security)[Research]											
1-Jul-18	Opening	60			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 100.0 %	60	60	60	100.0%	100.0%	60	0	60	100.0%	100.0%
Supplementary Water											
1-Jul-18	Opening	181,397			0.0%	0.0%	0	0	0	0.0%	0.0%
1-Jul-18	AWD 1.25 ML per Share	181,397	226,748	226,748	125.0%	125.0%	226,748	0	226,748	125.0%	125.0%

## Note 3—Allocation account usage

This is the volume of water that is extracted, diverted or measured as usage and is accountable against an access licence. This figure excludes that water accounted as over-order debit, which is accounted for separately (see Note 21).

### Data type

Measured/administration data

### Policy

Not applicable

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

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

### Methodology

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

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

- Based on periods of announcement—during periods of supplementary water announcements, extractions can be debited against the Supplementary water licences
- Usage is based on water orders—users place orders for water against an access licence and usages are debited against accounts in proportion to the orders placed.
- Licence category apportionment—if no water orders are available, water extracted is apportioned against categories of access licence in order of priority as set out in the next table. The ranking is based on the nature of and rules of each of the licence categories.

Table 15 shows the order in which extractions are apportioned to access licence categories, starting at priority 1. This is a generic list where not all categories will necessarily appear in this GPWAR. There are also various sub-categories of licence associated with some of these.

**Table 15: Licence category metered usage apportionment table**

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

### Additional information

Table 16 summarises account usage by licence category for the reporting period.

**Table 16: Account usage summary**

Licence category	Account usage (ML)
Domestic and Stock	1,355
Domestic and Stock [Domestic]	0
Domestic and Stock [Stock]	74
Local Water Utility	3,128
General Security	106,151
High Security	10,422
High Security (Research)	0
Supplementary	0
<b>Total Account Usage</b>	<b>121,130</b>

## Note 4—Internal trading (allocation assignments)

This represents the temporary trading (allocation assignments) of water between allocation accounts within the Gwydir Regulated 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 Gwydir Regulated River Water Source 2016*

- Part 10 Access licence dealing rules
  - Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A1—Nil inaccuracy +/- 0%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

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

### 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 17 presents the internal trading figures between licence categories. All figures represent a volume in megalitres.

**Table 17: Gwydir allocation assignments summary**

From	To General Security	To High Security	To Supplementary Water	Total
<b>General Security</b>	56,315.3			<b>56,315.3</b>
<b>High Security</b>	9,251.4	126.9		<b>9,378.3</b>
<b>Supplementary Water</b>			13,178.2	<b>13,178.2</b>
<b>Total</b>	<b>65,566.7</b>	<b>126.9</b>	<b>13,178.2</b>	<b>78,871.8</b>

## Note 5—Held environmental water

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

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

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

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

### Data type

Measured

### Policy

*Water Sharing Plan for the Gwydir Regulated River Water Source 2016*

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

WaterNSW/NSW Department of Planning, Industry and Environment—Water Accounting System (Joint ownership)

Available Water Determination Register—NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://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



- excess orders (where water order debiting is in place)
- licence conversion
- 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 19 summarises held environmental water for the reporting period. Table 18 explains the components. Table 20 summarises changes to the environmental portfolio since the previous reporting period. Table 21 provides environmental allocation movement through temporary allocation assignments.

**Table 18: Explanatory information for environmental account summary**

Heading		Description
No. Licences		This is the number of environmental licences held.
Category		Licence category issued under the water sharing plan
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 the previous year's allocation account
AWD—available water determination		The total annual volume of water added to the allocation account as a result of allocation assessments
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 or diverted or used and is accountable against the licence
End-of-year balance	Available	Account balance that is available to be taken at the conclusion of the water year
	Not available	Account balance that is currently not available for use (e.g. restricted due to drought conditions or annual use limit restrictions)
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 19: Gwydir environmental regulated river account summary <sup>14</sup>

Category	Share 30 June 2019	Opening balance	AWD	Assignments		Account usage	End-of-year balance		End-of- year forfeit	Carry forward
				In	Out		Available	Not Available		
General Security	106,617	70,884	0	47,856	45,599	61,550	11,591	0	0	11,591
High Security	5,757	0	5,757	0	5,757	0	0	0	0	0
Supplementary water	23,591	0	29,489	0	0	0	29,489	0	29,489	0

Table 20: Annual change summary for Gwydir regulated river environmental licences

Category	Volume 30 June 2018	Volume 30 June 2019	Volume difference	No. Licences 30 June 2018	No. Licences 30 June 2019	No. Licence Difference
General Security	106,617.0	106,617.0	0.0	8	8	0
High Security	5,757.0	5,757.0	0.0	4	4	0
Supplementary water	23,591.2	23,591.2	0.0	4	4	0

<sup>14</sup> The account balance summary includes only those licences where the registered holder is either state or federal government agencies and the licence is wholly managed for environmental benefit.

Table 21: Environmental allocation assignment summary<sup>15</sup>

Movement of water via allocation assignments between consumptive and environmental users			To		Total
			Consumptive	Enviro	
			General security	General security	
From	Enviro	General security	2,900	42,699	45,599
	Enviro	High Security		5,757	5,757
<b>Total</b>			<b>2,900</b>	<b>48,456</b>	<b>51,356</b>

<sup>15</sup> The environmental allocation assignment summary is modified to obtain actual movement between the environmental and consumptive pools, alternating the intended purpose of use for that traded allocation. Transfers to non-environmental holders for the purposes of delivering environmental water are therefore considered as environmental to environmental in this report.

## Note 6—Environmental provisions

There are several planned environmental provisions within the regulated Gwydir water source that are implemented under the water sharing plan. These provisions aim to enhance environmental benefits.

**A minimum flow requirement through to the Gwydir Wetlands:** The flow aims to maintain wetland health by maintaining a minimum flow into the Gwydir Wetlands of up to 500 megalitres per day.

**An environmental contingency allowance (ECA):** Water is put aside in Copeton storage that can be called upon to achieve environmental benefits such as supporting bird breeding events, supporting native fish colonies and maintaining general river ecosystem health. The amount of water that may be credited to the ECA account is determined based on the available water determinations for General Security licence holders, up to a maximum of 90,000 megalitres. Utilisation of the ECA is managed by the Department of Industry, Planning and Environment – Environment, Energy and Science (former New South Wales Office of Environment and Heritage).

**Long-term extraction limit:** By limiting long-term average extractions to an estimated 392,000 megalitres per year, this plan ensures that approximately 66% of the long-term average annual flow in the water source (estimated to be 1,141,000 megalitres per year) will be preserved and will contribute to the maintenance of basic ecosystem health.

**Supplementary access restrictions:** During periods of supplementary flow, water made available for consumptive use is restricted to a maximum volume of 50% of the water in excess of requirements, with the remaining 50% being reserved for environmental benefit. For more detail on supplementary water announcements and extractions, refer to Note 18.

### Data type

Measured

### Policy

*Water Sharing Plan for the Gwydir Regulated River Water Source 2016*

- Part 3 Environmental Water Provisions
- Clause 13 and 14 Planned Environmental Water

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A1—Nil inaccuracy +/- 0%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

WaterNSW/NSW Department of Planning, Industry and Environment—Water Accounting System (Joint ownership)

WaterNSW annual compliance report (internal document)

### Methodology

The minimum flow required to pass to the Gwydir Wetlands is calculated by assessing the total volume of water entering the Gwydir River from the Horton River, Myall Creek and Hall's

Creek and any water spilling or being pre-released from Copeton Dam against the Yarraman gauge on the Gwydir. The volume assessed up to a maximum of 500 megalitres per day is required to be passed through to Gwydir wetlands being split 50/50 between Gingham and Lower Gwydir. It is however acknowledged that at times when other system requirements are minimal, natural attenuation of flows may mean that the required minimum flows are not achieved. The system operational requirements are indicated in Figure 24 by the total orders at Copeton Dam.

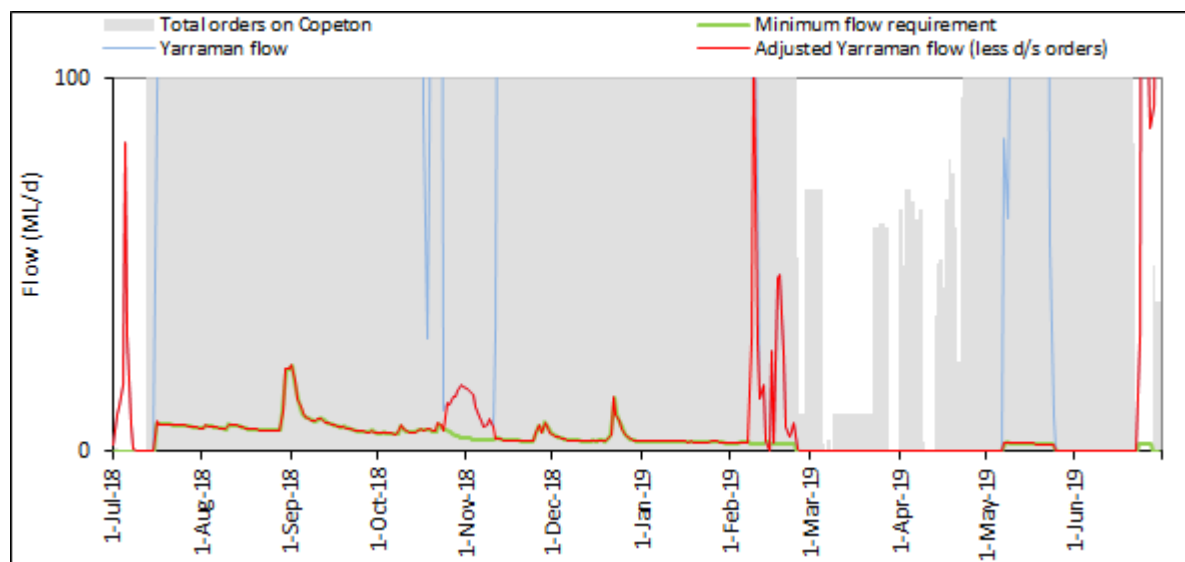
### Additional information

Annual accounting information for the ECA is presented in Table 22. Performance of the minimum flow requirement is provided in Figure 30.

**Table 22: Summary of ECA account balance<sup>16</sup>**

Water year	Water credited	Usage	Balance
2009–10	0	0	17,305
2010–11	37,287	5,000	49,610
2011–12	56,890	16,500	90,000
2012–13	2,320	3,074	89,246
2013–14	89,246	1,000	88,246
2014–15	88,246	29,895	58,370
2015–16	2,400	4,750	56,020
2016–17	35,398	21,010	70,408
2017–18	7,922	3,000	75,330
2018–19	0	52,000	23,330

**Figure 30: Plot of minimum flow targets at Yarraman**



<sup>16</sup> The ECA balance is held to 4 significant figures only

## Note 7—Surface water storage

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

### Data type

Derived from measured data

### Policy

Not applicable

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

Lands and Water

### Data source

NSW Department of Planning, Industry and Environment—HYDSTRA

### Methodology

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

### Additional information

**Table 23: Capacity and dead storage summary table**

Name	Capacity (ML)	Dead storage (ML)
Copeton Dam	1,361,720	18,490

## Note 8—River channel storage

This is 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, Industry and Environment

### Data sources

NSW Department of Planning, Industry 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 24: 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/d
V	Volume in each river section	Calculated	ML
T	Average travel time for a parcel of water to travel through the river section	CAIRO	days

### Assumptions and approximations:

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

## Note 9—Storage inflow—Copeton

Storage inflow refers to the volume of water flowing into the major headwater storage, Copeton Dam.

### Policy

Not applicable

### Data type

Derived from measured data

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

NSW Department of Planning, Industry and Environment: HYDSTRA, SILO (Queensland Government climatic information)

### Methodology

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

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

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

**Table 25: Components for back-calculation of inflow**

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

### Assumptions and approximations:

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



## Note 10—Storage evaporation and storage rainfall

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

### Data type

Derived from measured data

### Policy

Not applicable

### Data accuracy

B—Estimated in the range +/- 25%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

NSW Department of Planning, Industry and Environment—HYDSTRA, SILO (Queensland Government climatic information)

### Methodology

Daily rainfall and Mortons shallow lake evaporation data (accessed via SILO) are applied to storage surface area time-series from HYDSTRA to achieve a volume in megalitres that is then aggregated to an annual figure. The rainfall and evaporation data used is equivalent to the data used in the storage inflow back-calculation (Note 9)

#### Rainfall:

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

#### Evaporation:

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

**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	Ha
E	Evaporation (Mortons shallow lake estimation, SILO)	mm/day

## Note 11—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, Industry and Environment

### Data source

NSW Department of Planning, Industry 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 a daily time-series of 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.

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

In the formula, 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 a volume in megalitres that 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 27: 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 <sup>2</sup>
ETO	Reference evapotranspiration from SILO	mm/day
Kc	Crop coefficient for open water (1.05)	-

## Note 12—Gauged tributary inflow

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

### Policy

Not applicable

### Data type

Measured data

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

NSW Department of Planning, Industry and Environment: 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.

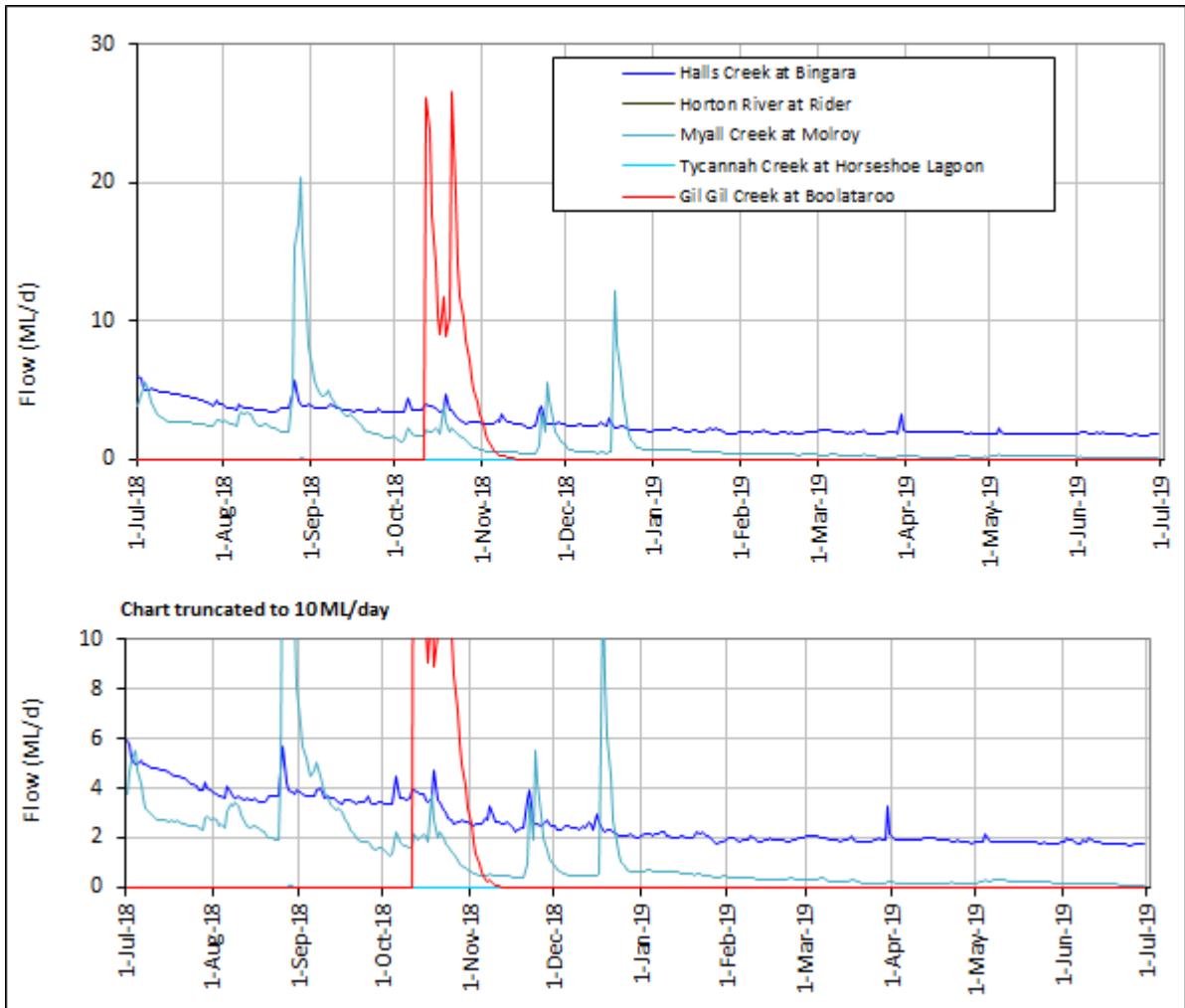
### Additional information

The total gauged inflow for the reporting period is the sum of the inflows for the gauged tributaries defined in Table 28. A plot of the daily gauged tributary inflows is provided in Figure 31.

**Table 28: Summary of gauged tributary inflow (annual volume in megalitres)**

Station	Station name	Catchment area (km <sup>2</sup> )	Inflow (ml)
418025	Halls Creek at Bingara	156	971
418015	Horton River at Rider	1,970	0
418017	Myall Creek at Molroy	842	534
418032	Tycannah Creek at Horseshoe Lagoon	866	0
416054	Gil Gil Creek at Boolataroo	0	256
<b>Total Gauged Inflow</b>			<b>1,761</b>

Figure 31: Gauged tributary Inflow



## Note 13—Ungauged runoff estimate

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

### Policy

Not applicable

### Data type

Estimated

### Data accuracy

C—Estimated in the range +/- 50%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

NSW Department of Planning, Industry and Environment, HYDSTRA

### Methodology

To derive an estimate, a simple mass balance approach was adopted whereby known inflows and outflows were combined with an assumed loss factor. No estimate was made for the areas below the Pallamallawa on the Gwydir River (assumed negligible except for heavy storm events).

$$UI = EoS - SR - GI + E + LE$$

Where:

UI = Ungauged inflow estimate

EoS = Gauged flow at the point in the system where no further inflow is estimated downstream for the purposes of this ungauged calculation (Pallamallawa).

SR<sub>k</sub> = Copeton storage release

GI = Gauged inflows (Copeton to Pallamallawa)

E = Extractions (Copeton to Pallamallawa)

LE = Estimated losses. This was assumed to be 10% of the measured (gauged flow plus storage releases) entering the system.

### Additional information

Table 29 summarises ungauged inflow estimates for the reporting period and prior years.

**Table 29: Summary of Gwydir ungauged inflow estimates**

Catchment	Total volume estimated (ML)
2013-14	49,000
2014-15	52,000
2015-16	65,000
2016-17	196,000
2017-18	120,000
2018-19	2,000

## Note 14—Dam releases, river inflow from dam releases

This the volume of water released from Copeton Dam. In the accounting process, this release is represented as both a decrease in asset (of the dam) and an equal increase in asset (of the river).

### Policy

Not applicable

### Data type

Measured data

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data sources

NSW Department of Planning, Industry and Environment: HYDSTRA

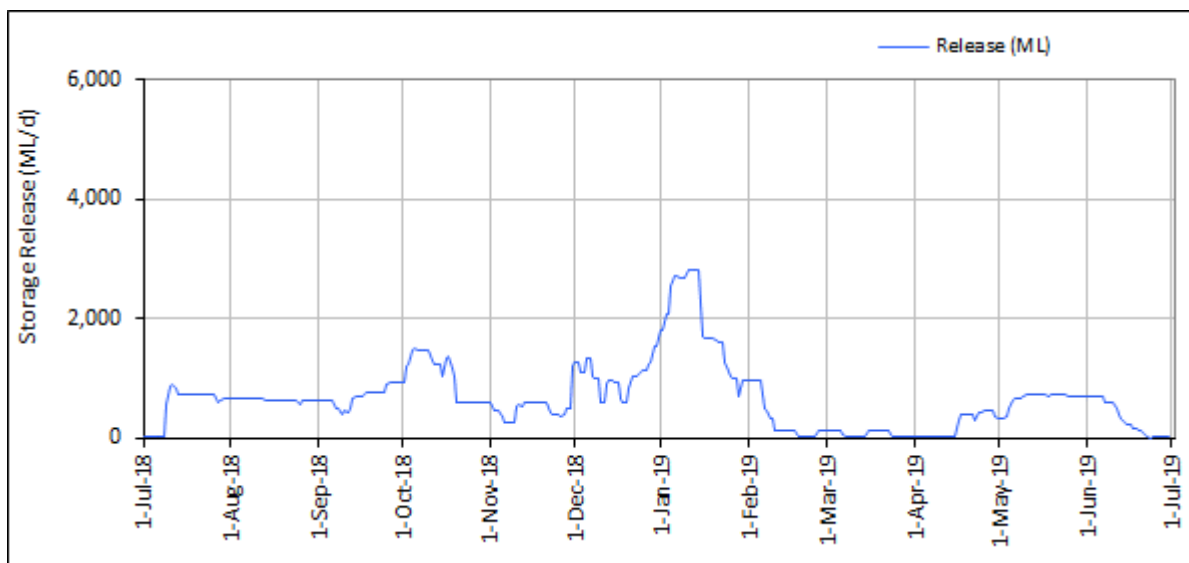
### Methodology

The flows are obtained by measuring river heights at a gauging station downstream of the dam wall, and then passing these heights through a rating table that converts them to a daily flow volume. The releases have been represented in the Statement of Changes in Water Assets and Water Liabilities as both a decrease in water asset (water leaving the dam) and an equal volume of increase in water asset (water released increasing the volume of the river).

### Additional information

Figure 32 provides daily releases from Copeton storage for the reporting period.

**Figure 32: Copeton Dam releases**



## Note 15—End-of-system flow/flow to wetlands/replenishments

This refers to flow that leaves the entity and does not return to the entity. The flow has been separated into delivered replenishment flows that are delivered as a requirement of the water sharing plan and other end-of-system flows. The *flow to wetlands* line item (effectively an end-of-system flow for accounting purposes) is an estimate of the total amount of water that entered the Gwydir wetlands.

Under the conditions of the water sharing plan, water must be put aside in Copeton dam to deliver, as required, replenishment flows of up to 21,000 megalitres, broken down into five specific areas as detailed below:

- 6,000 megalitres per year to the Gingham Watercourse—this is no longer required due to the completion of the lower Gingham Domestic Water Supply Scheme in April 2011
- 4,000 megalitres per water year to the lower Gwydir system—this is no longer required due to the completion of the lower Gingham Domestic Water Supply Scheme in June 2013
- up to 6,000 megalitres per water year to Mallowa Creek
- up to 4,000 megalitres per water year to Thalaba Creek
- up to 1,000 megalitres per water year to Ballin Boora Creek.

### Data type

Derived from measured data

### Policy

*Water Sharing Plan for the Gwydir Regulated River Water Source 2016*

- Part 12 System operation rules
- Clause 58 Replenishment flows

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

NSW Department of Planning, Industry and Environment—HYDSTRA, WaterNSW annual compliance report (internal document)

### Methodology

End-of-system flows are derived by the summation of flows at gauging site/s measuring the volume of water that leaves the accounting extent (Figure 1). Replenishments flows are obtained from the annual WaterNSW compliance reports.

Flows to the Gwydir wetlands are estimated by summing flows leaving Tyreel weir (which is passed to both to the lower Gwydir River and Gingham watercourse), and then subtracting



any non-environmental usage from these reaches below Tyreel weir. The remaining volume is assumed to be the amount that was supplied to the Gwydir wetlands.

### Additional Information

A summary of the calculation to determine the inflow to wetlands line item is presented in Table 30. Total end-of-system flows for the reporting period are summarised in Table 31. End-of-system outflows, excluding the flow to wetlands, are illustrated in Figure 33.

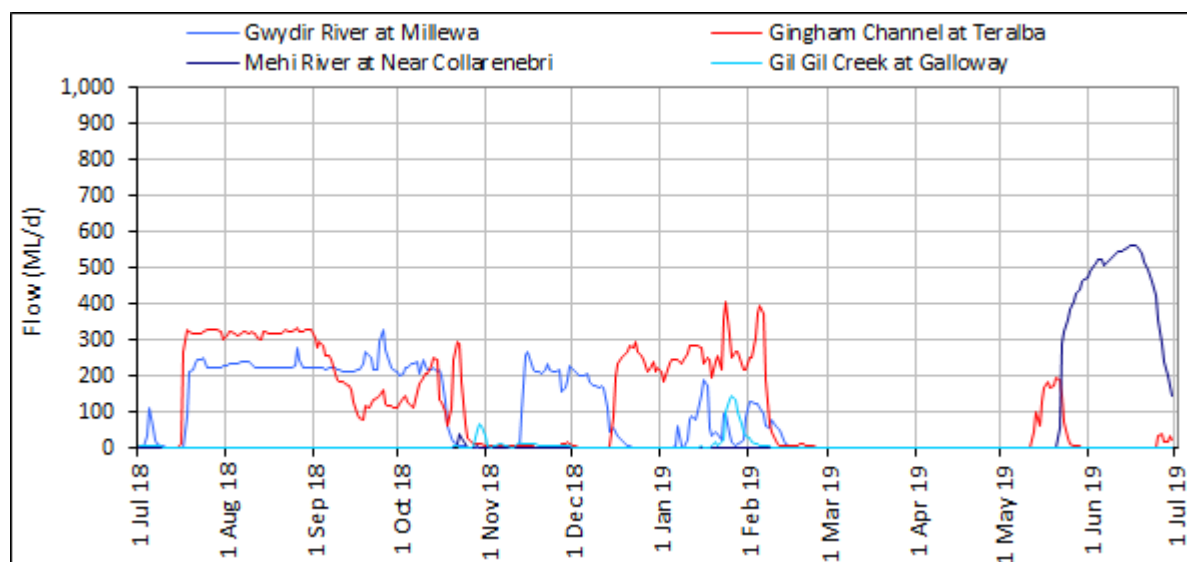
**Table 30: Calculation of Gwydir flow to wetlands**

Component	Volume (ML)
Gingham watercourse diversion from Tyreel Weir <i>minus</i>	40,175
Consumptive usage from Gingham watercourse below Tyreel Weir <i>plus</i>	97
Gwydir River release from Tyreel Weir <i>minus</i>	38,166
Consumptive usage from Gwydir River below Tyreel Weir <i>minus</i>	9,915
<b>Total volume estimate flow delivered to the Gwydir wetlands</b>	<b>68,329</b>
Replenishment component of flow to wetlands	0 <sup>17</sup>

**Table 31: End-of-system flow summary**

Station	Volume (ML)	Accounting component
Mehi River near Collarenebri	18,124	End of system: other
Gil Gil Creek at Galloway	1,549	End of system: other
Replenishment outflows	2,135	End of system: replenishment
<b>Total end of system flow</b>	<b>21,808</b>	

**Figure 33: Gwydir end of system (excludes flow to wetlands)**



<sup>17</sup> Replenishment supplies to the Lower Gwydir and Gingham are no longer supplied from open channel deliveries due to completion of the domestic and stock supply pipeline scheme

## Note 16—Extractions from river

This is the actual volume of water directly pumped or diverted from the regulated river by licence holders.

Occasionally (generally in the case of environmental water) volumes are ordered against a licence account for in-stream benefits or to pass through end-of-system target points. As such, the volume reported to be physically extracted from the accounted river extent will not always be equal to the amount of water debited against accounts for usage, which has been described in Note 3. The figure stated for extractions from river excludes basic rights extractions, which is reported as a separate line item and detailed in Note 17.

### Data type

Measured data

### Policy

Not applicable

### Data accuracy

A—Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

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

NSW Department of Planning, Industry 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 licenced account water that can be identified as being used within the system or ordered to be passed through the system. These volumes are generally associated with environmental water orders and have already been accounted for separately in other line items.

### Additional information

Table 32 reconciles estimated extractions from the river compared to total account usage.

**Table 32: Reconciliation of physical extraction to account usage**

Component	Volume (ML)
Licensed extractions from river <sup>18</sup>	59,580
plus	
Licensed flow leaving system <sup>19</sup>	61,550
plus	
In-stream licenced usage <sup>20</sup>	0
equals	
Total allocation account usage <sup>21</sup>	121,130

<sup>18</sup> Direct licensed extractions from the river excluding basic rights usage estimate

<sup>19</sup> Licensed water ordered to leave the accounted Gwydir extent for environmental benefits

<sup>20</sup> Water ordered and used within the accounted system for environmental benefit (not extracted from the river)

<sup>21</sup> The total amount of water accounted for usage against the allocation accounts

## Note 17—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 Gwydir Regulated River Water Source 2016*

- Part 4 Basic Landholder Rights
  - Clause 17 Domestic and stock rights

Available on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

C—Estimated in the range +/- 50%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

*Water Sharing Plan for the Gwydir Regulated River Water Source 2016*

### 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 Gwydir Regulated River Water Source 2016* (6,000 megalitres)

## Note 18—Supplementary extractions

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

### Data type

Measured data

### Policy

*Water Sharing Plan for the Gwydir Regulated River Water Source 2016*

- Part 8 Limits to the availability of water
  - Division 2—Available water determinations
    - Clause 38 Available water determinations for supplementary water access licences
- Part 9 Rules for managing access licences
  - Division 3—Extraction conditions
    - Clause 47 Taking of water under supplementary water access licences

Refer to applicable Water Sharing Plan on the NSW Department of Planning, Industry and Environment website at [www.industry.nsw.gov.au/water](http://www.industry.nsw.gov.au/water)

### Data accuracy

Estimated in the range +/- 10%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

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

### Methodology

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

The total volume of water that may be made available for extraction under supplementary water access licences in the Gwydir Regulated River Water Source should not exceed 50%

of the total supplementary volume available to share (remaining 50% reserved for environmental benefits).

### Additional information

There were no supplementary announcements in the reporting period

## Note 19—Unaccounted difference

In theory, if all the processes of a water balance could be accurately accounted for, the unaccounted difference would be zero. In reality, because of uncertainty about many of the volumes presented in the accounts, the variety of data sources, and not all processes of the water cycle being accounted for, the statements are not balanced at the end of the accounting process. To balance the accounts, a final balancing entry is required, and this is termed the unaccounted difference. As technology improves the accuracy of the account estimates, we anticipate that, relatively, this figure should be lower in future accounts.

### Data type

Not applicable

### Policy

Not applicable

### Data accuracy

D—Estimated in the range +/- 100%

### Providing agency

Not applicable

### Data source

Not applicable

### Methodology

The unaccounted difference is equal to the amount needed to get the correct volume in river at the end of the reporting period, after all the known physical inflows and outflows have been accounted for. The double-entry accounting process attempts 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 8.

Surface Water Unaccounted difference

$$UVSW = Rs - Rc + RI - Ro$$

Where:

UVSW = Unaccounted difference for Surface Water

Rs = Opening river volume estimate

Rc = Closing river volume estimate

Ro = Physical outflows from the river (for example, extractions)

RI = Physical inflows to the river (for example, runoff, return flows, dam releases)

### Additional information

The unaccounted difference as a percentage of inflow to the river (above Pallamallawa) for the reporting period and prior years is presented in Table 33.

**Table 33: Summary of unaccounted difference**

Water year	Unaccounted difference (ML)	Total river inflow above Pallamallawa (ML) <sup>22</sup>	% of inflow
2013–14	67,972	596,174	11%
2014–15	5,701	286,579	2%
2015–16	4,958	169,590	3%
2016–17	51,699	480,322	11%
2017–18	77,340	436,950	18%
2018–19	2,352	243,453	1%

<sup>22</sup> Copeton releases plus system inflows from Halls Creek, Horton River and Myall Creek



## Note 20—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).

### Data type

Modelled

### Policy

Not applicable

### Data accuracy

D—Estimated in the range +/- 100%

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

NSW Department of Planning, Industry and Environment—MODFLOW (Data inputs from HYDSTRA, GDS)

### Methodology

For the lower Gwydir groundwater source, the annual budget has been estimated using a NSW Department of Planning, Industry and Environment MODFLOW planning model (see Method A in the document NSW General Purpose Water Accounting Reports—Groundwater Methodologies, available for download from the NSW Department of Planning, Industry and Environment website).

No estimates were made for interactions with the river outside the area covered by the lower Gwydir groundwater source.

### Additional information

Groundwater modelling information on river fluxes for 2018–19 was unavailable at the time of publication and has not been quantified for the reporting period. The process therefore forms a component of the stated unaccounted difference within the physical flow balance of the river. Figures will be updated retrospectively in future releases of the GPWAR.

## Note 21—Water order debiting

In the Gwydir regulated water source the allocation accounts are currently managed using a water order debiting approach. Accounting under this system defines that the accounts are reduced by the greater of the volume of water:

- extracted
- ordered for extraction against an access licence.

Therefore, the volume appearing in statements against the line item 'water order debiting' reflects the amount of water ordered against a category of licence that is in excess of the physical extraction that occurred.

### Data type

Measured/calculated

### Policy

*Water Sharing Plan for the Gwydir Regulated River Water Source 2016*

- Part 9—Rules for managing access licences.
  - Division 2—Water allocation account management.
    - Clause 42—Volume taken under access licences.

Available on the NSW Department of Planning, Industry and Environment website at <https://www.industry.nsw.gov.au/water>

### Data accuracy

Estimated in the range +/- 10%.

### Providing agency

NSW Department of Planning, Industry and Environment

### Data source

WaterNSW/NSW Department of Planning, Industry and Environment—Water accounting system (joint ownership)

### Methodology

Over-order debiting is a required component of balancing the allocation accounts detailed in Note 1. The over-order debit component is calculated by analysing the recorded extractions against orders for the corresponding measurement period. That is, if metered usage is collected monthly, then the corresponding monthly orders are compared and any orders that are in excess the usage are recorded as over-order debit.

## Note 22—Adjusting entry

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, we need to correct accounts for a variety of reasons including when we have identified an error in the previous year's reporting, a balance in the previous year has since been adjusted, or when a process that had previously been reported cannot 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

NSW Department of Planning, Industry and Environment

### Data source

Not applicable

### Methodology

A journal entry is placed in the comparative year to ensure correct opening balances are achieved in the reporting year. No adjusting entries were needed for the reporting period.

## References

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