

# Macquarie- Cudgegong Operations Plan

February 2019

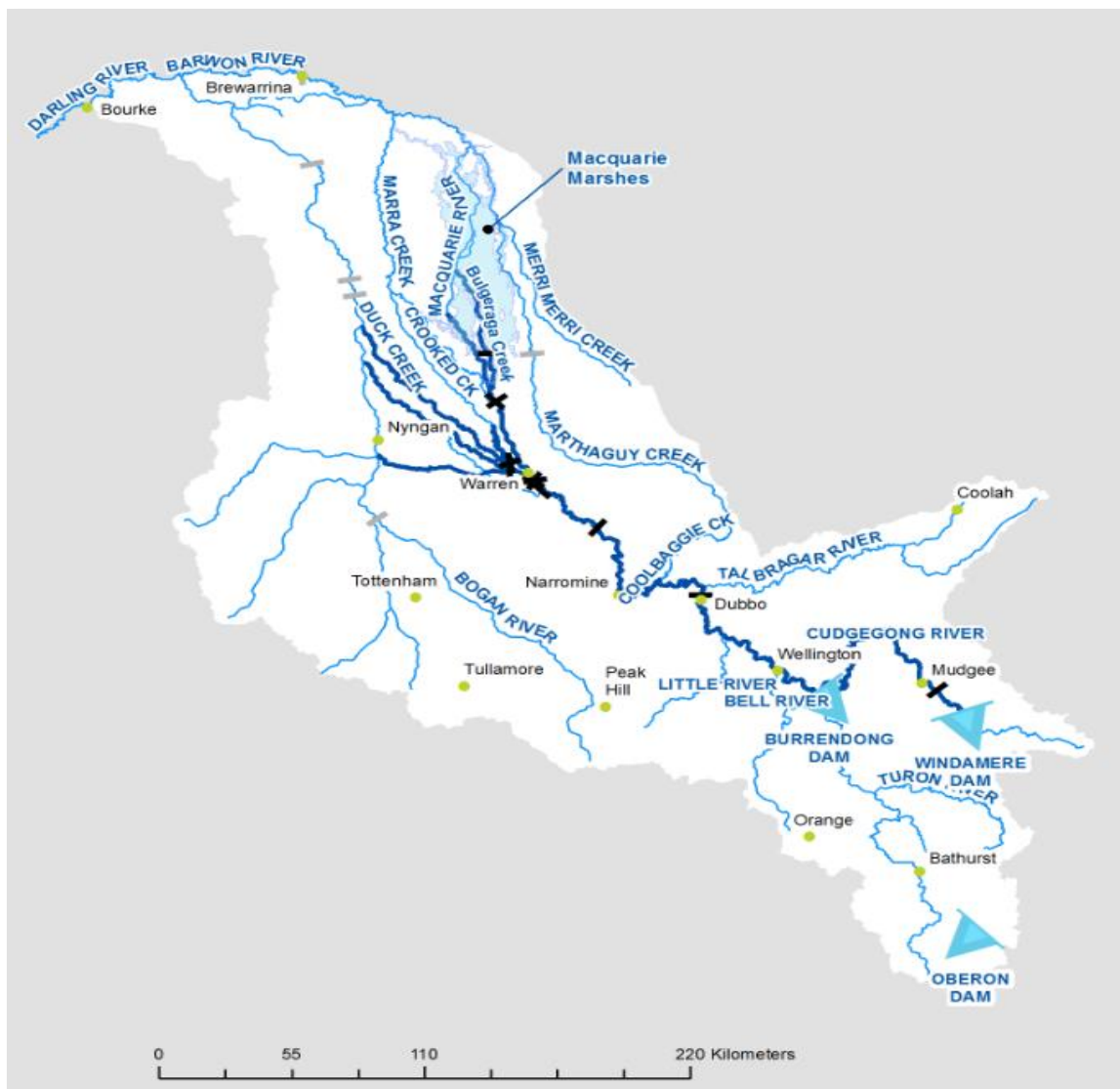
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## 1. Highlights

- Customer's drought planning has seen significant carryover into this year; 316 GL, equivalent to 52% of share component in the Macquarie Valley, and 20 GL or 102% of share component in the Cudgegong Valley.
- The actual inflows to Burrendong Dam since the last AWD in August 2017 total about 76 GL. This is only 33% of the previous record low inflow of about 228 GL for the 18 months ending in January 2019.
- The drier than historic inflows confirms that the system is currently experiencing a new drought of record for Burrendong Dam.
- The delivery of water in accounts relies on stored water, minimum forecasted inflows and planned bulk water transfer from Windamere to Burrendong Dam. Therefore, with the current low inflows not all carryover water in the accounts can be delivered.
- Access to general security and planned environmental water accounts has been reduced by DoI Water to 70% of the 1 July 2018 carryover balance.
- As inflows are received during the year, subject to meeting high priority commitments such as town water supply and basic landholder rights for 2019-20, the amount of water in the drought reserve may be reduced and be made available to customers.
- Under the temporary water restriction order it is planned to deliver about 222 GL of general security irrigation and environmental water, 53 GL of active environmental water allowance (EWA) and 35 GL of translucent EWA in 2018-19.
- First phase of the Bulk Water Transfer (BWT) from Windamere to Burrendong Dam has commenced on 1<sup>st</sup> January 2019 and ceased on 25<sup>th</sup> January. A total of around 10 GL was transferred in first phase.
- Recent rain has produced an inflow of about 26,000 ML into Burrendong Dam in January. The combination of Windamere releases and Burrendong inflows has resulted in Burrendong Dam being higher than previously forecast for this stage of the drought planning.
- A second phase of the transfer may occur later in 2019 if the dry conditions persist.
- Delivery of environmental water commenced at Burrendong Dam on 12 July 2018 and has finished on 11 Dec 2018 with a total delivery of 127 GL of licenced and planned environmental water to the Macquarie Marshes.
- Stock & Domestic (S & D) replenishment flows to the Marra Creek and Lower Bogan River have been completed in April to June 2018.
- The S&D flow requirements in the lower Macquarie River have been met by the environmental water draining out of Macquarie Marshes.

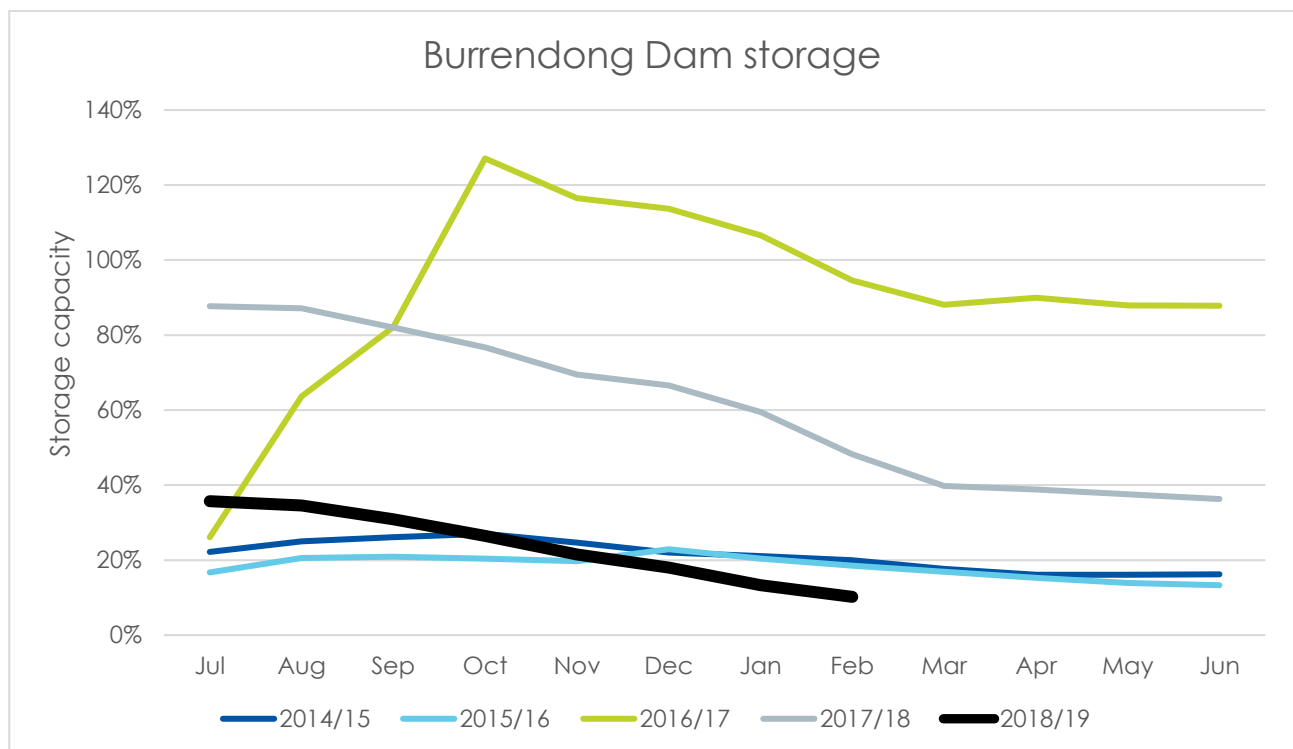
- Under dry conditions, the timing of all S&D replenishment deliveries in 2019 will depend on rainfall and inflows to the dam and flows in the downstream tributaries.
- Water conservation initiatives have been implemented to reduce losses during deliveries of allocations in 2018-19. Operational surplus to end of Jan 2019 is just over 1,500 ML compared to 18,001 ML of operational surplus for the same period in last water year.



## 2. Dam storage

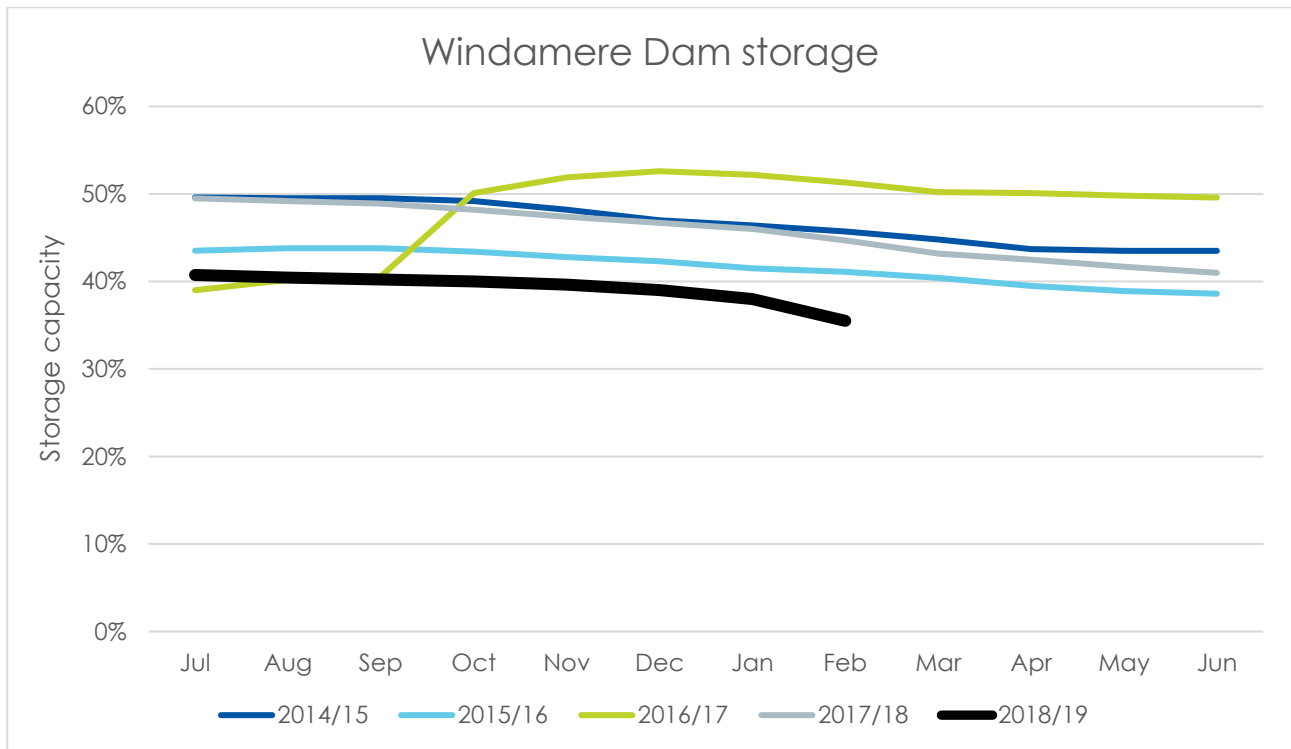
### 2.1 Burrendong Dam storage

The below figure shows the Burrendong Dam behaviour for the 2018-19 water year compared to the last four water years. The dam was around 36% full at the start of July 2018 and by the end of January 2019 was only about 10% full. No significant inflows have been recorded at the dam over the last year and the trend continues into the current year. Therefore, the below graph indicates a continuous decreasing storage level over the last 19 months.



### 2.2 Windamere Dam storage

The below figure shows the Windamere Dam behaviour for the 2018-19 water year compared to the last four water years. The dam was around 41% full at the start of July 2018 and by the end of January 2019, was only 36% full. No significant inflow has arrived at the dam over the last water year and the trend continues into the current year. Therefore, the below graph indicates a continuous decreasing storage volume over the last 18 months.



## 3. Supplementary access

### 3.1 Commentary

There have not been any supplementary events in the Macquarie-Cudgegong since the start of the 2018-19 water year.

### 3.2 Explanation

In the Macquarie regulated river extraction of water under the supplementary water access licences is only permitted when flows at Warren gauge (421004) are greater than 5000 ML/day, more than requirements (e.g. environmental & irrigation water order, S&D order, higher priority access license and any replenishment flows). Access to supplementary water access licences is from unregulated flows and not from water released from the dam when it is below full supply level.

## 4. Water availability

### 4.1 2018/2019 water availability for Macquarie

This information was current at 1 February 2019.

Licence category	Share component	Carryover in	AWD volume	Allocation assignments in	Allocation assignments out	Usage	Balance (Includes Drought suspended account)
Domestic and stock	4,291	0	4,291	0	0	856	3,435
Domestic and stock (domestic)	794	0	794	0	0	21	772
Domestic and stock (stock)	170	0	170	0	0	35	135
Local water utility	16,205	0	16,205	0	0	7,547	8,658
Regulated river (general security - irrigation)	439,775	204,455	0	54,336	43,209	120,751	91,185
Regulated river (general security - environment)	173,532	111,979	0	78,867	80,257	75,405	32,717
Regulated river (high security)	8,416	0	8,416	79	704	4,446	3,345
Regulated river (high security - research)	4,044	0	4,044	0		2,548	1,496
Regulated river (high security-town water supply)	40	0	40	0	0	0	40
Supplementary water	48,708	0	48,708	8,292	8,292	0	48,708
<b>Total</b>	<b>695,975</b>	<b>316,434</b>	<b>82,668</b>	<b>141,574</b>	<b>132,462</b>	<b>211,609</b>	<b>190,491</b>

Note: all the values are in ML

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**General security available water determination**


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Date	AWD (ML/share)	Total
01/07/2018	0	52%

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A total of 316,434 ML of General Security (GS) water has been carried over into 2018-19, which is equivalent to 52% of GS share component. Of the 316,434 ML, GS Irrigation carryover is 204,455 ML and GS License Environment carryover is 111,979 ML.

As in the past years, GS water allocations have been traded in between Macquarie and Cudgegong community. To end of January 2019 a total of 9,112 ML (Net Trade) of water has been traded in to the Macquarie.

In the current water year (2018-19), 0% AWD (Available water determination) has been announced on 1<sup>st</sup> July 2018 for GS. For other water users (e.g. High Security and Town Water Supply), the announced AWD is 100%.

The sum of account balance in the table refers to the amount of water remaining in accounts as of 31 January 2018 after trade and use. For example, Local Water Utility has 8,658 ML of water in their account, they have used 7,547 ML of their initial 16,205 ML of water in this current water year.

Carryover evaporation reduction was applied on unsuspended (70%) carryover balances in HS and GS sub accounts in Macquarie and on carryover balances in Cudgegong Rivers for second quarter of 2018-19. A 4.2% reduction applied on Macquarie River and a 1.5% reduction was applied on Cudgegong River. Carryover balances in EWA account also incurred a 4.2% reduction.

Total GS water usage (to end of January) is 196,156 ML of which 75,405 ML is GS licensed environmental usage and 120,751 ML is GS Irrigation usage.



## 4.2 2018/2019 water availability for Cudgegong

This information was current as 1 February 2019.

Licence category	Share component	Carryover in	AWD volume	Allocation assignments in	Allocation assignments out	Usage	Balance
Domestic and stock	672	0	672	0	0	261	411
Domestic and stock (domestic)	19	0	19	0	0	0	19
Domestic and stock (stock)	15	0	15	0	0	0	15
Local water utility	2,600	0	2,600	0	0	1,320	1,280
Regulated river (general security)	19,159	19,581	0	615	5,329	1,695	12,835
Regulated river (high security)	5,412	0	5,412	90	4,488	379	635
Regulated river (high security - research)	1	0	1	0	0	0	1
Supplementary water	1,290	0	1,290	0	0	0	1,290
<b>Grand total</b>	<b>29,168</b>	<b>19,581</b>	<b>10,009</b>	<b>705</b>	<b>9,817</b>	<b>3,655</b>	<b>16,486</b>

Note: all the values are in ML

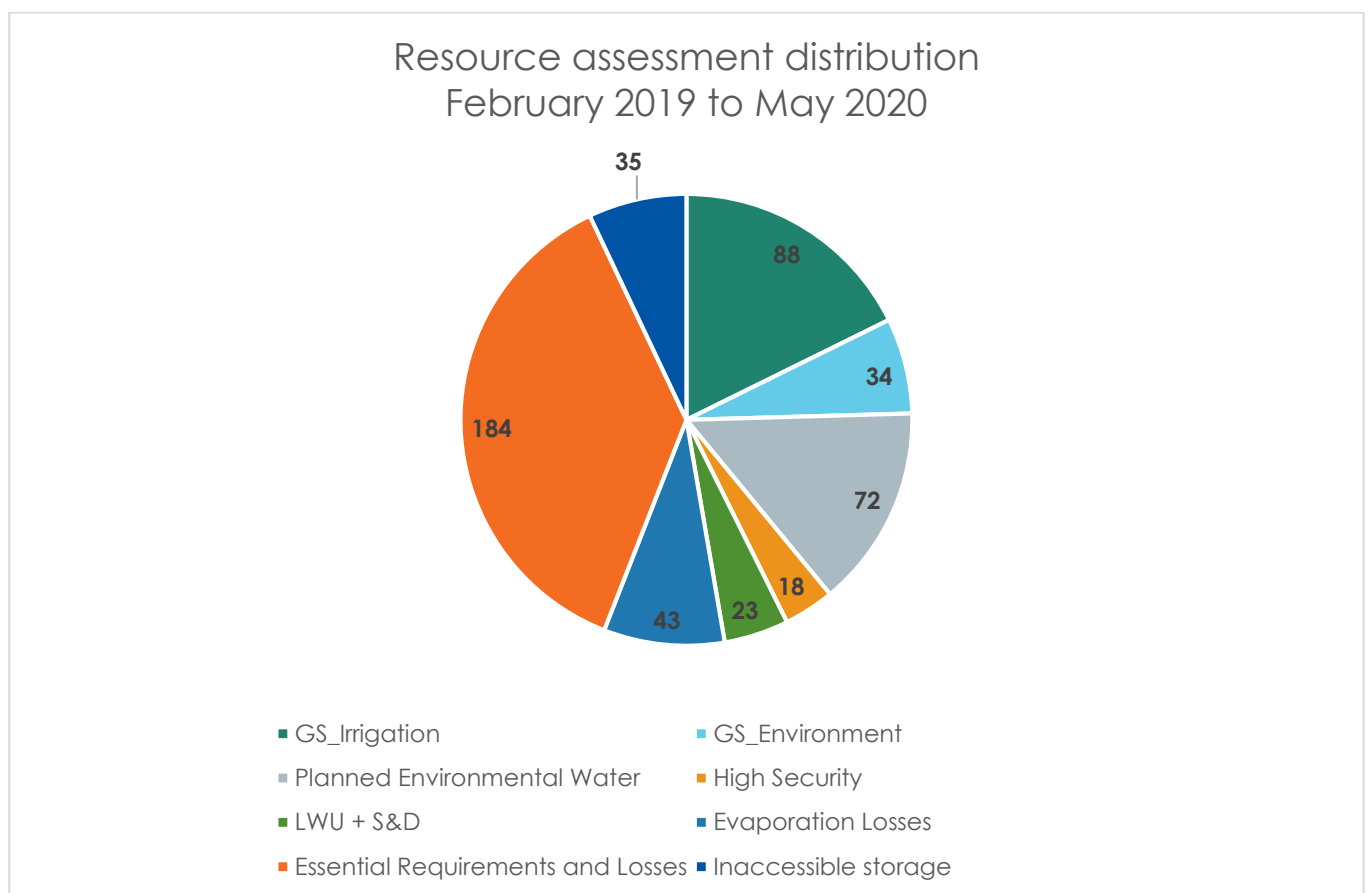
### General security available water determination

Date	AWD (ML/share)	Total
01/07/2018	0	102%

A total of 19,581 ML has been carried over to 2018-19 by GS accounts, which is equivalent to 102% of share component. To end of January, a total of 9,112 ML (Net Trade) of water has been traded out of Cudgegong.

In the current water year (2018-19), 0% AWD has been announced on 1<sup>st</sup> July 2018 for GS. For other water users (e.g. High Security and Town Water Supply), the announced AWD is 100%.

### 4.3 Resource assessment



Note: Volumes in the pie chart are in GL. GS and EWA volumes represent 100% carryover balance.

Based on the above resource distribution, the total amount of water resource required for Feb 2019 to May 2020 is 497 GL, whereas, total resource available is 201 GL, which results in a shortfall of about 296 GL. Total resource availability is based on the end of January storage volume in Burrendong Dam, plus minimum forecast inflow from February 2019 to May 2020 and the planned bulk water transfer from Windamere Dam to Burrendong Dam.

Total General Security account is the combination of announced (if any) AWD volume plus carryover from the previous water year. Currently the general security irrigation account balance is 88 GL and general security environment balance is 34 GL

A temporary water restriction order has been issued by DoI-Water to ensure that water usage below Burrendong Dam in 2018-19 is limited to this reduced water availability. Macquarie regulated river (general security) access licences are restricted to 70 per cent of the volume of water in the carryover sub-account account as at 1 July 2018. The remaining 30% of the water in carryover subaccounts will be held in a "drought sub account" (Restricted Account). Customers are not permitted to use or trade the water in their Restricted Account pursuant to the Order. Out of 88 GL of GS\_Irrigation licenses, 60 GL is in the "drought sub account" and 28 GL is effectively available to irrigators for use and/or trade. A total of 32 GL of Environment license account is in the restricted account and 2GL is effectively available to use.

Towns, S&D and High Security commitments are 41 GL till 31 May 2020. Available resource of 201 GL is inadequate to meet the delivery of 100% for the towns, stock, domestic and high security entitlements in 2019-20.

Essential requirements/Operational losses are the conservative estimate of the volume required to run the river under dry conditions through to May 2020 to meet all demands. This is mainly natural transmission losses as water evaporates and soaks into the river bed, as well as planned S&D replenishments delivered in autumn 2019 and 2020. It is assumed that tributary inflows will return to dry conditions from now onward. The loss allowance is 184 GL for the period of February 2019 to May 2020.

<b>Resource assessment</b>	<b>Feb 2019</b>	<b>Jan 2019</b>	<b>Dec 2018</b>	<b>Nov 2018</b>	<b>Oct 2018</b>	<b>Sept 2018</b>	<b>August 2018</b>	<b>July 2018</b>	<b>June 2018</b>
Storage volume	152	190	241	284	341	392	433	446	454
Plus bulk water transfer volume	40	50	50	54	54	54	54	57	56
Plus minimum inflows	9	10	14	25	71	78	114	18	21
Less dead storage	-34	-34	-34	-34	-34	-34	-34	-34	-34

Less evaporation loss	-43	-51	-61	-69	-71	-69	-70	-38	-42
Less essential supplies	-225 <sup>1</sup>	-246	-270	-284	-309	-308	-330	-177	-194
Less unallocated storage	-1 <sup>2</sup>	-1	-1	-4	-2	-2	-3	-1	-3
Less general security balance	-88 <sup>3</sup>	-128	-157	-173	-197	-199	-200	-200	-203
Less environmental account balance	-106 <sup>4</sup>	-107	-107	-129	-151	-212	-229	-233	-232
<b>Surplus/shortfall</b>	<b>-296</b>	<b>-317</b>	<b>-325</b>	<b>-330</b>	<b>-298</b>	<b>-300</b>	<b>-265</b>	<b>-162</b>	<b>-177</b>

Notes:

<sup>1</sup> 225 GL of essential supplies, budgeted for S&D replenishment flows, TWS and HS use and for transmission losses in 2018-19 and 2019-20. Of this 23 GL is for S&D and LWU use and 18 GL is for HS licence use.

<sup>2</sup> Estimated unallocated storage of 1 GL to ensure valve ops at very low storage level

<sup>3</sup> Estimated GS irrigation account balance of 88 GL after allowing for carryover evap losses.

<sup>4</sup> Of the 106 GL of Env balance, after allowing for carryover evap losses. 72 GL of EWA and 34 GL of GS account balance.

Volumes in the table are in GL.

#### 4.3.1 Significance of this resource assessment

The resource assessment at 1<sup>st</sup> of February 2019 indicates no increment in AWD for General Security licenses as there is shortfall in supplies. It is estimated that inflows of around 296 GL are required in February 2019 before any increment in AWD can be recommended. Based on the historical inflows there is 5% chance that inflows in February 2019 will exceed 296 GL. However, the chances of exceeding inflows of 296 GL increases to over 20% by end of June 2019.

#### 4.3.2 Resource assessment process

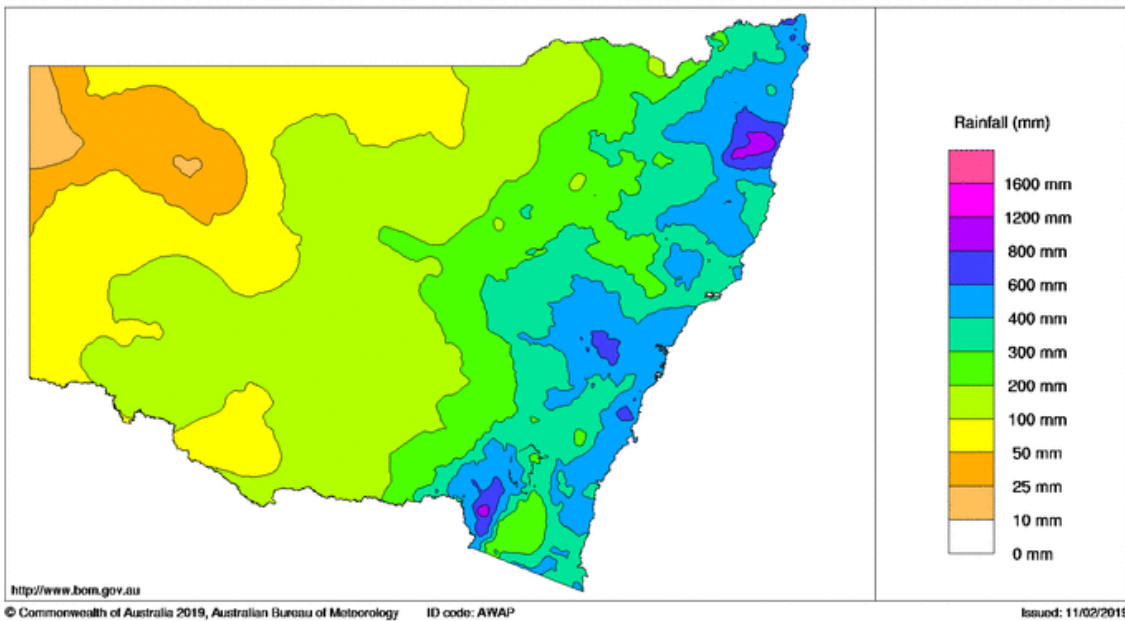
Resource Assessment is the process of calculating how much water resource is available based on the rules of the Water Sharing Plan and work approvals. This is done periodically during the year, typically at the end of the month and when any significant inflow event happens. The above resource assessment table indicates that the latest resource assessment has been done for 1<sup>st</sup> of February 2019. The planning horizon for this resource assessment is February 2019 to May 2020.

From the above table, at 1<sup>st</sup> of February 2019, the total available resource is  $152 + 40 + 9 = 201$  GL. Afterwards, commitments for the planning horizon are subtracted, to find the remaining available resource for GS AWD announcement. From the table, total commitment is about 497 GL, which is higher than the total available resource. Therefore, no general security AWD announcement is currently possible.

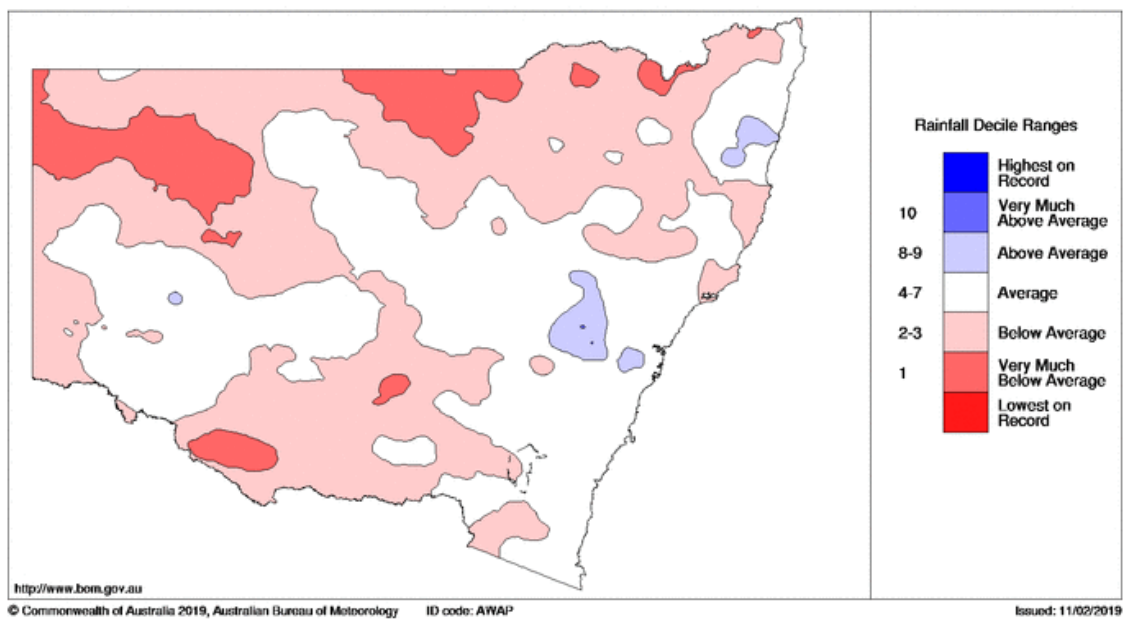
# 5. Rainfall

## 5.1 6-month rainfall

New South Wales Rainfall totals (mm) 1 August 2018 to 31 January 2019  
Australian Bureau of Meteorology



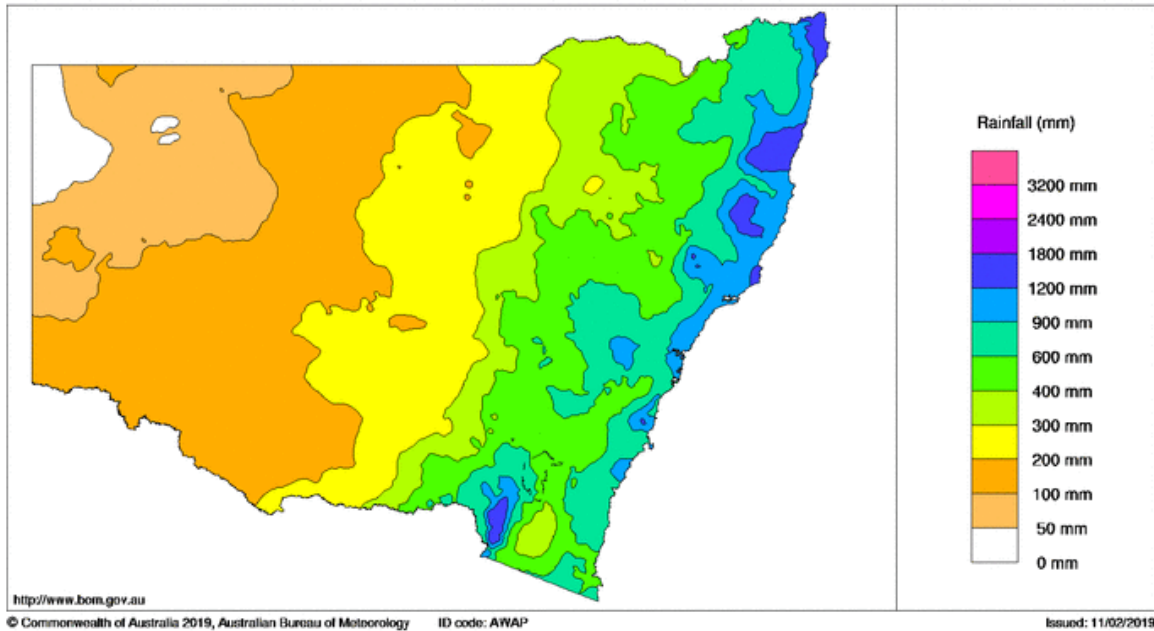
New South Wales Rainfall Deciles 1 August 2018 to 31 January 2019  
Distribution Based on Gridded Data  
Australian Bureau of Meteorology



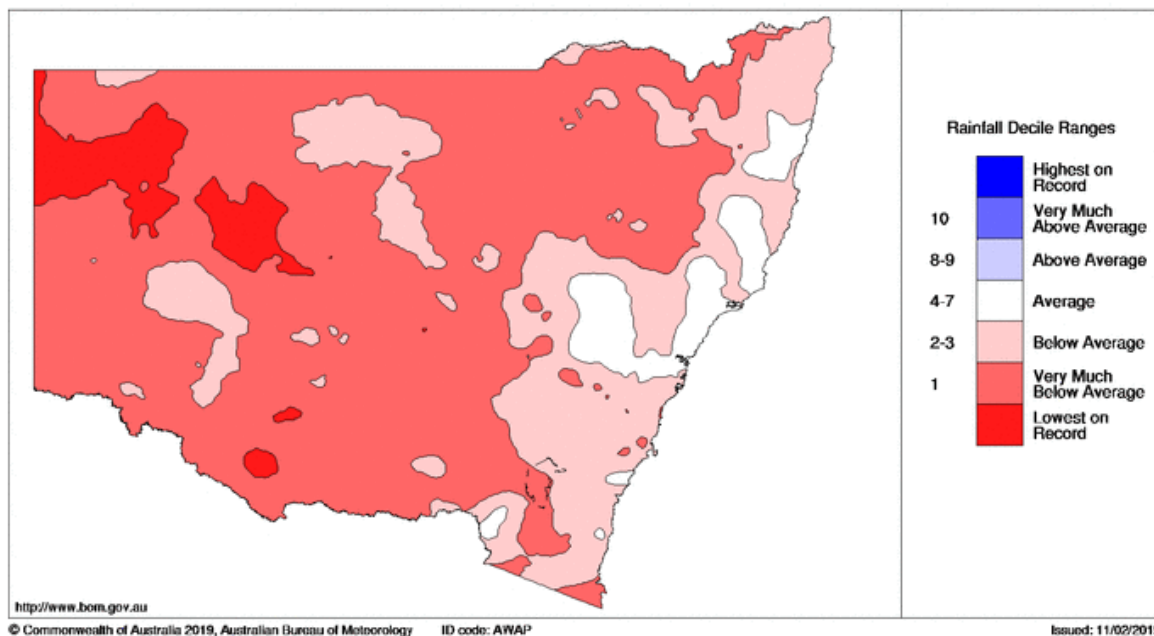
During the last 6-months, total rainfall has ranged between 100 to 300mm which is average to below average.

## 5.2 12-month rainfall

New South Wales Rainfall totals (mm) 1 February 2018 to 31 January 2019  
Australian Bureau of Meteorology



New South Wales Rainfall Deciles 1 February 2018 to 31 January 2019  
Distribution Based on Gridded Data  
Australian Bureau of Meteorology

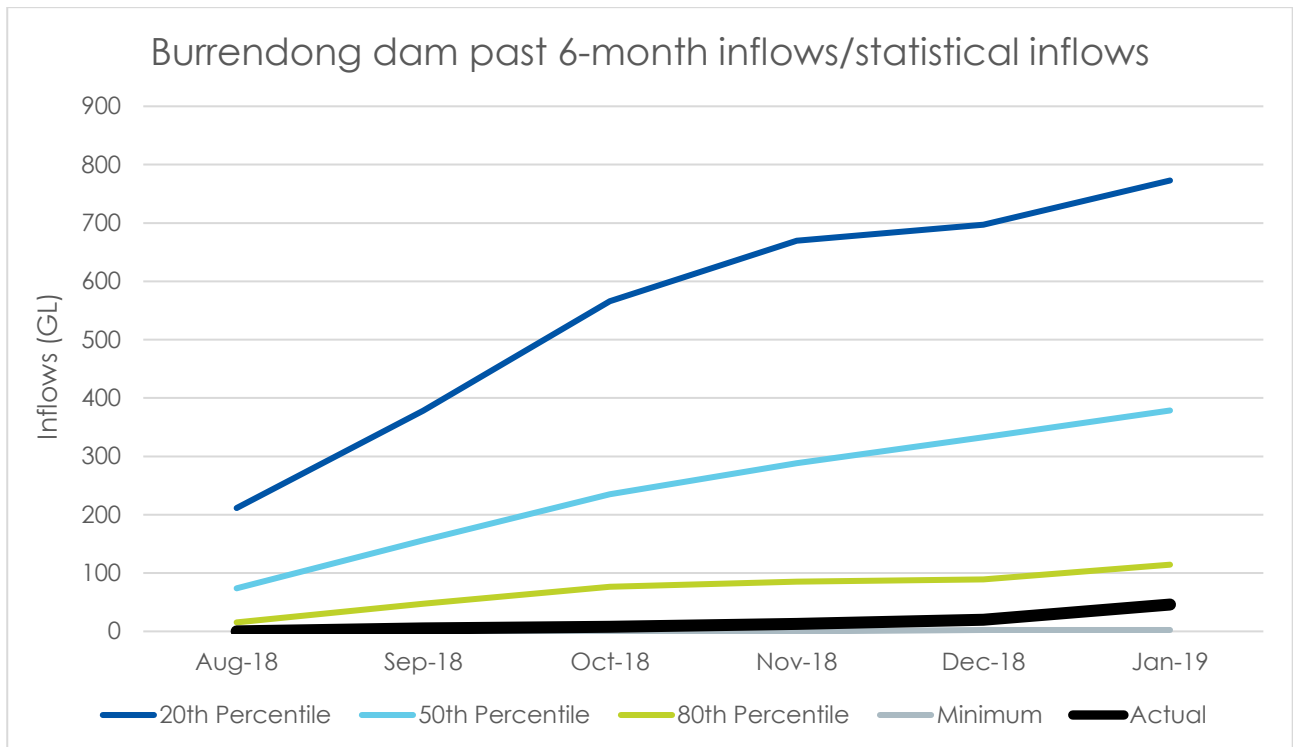


During the last 12-months, total rainfall has ranged between 200 to 400 mm which is below average to very much below average.

## 6. Inflows

### 6.1 Burrendong Dam inflows

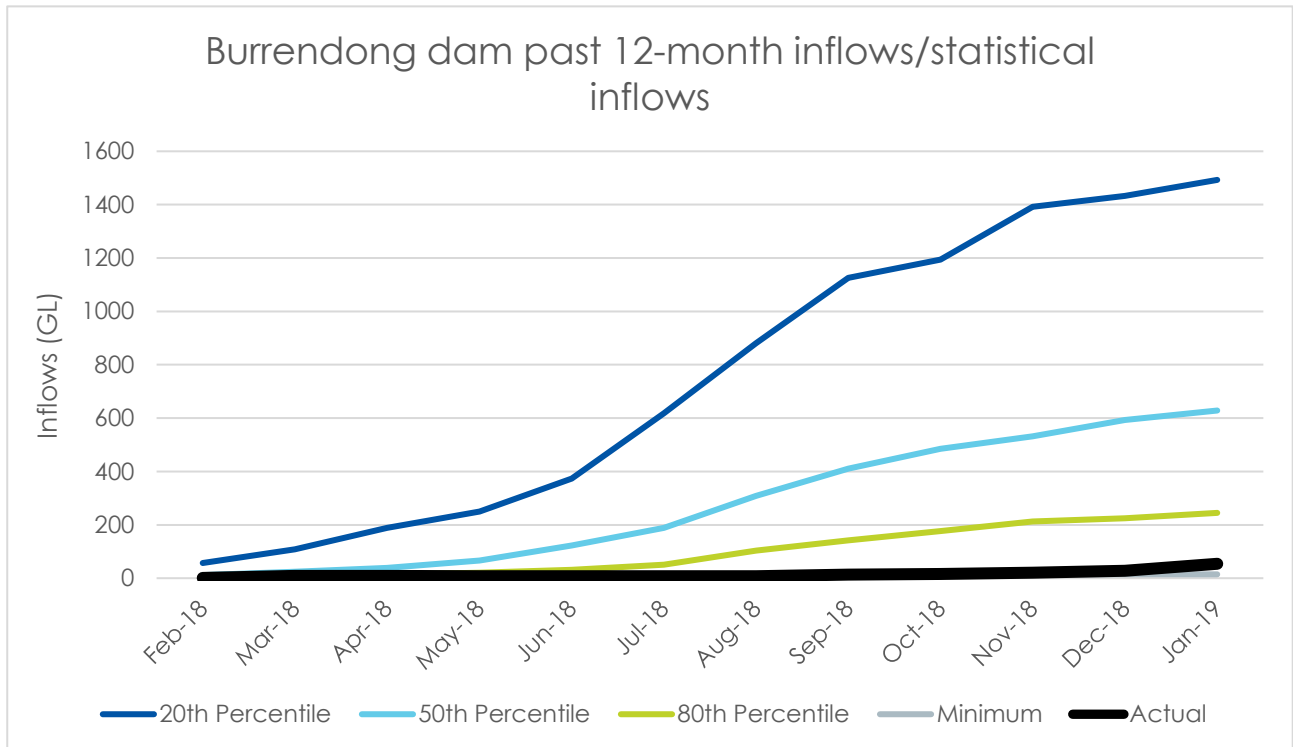
#### 6.1.1 Burrendong Dam past 6-month inflows/statistical inflows



Inflows are consistent with rainfall over the past 6-month period. Actual inflows in last 6 months were only around 46 GL which is slightly better than 95<sup>th</sup> percentile inflow condition however very much below 80<sup>th</sup> percentile inflows. Of this 46 GL inflows 26 GL was in January due to recent rain.



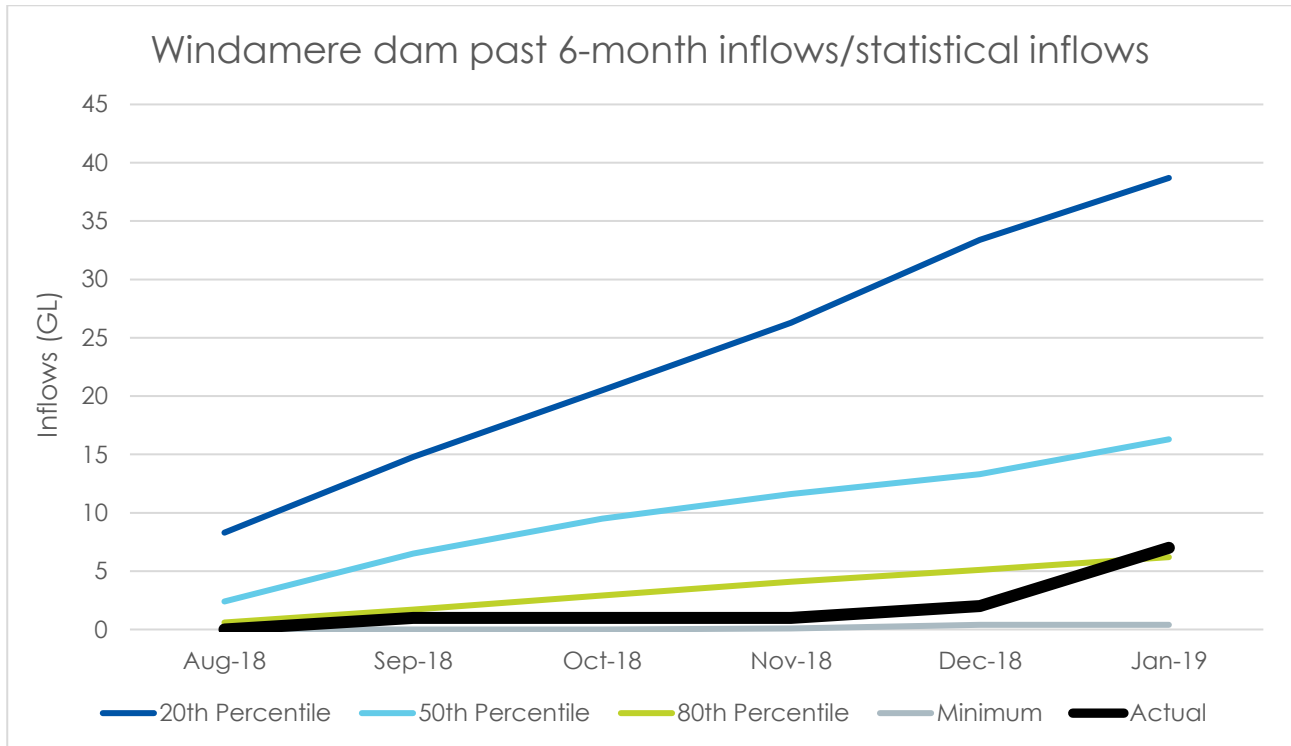
### 6.1.2 Burrendong Dam past 12-month inflows/statistical inflows



Inflows are consistent with rainfall over the past 12 months. Due to dry conditions over the last 12 months only 54 GL of inflows were recorded, which is slightly better than 99<sup>th</sup> percentile inflow condition.

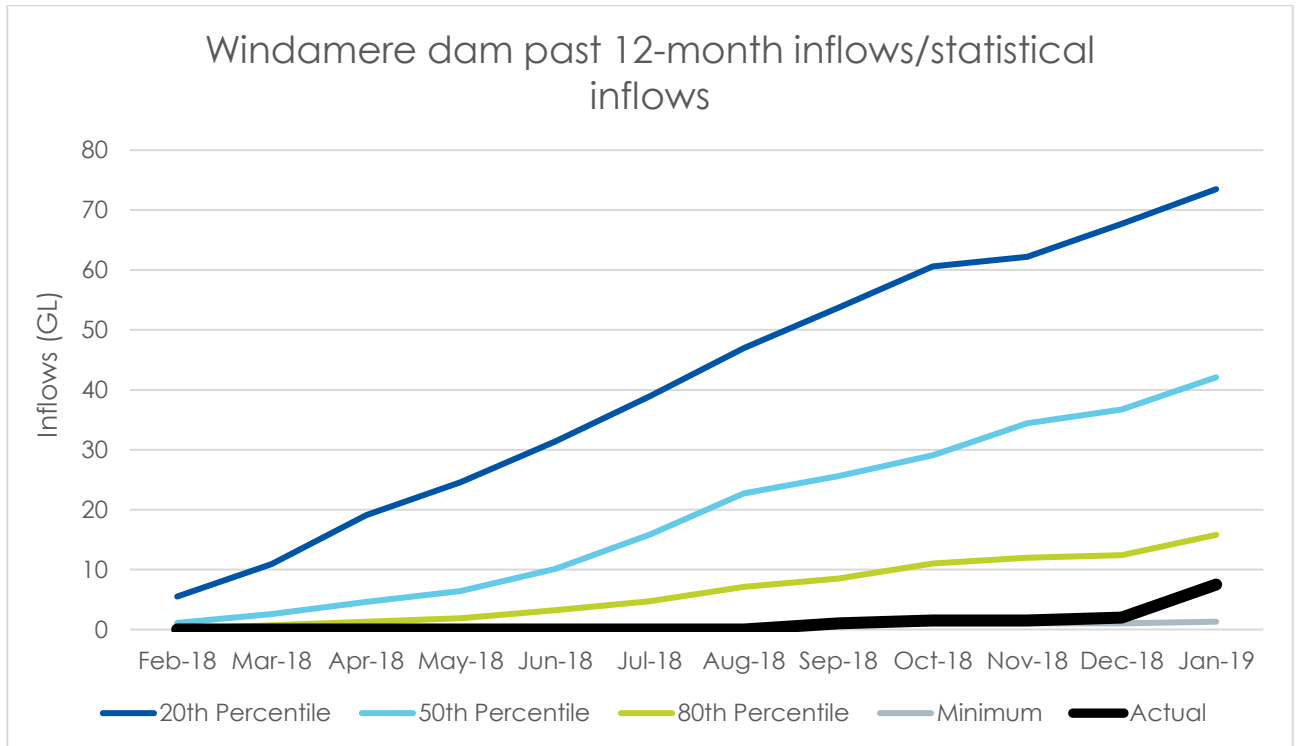
## 6.2 Windamere Dam inflows

### 6.2.1 Windamere past 6-month inflows/statistical inflows



Inflows are consistent with rainfall over the past 6 months. Around 7 GL of inflows were recorded in the last 6 months which is in line with 80<sup>th</sup> percentile inflow conditions. Most of these inflows were received in January 2019.

### 6.2.2 Windamere past 12-month inflows/statistical inflows



Dry condition throughout has resulted only 8 GL of inflow into Windamere dam over the past 12-month period, which is better than 95<sup>th</sup> percentile inflow conditions. Most of these inflows were received in January 2019.

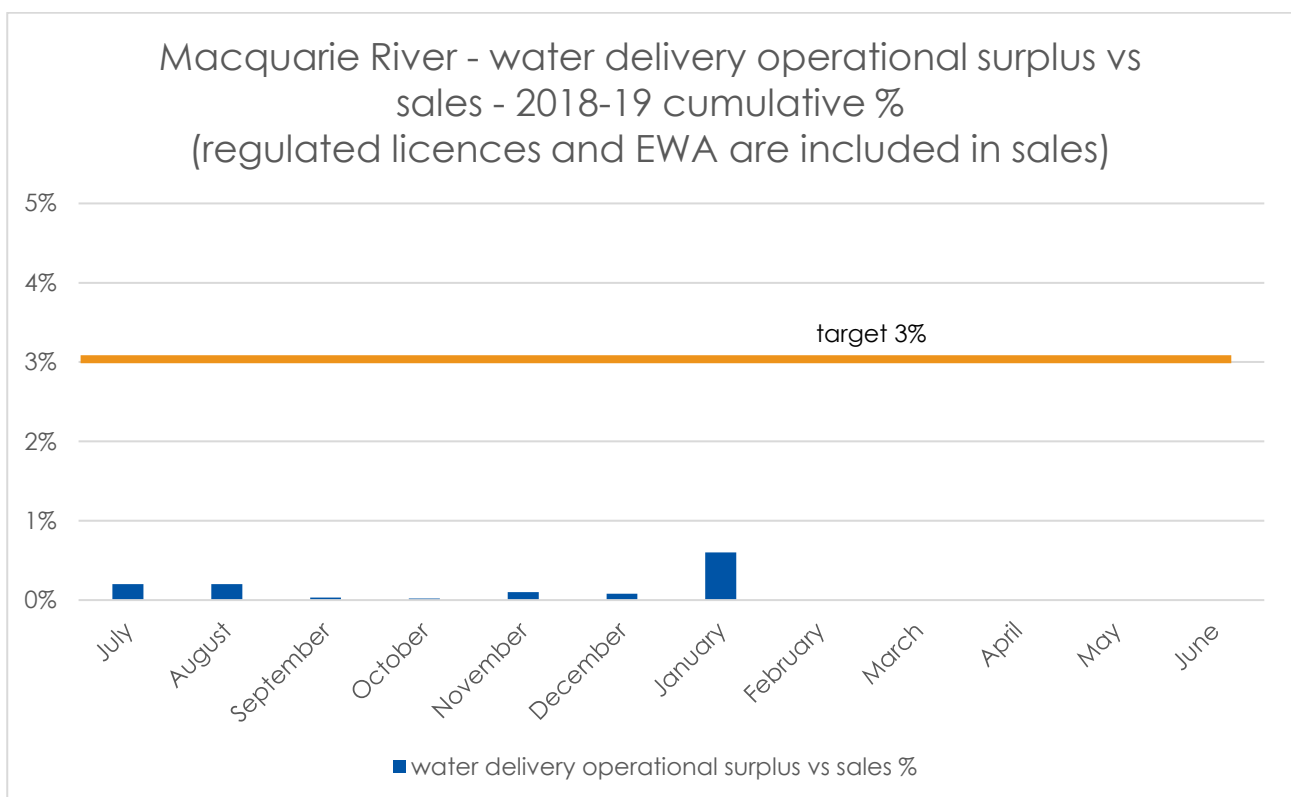
### 6.3 Downstream tributary inflows

There have been no significant downstream tributary inflows in this current year (2018 – 19).

## 7. Operational surplus

### 7.1 Operational surplus for Macquarie

Operational surplus is water above that which could reasonably be expected to pass the last extraction point on each given river/creek being supplied with regulated flow (dam releases and controlled tributary inflows – not supplementary flows). The following table and graph show the operational surplus over the last seven months in the current water year 2018-19, which is less than 1%. The average operational corporate target for this year is 3%.



#### Macquarie cumulative totals

Dates	Sales + environmental delivery	Operational surplus	Actual	Target
July	4,236	9	0.2%	5%
July-Aug	25,632	28	0.2%	5%
July-Sep	82,123	28	0.03%	5%
July-Oct	135,218	28	0.02%	3%

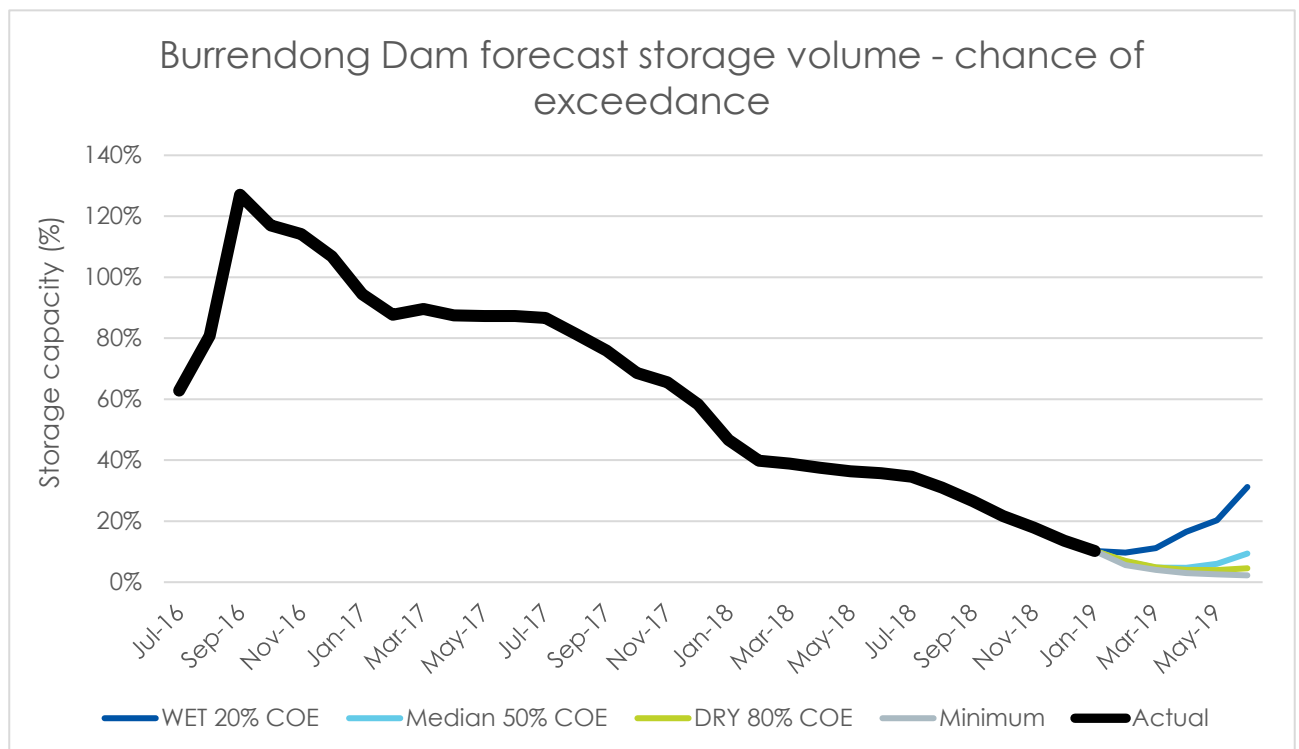
July-Nov	175,127	158	0.1%	3%
July-Dec	208,738	158	0.08%	3%
July-Jan	261,389	1,561	0.6%	3%

Explanation:

WaterNSW sets an operational surplus target of 3% of total delivery of revenue and planned environmental water (excluding supplementary) measured as flows above operational target at Macquarie River at Oxley, Bulgeraga Ck at Bifurcation, and Gunningbar Ck at Fairview. Water delivered under EWA is accounted in the total delivery.

## 8. Storage forecast

### 6.4 Burrendong storage forecast



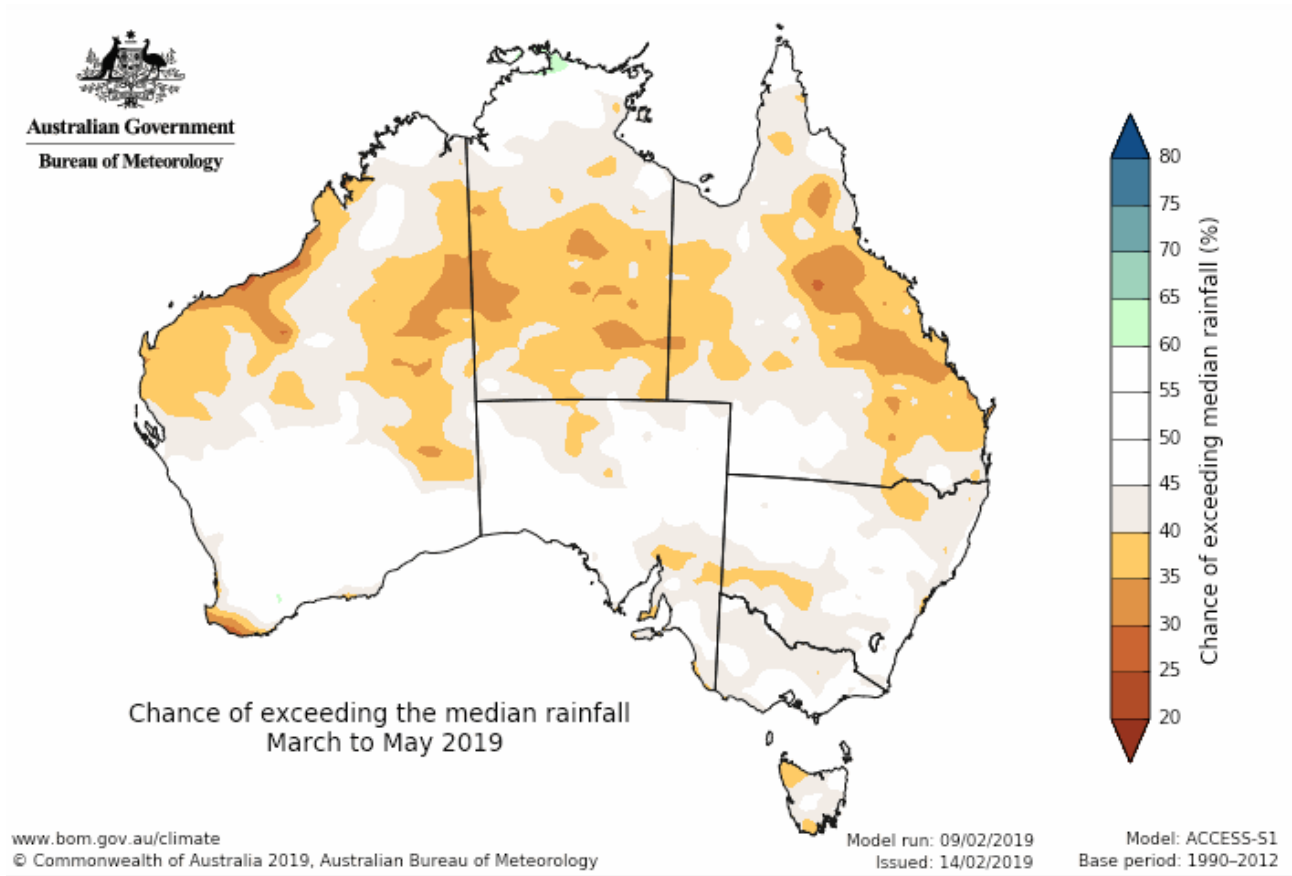
Above figure demonstrate the behaviour of Burrendong Dam under various inflow conditions until June 2019. For example, with 20<sup>th</sup> percentile inflow the dam may be around 31% full at the end of June 2019. With the minimum inflow conditions, the dam would be only at 2% at the end of June 2019. The Chance of Exceedance (COE) in the figure refers to the chance of exceeding inflows and storage levels in the time frame. For example, Wet 20% COE indicate that there is only a 20% of

chance that the dam volume will be greater than the projected level, and there is 80% chance that the dam volume will be less than the projected level.

## 9. Outage planning

Item	Time	Description
Burrendong Dam	3/01/2019	Cold Water Pollution thermal curtain has been lowered below the low-level intake as the dam level drops over the summer.
Windamere Dam	N/A	None
Weirs	N/A	None
Regulators	N/A	None

# 10. Climate Outlook



## 11. Drought Operation Measures

The NSW Extreme Events Policy introduces a staged approach to managing extreme events such as severe droughts or poor water quality events, and to the associated Incident Response Guides (IRGs). The Macquarie regulated river water source is assessed to be in Stage 3 of the drought stages with stage 4 the highest level under the Incident Response Guides. The Macquarie–Castlereagh incident response guide can be viewed at [Link](#).

Public information sessions were held in January with the Macquarie-Cudgegong valley local communities and councils. Five sessions were held in; Warren, Narromine, Dubbo and Mudgee to improve understanding of the current drought situation, forecasted conditions and to discuss the impacts from the worst drought on record.

On 11 February the department and WaterNSW held a public information session in Dubbo as part of the Critical Water Advisory Panel consultations.

The session provided an update on the water availability outlook and proposed measures to help manage the Macquarie River system if the dry conditions persist.

To download the presentation and for further information on drought management in the Macquarie Cudgegong Valley:

<https://www.waternsw.com.au/supply/drought-information/regional-nsw/macquarie-valley>

The current drought plan for Cudgegong and Macquarie rivers under zero inflows and drought of record inflows from the presentation made at the information sessions is updated and reproduced below.



## Windamere Drought Plan – Zero Inflow

2019				2020
Jan	March	July	Dec	March
Irrigation/ Stock and Domestic/ Town Water Supply			Supply Stock and Domestic/ Town Water Supply	
<p>Phase 1 <u>Windamere</u> transfers 10 gegalitres completed</p> <p>At the end of the transfer 132 gegalitres remaining in storage</p>			<p>At the start of the <u>water</u> year there will be 120 gegalitres held in <u>Windamere</u> dam storage</p> <p>The likely allocation will be 100% to local water utilities and high security</p> <p>The carry over will be able to be delivered for general security</p> <p>Phase 2 <u>Windamere</u> transfers November 2019 40 gegalitres</p>	

## Macquarie Drought Plan – Zero Inflow

2019				2020	
Jan	March	July	Dec	Jan	March
Irrigation/ Stock and Domestic/ Town Water Supply	Stock and Domestic/ Town Water Supply	Intermittent supply Stock and Domestic/ Town Water Supply		Town Water Supply	
<p>Phase 1 <u>Windamere</u> transfers 10 gegalitres</p> <p>Irrigation peak release cease at end of February</p> <p>Carryover available to end June 2019</p>	<p>Minimum flows maintained through to Marshes</p> <p>Stock and domestic replenishment only from surplus tributary flows</p>	<p>Continuous flow only to Warren <u>Gunningbar</u> Creek Weir–</p> <p>Intermittent flows to other regulated sections</p> <p>Phase 2 <u>Windamere</u> Transfers November 2019 40 gegalitres</p>		<p>Pumping dead storage in <u>Burrendong</u> dam</p> <p>Cease flows to other sections – no Stock and domestic</p>	
<b>Cease to Flows</b>					
<p><b>Key point:</b></p> <ul style="list-style-type: none"> <li><u>WaterNSW</u> is working with key stakeholders to manage these stages</li> </ul>					

## Macquarie Drought Plan – Drought of Record

2019				2020	
Jan	March	July	Dec	FEB	May
<b>Irrigation/ Stock and Domestic/ Town Water Supply</b>	<b>Stock and Domestic/ Town Water Supply</b>	<b>Intermittent supply Stock and Domestic/ Town Water Supply</b>		<b>Town Water Supply</b>	
Phase 1 <u>Windamere</u> transfers 10 gegalitres  Irrigation peak release cease at end of February  Carryover available to end June 2019	Minimum flows maintained through to Marshes  Stock and domestic replenishment only from surplus tributary flows	Continuous flow only to Warren <u>Gunningbar Creek Weir</u> – Intermittent flows to other regulated sections  Phase 2 <u>Windamere</u> transfers November 2019 40 gegalitres		Pumping dead storage in <u>Burrendong</u> dam  Cease flows to other sections – no Stock and domestic	
<b>Key point:</b> • <u>WaterNSW</u> is working with key stakeholders to manage these stages					

Cease  
to  
Flows

## More information

Visit our website to view our water operations reports at [waternsw.com.au/operations](http://waternsw.com.au/operations).

Subscribe to our customer information (weekly water availability reports, e-newsletters, etc.) at [waternsw.com.au/subscribe](http://waternsw.com.au/subscribe).