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<th>Definition</th>
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<td>Available Water Determination</td>
</tr>
<tr>
<td>BLR</td>
<td>Basic Landholder Rights</td>
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<tr>
<td>BoM</td>
<td>Bureau of Meteorology</td>
</tr>
<tr>
<td>CWAP</td>
<td>Critical Water Advisory Panel</td>
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<tr>
<td>CWTAG</td>
<td>Critical Water Technical Advisory Group</td>
</tr>
<tr>
<td>DPI CDI</td>
<td>Department of Primary Industries - Combined Drought Indicator</td>
</tr>
<tr>
<td>DPIE EES</td>
<td>Department of Planning, Industry and Environment - Environment, Energy &amp; Science</td>
</tr>
<tr>
<td>DPI Fisheries</td>
<td>Department of Primary Industries - Fisheries</td>
</tr>
<tr>
<td>DPI Water</td>
<td>Department of Planning, Industry and Environment - Water</td>
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<td>FSL</td>
<td>Full Supply Level</td>
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<td>HS</td>
<td>High Security</td>
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<td>IRG</td>
<td>Incident Response Guide</td>
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<td>ISEPP</td>
<td>Infrastructure State Environmental Planning Policy</td>
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<tr>
<td>LGA</td>
<td>Local Government Areas</td>
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<tr>
<td>ROSCCo</td>
<td>River Operations Stakeholder Consultation Committee</td>
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<tr>
<td>D&amp;S</td>
<td>Domestic &amp; Stock</td>
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<tr>
<td>vTAG</td>
<td>Valley Technical Advisory Group</td>
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</table>
Introduction

This annual operations plan provides an outlook for the coming year in the Border Rivers region. The plan considers the current volume of water in storage and weather forecasts. This plan may be updated as a result of significant changes to the water supply situation.

Due to the current low water storage levels and the forecast of dry conditions to continue over the valley at least up to the end of the year, this year’s plan outlines WaterNSW’s response to the drought in the Border Rivers including:

• identification of critical dates,
• our operational response, and
• potential projects to mitigate the impact of the drought on customers and communities within the valley.

The NSW Department of Planning, Industry and Environment’s Extreme Events Policy and Incident Response Guides outline 4 stages of drought.

The Border Rivers regulated river system is assessed to be in stage 4, which is categorised as ‘critical drought/water shortage’.

The Border Rivers system

The Border Rivers catchment is one of the northern-most catchments in the Murray-Darling Basin. It is made up of a group of rivers in a region straddling the New South Wales and Queensland border. The rivers of the catchment rise on the western slopes of the Great Dividing Range and run westward, gradually merging with one another to become the Barwon River on the floodplains upstream of Mungindi.

A 450 km section of the Dumaresq, Macintyre and the Barwon rivers forms the border between Queensland and New South Wales.
Regulated and unregulated system flow trends

Regulated and unregulated flows from the Border Rivers at Mungindi contribute to an average total annual discharge of 565,560 megalitres (ML). This amount fluctuates significantly over time, which illustrates the significant variability in flows between wet and dry years. Variability in flow levels also occur across the valley and between seasons due to summer being the predominate season for rainfall and irrigation use.

Sharing water resources between the states and water users is a key water management issue addressed through intergovernmental agreements and states’ water sharing plans, which set rules as to how water can be accessed, used and traded.

The major water storage in the New South Wales portion of the catchment is Pindari Dam on the Severn River. It was completed in 1969 and upgraded in 1995 to provide a full storage capacity of 312,000 ML. The dam supplies water for irrigation, domestic and stock, and town water supply.

The two major storages in Queensland are Glenlyon Dam on Pike Creek which stores 253,600 ML, and Coolmunda Dam on the Macintyre Brook with a capacity of 69,000 ML for irrigation and town water supply.

The water resources in Pindari Dam are solely for New South Wales use and similarly water stored in Coolmunda Dam is available for Queensland users only. Water stored in Glenlyon Dam is shared between two states in the ratio of 57:43 for NSW:QLD respectively.

The Border Rivers catchment supports a variety of water users including local councils and water utilities, dryland agriculture (including winter cereals, summer grains and oilseeds), irrigated cropping (cotton, fruit, vegetables, wine grapes and lucerne), livestock grazing and forestry.

Rainfall trends

For the period April 2017 to March 2019, lowest-on-record rainfall was observed over southern inland Queensland and areas of north and northwestern New South Wales. Over most of this area, rainfall for the period was less than 50% of the 1961–1990 average. Large areas from central to southwestern Queensland, and northcentral and northwestern New South Wales, into northeastern South Australia, have seen rainfall totals between 40% to 60% of this average, implying that nearly one year’s worth of average rainfall has been missed over this two-year period. Rainfall for January to August 2019 was lowest-on-record in the Southern Downs (Queensland) and Northern Tablelands (New South Wales).

The recent dry periods have been especially severe during the cooler months of April to September, an important time for agriculture and the replenishment of surface and groundwater storages across southern Australia. Over the Murray-Darling Basin (MDB), the total average rainfall over two consecutive April to September periods was the lowest on record, at 217.5 millimetres (mm). This is around 15% below the previous record, which saw 255.7 mm over the 1940–41 April to September period. It was also the only instance of an April to September rainfall total below 125 mm in two consecutive years.

Rainfall for the combined two-year 2017 and 2018 April to September period was the lowest on record and very much below average (lowest 10% of all such periods) for large parts of southeastern and southwestern Australia. Around 50% of New South Wales was the lowest on record for these two periods combined.

The 2019 winter was also dry, which means three consecutive winters of below average rainfall.

Over the 24-month period, there has been a large decline in water resources in the northern half of the MDB.
Water users in the valley

**Basic Land Holder Rights (BLR)**

At the commencement of the current Water Sharing Plan, the water requirements of holders of BLR rights are estimated to be 8,000 megalitres per year (ML/year).

**Domestic and Stock access licences**

The share components of Domestic and Stock access licences authorised to extract water from this water source are 1,001 ML/year.

**Local Water Utilities access licences**

The share components of local water utility access licences authorised to extract water from this water source are 640 ML/year.

**Regulated river (High Security) access licences**

The share components of regulated river (High Security) access licences authorised to extract water from this water source are 1,500 unit shares.

**Regulated river (General Security A-class) access licences**

The share components of regulated river (General Security-A class) access licences authorised to extract water from this water source are 22,007 unit shares.

**Regulated river (General Security B-class) access licences**

The share components of regulated river (General Security-B class) access licences authorised to extract water from this water source are 241,211 unit shares.

**Supplementary Water access licences**

The share components of Supplementary Water access licences authorised to access water from this water source are 120,001 unit shares.

**Planned Environmental Water**

The NSW Border Rivers Water Sharing Plan establishes the following planned environmental water rules:

a. Water in excess of the long-term extraction limit (194,500 ML/year) may not be taken from this water source or used for any purpose.

b. Water availability is to be managed to ensure water volume in excess of the long-term extraction limit is not being taken.

c. A minimum daily release will be made from Pindari Dam that is equal to 10 ML except when a release of greater than 10 megalitres per day (ML/d) is required to meet basic landholder rights and access licence extractions. The continuous low flow aims to provide connectivity for downstream pools and riffles, and curtail problems associated with extended flow recession.

d. In the months of September, October, November, December, January, February, March, April and May, inflows into Pindari Dam will be released from Pindari Dam, up to a limit of 50 ML/d, except when a release of greater than 50 ML/d is required to meet basic landholder rights and access licence extractions.
e. In the months of June, July and August, inflows into Pindari Dam will be released from Pindari Dam, up to a limit of 200 ML/d, except when a release of greater than 200 ML/d is required to meet basic landholder rights and access licence extractions.

f. At the start of each water year, 4000 ML shall be set aside in Pindari Dam for the purpose of releasing a flow, called a stimulus flow, from Pindari Dam.

g. A stimulus flow shall be released from Pindari Dam if an inflow into Pindari Dam of greater than 1200 ML/d has occurred on any day between 1 April and 31 August.

h. The stimulus flow released under subclause (g) shall be made between 1 August and 1 December. The aim of the stimulus flow is to provide a flow in the river that mirrors a naturally occurring hydrograph, targets pre-season cues to fish breeding and to regularly wet and inundate interconnected riparian areas.

i. The timing, rate, volume and duration of the stimulus flow released between 1 August and 1 December shall be determined by the Department and the Department responsible for the Environment, after taking into consideration factors such as:

(i) antecedent conditions
(ii) irrigation demand
(iii) flows in this water source
(iv) the ability to monitor environmental outcomes.

j. Seven days’ notice of the intent to release the stimulus flow under subclauses (g) and (h), shall be provided to WaterNSW.

k. The water set aside for a stimulus flow under subclause (f), but not released pursuant to subclauses (g) and (h), may be carried over to the next water year, provided that the total amount of water available at the start of the water year to be released as a stimulus flow does not exceed 8,000 ML.

l. Releases from Pindari Dam as described in subclauses (d), (e), (g) and (h) are to be protected from extraction downstream of Pindari Dam to the confluence of the Severn River and Frazers Creek.

m. During the period from 1 September of each year to 31 March of each following year, the holder of an access licence is not permitted to take uncontrolled stream flow from this water source, which, after taking into account stream losses, would result in a flow in the Barwon River at Mungindi of 100 ML/day or less.
Water availability

Water allocations in the Border Rivers Regulated River water source for 2019/20, as of 1 July 2019:

<table>
<thead>
<tr>
<th>Licence Category</th>
<th>AWD</th>
<th>Deliverability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic &amp; Stock</td>
<td>100%</td>
<td>Restricted</td>
</tr>
<tr>
<td>Local Water Utility</td>
<td>100%</td>
<td>Restricted</td>
</tr>
<tr>
<td>High Security</td>
<td>100%</td>
<td>Restricted</td>
</tr>
<tr>
<td>General Security A-class</td>
<td>0%</td>
<td>Restrictions on carry over</td>
</tr>
<tr>
<td>General Security B-class</td>
<td>0%</td>
<td>Restrictions on carry over</td>
</tr>
</tbody>
</table>

Current drought conditions

The system continues to experience extremely low inflows to both Pindari and Glenlyon Dams and downstream tributaries. Over the last 10 years, good inflows occurred in four years: 2010-11, 2011-12, 2012-13 and 2016-17.

Low inflows occurred in five years out of the last six: 2013-14, 2014-15, 2015-16, 2017-18 and 2018-19. In the last two years, the system has received extremely low inflows.

The combined inflows for the 24 months (November 2017 to October 2019) was 92,000 ML. This is about 50% of the previous minimum observed 24-month inflow of 185,000 ML.

As of 6 November 2019, Pindari Dam is at 4% capacity with an active storage volume of 13,800 ML, and Glenlyon Dam is at 3% capacity with an active storage volume of 7,300 ML. Deliveries to town water and domestic and stock supplies are being maintained between the storages and Goondiwindi, but no releases are being made downstream of Goondiwindi.
**Border Rivers storages**

As a result of the low inflows over the past two years, the volume of water in Pindari Dam and Glenlyon Dam has slowly declined since Pindari was full and Glenlyon was at 75% capacity in December 2017. The graph below shows Pindari and Glenlyon Dam’s behaviour for the 2018-19 water year, compared to the last four water years.

From the above figures, it can be seen that at the start of the last water year the volume of Pindari Dam and Glenlyon Dam was around 60% and 50% respectively and, at the end of the water year, was drawn down to 5% and 9% of total capacity.

In 2018-19, about 1,200 ML was supplied to town water and domestic and stock, 138,600 ML was provided to general security irrigation, and 91,600 ML was used to run the river with water being lost to groundwater and evaporation.
Resource assessment

The Border Rivers resource assessment is the process of calculating and sharing water between the states and is based on the rules in the Interstate Agreement. This is done mid-month and when any significant inflow event occurs.

The planning horizon for this resource assessment is 24-months. Taken into consideration is the volume of water held in storage, plus the expected minimum inflow based on historical records for the 24-month period.

The most recent resource assessment approved by the Border Rivers Commission was the end of August 2019. As of 1 September 2019, the total amount of water available in storages was 36,350 ML. Added to this was the expected minimum inflow over 18-months of 26,900 ML. Commitments for the planning horizon were then subtracted to find the remaining available resource for the Available Water Determination (AWD) announcement.

Currently the total commitment is higher than the available resource and the shortfall is about 31,000 ML. Therefore, currently, no additional allocation is possible.

At the start of the 2019-20 water year, around 4,600 ML general security water was carryover from the previous water year, but 50% of that is restricted.

The account balances of different licence categories, at the start of water year, are shown below with AWD percentages:

- General Security A-class (300 ML) – 0%
- General Security B-class (4,300 ML) – 0%
- High Security (1,500 ML) – 100%
- Local Water Utilities (570 ML) – 100%
- Domestic and Stock (1,000 ML) – 100%.

Border Rivers resource distribution - 1 September 2019

![Chart showing resource distribution]

- Storage Losses
- Storage Losses shortfall
- Essential Supplies
- Essential Supplies shortfall
- QLD general use
- NSW general use
- Delivery Losses
- Delivery Losses shortfall

<table>
<thead>
<tr>
<th>Category</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Losses</td>
<td>2,364 ML</td>
</tr>
<tr>
<td>Storage Losses shortfall</td>
<td></td>
</tr>
<tr>
<td>Essential Supplies</td>
<td>3,260 ML</td>
</tr>
<tr>
<td>Essential Supplies shortfall</td>
<td></td>
</tr>
<tr>
<td>QLD general use</td>
<td>2,960 ML</td>
</tr>
<tr>
<td>NSW general use</td>
<td>3,468 ML</td>
</tr>
<tr>
<td>Delivery Losses</td>
<td>4,620 ML</td>
</tr>
<tr>
<td>Delivery Losses shortfall</td>
<td></td>
</tr>
<tr>
<td>QLD general use shortfall</td>
<td></td>
</tr>
<tr>
<td>NSW general use shortfall</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25,510 ML</td>
</tr>
<tr>
<td>QLD general use shortfall</td>
<td>25,180 ML</td>
</tr>
<tr>
<td>NSW general use shortfall</td>
<td></td>
</tr>
</tbody>
</table>
Water resource forecast

Border catchment - past 24-month rainfall

Over the last 24-months, the total rainfall across the Border Rivers catchment was mostly the lowest on record. Rainfall was in the range of 400mm to 1,200mm for the 24-month period. The median annual rainfall across the Border catchment is 400-1,000mm per year.

Total NSW rainfall (mm) for 24 months - 1 November 2017 to 31 October 2019

NSW rainfall deciles for 24 months - 1 November 2017 to 31 October 2019
**Pindari Dam - past 24-month inflows/statistical inflows**

The inflows for the last 24-months were 37,000 ML which is only 45% of the minimum observed historic flows of 82,000 ML.

**Glenlyon Dam - past 24-month inflows/statistical inflows**

The inflows for the last 24-months were 31,000 ML which is higher than the minimum observed historic flows, but lower than 95th percentile flow.
Three-month weather forecast

Forecasts from the Bureau of Meteorology (BoM) indicate a warmer and drier summer ahead. The strong positive Indian Ocean Dipole (IOD) event continues, while the El Niño–Southern Oscillation (ENSO) remains neutral. The BoM indicate the positive IOD is so strong that it is likely to take several weeks to decline and could persist into mid-summer. A positive IOD typically brings below average spring rainfall to southern and central Australia, with warmer days for the southern two-thirds of the country. Positive IOD events are often associated with a more severe fire season for southeast Australia.

The figure below shows that there is a 20-40% probability of the Border Valley receiving above average rainfall during the December 2019 to February 2020 period.

Border storage forecast

Rainfall over summer is forecast to be below average and storage volumes are not expected to increase without any significant change in the weather pattern, which brings increased rainfall over the upstream catchment of the dams.

The figure opposite demonstrates the behaviour of Pindari Dam under different inflow conditions through to October 2021.

Under wet conditions (dark blue line) with 20th percentile inflows (meaning flows that are expected to exceed in only 2 years out of 10), the dam may reach 312,000 ML (100%) and spill by the end of March 2021.

Under median conditions (light blue line) with inflows expected to exceed 5 years out of 10, the storage is likely to exceed 70% capacity by October 2021. It should be noted that the storage volume does not reflect additional usage which would be expected under this scenario.
A dry scenario (green line), where conditions are expected to exceed this inflow 8 years out of 10, would still see the storage improve to above 30% capacity by October 2021.

The forecast under a repeat of minimum inflow conditions (grey line), indicates that Pindari Dam will continue to decrease until November 2020 and minor inflows will increase the storage volume to 11% capacity by October 2021.

Under wet conditions (dark blue line) with 20th percentile inflows (meaning flows that are expected to exceed in only 2 years out of 10), the Glenlyon Dam storage may reach close to 80% capacity by October 2021.
Under median conditions (light blue line) with inflows expected to exceed 5 years out of 10, the storage is likely to exceed 40% capacity by October 2021.

A dry scenario (green line), where conditions are expected to exceed this inflow 8 years out of 10, would still see the storage improve to about 30% capacity by October 2021.

The forecast under a repeat of minimum inflow conditions (grey line), indicates that Glenlyon Dam will continue to decrease until June 2020 and minor inflows will increase the storage volume to 6% capacity by October 2021.

While the short-term forecast is for dry conditions to continue through to summer, a change in weather patterns could see conditions improve quickly.

**Annual operations**

**Deliverability**

The depletion curve for Pindari and Glenlyon Dams is given in the following figures considering four options:

1. zero inflow and zero downstream tributaries
2. drought of record (pre-2004)
3. SDR1 (Synthetic Drought of Record) – last two years inflow imposed in the future
4. SDR2 (Synthetic Drought of Record) – drought of record repeated in every year.

Under zero inflow conditions, the critical time is December 2020, when Boggabilla weir will be emptied and no water will be available for release to the river from Glenlyon Dam.

**All the critical dates in the following graphs are for a zero-inflow scenario.**

![Pindari Dam forecast volume](image-url)
Note:
The forecast scenario for Pindari Dam on the opposite page is based on the end of October 2019 assessment and assumes:

- No General Security supply from 1 July 2019 onwards, and no High Security supply other than critical human needs, 300 ML/month (10 ML/d minimum release).
- In July 2020, approximately 7,000 ML will be released from Pindari Dam for storage in Boggabilla. It is assumed this will supply five to six months of water to Goondiwindi.
- No Boomi replenishment flow planned.
- Considering minimum releases from Pindari Dam according to water sharing plan.
- Pindari deep storage is 500 ML.

Note:
The above forecast scenario for Glenlyon Dam is based on the end of October 2019 assessment and assumes:

- No General Security supply from 1 July 2019 onwards, and no High Security supply other than critical human needs.
- Water has been released from Glenlyon for storage in Boggabilla. It is assumed this will supply eight months of water to Goondiwindi.
- Glenlyon Deep storage is 1,700ML.
Critical human needs

Water is being managed in the Border Rivers to meet critical human needs with a number of towns reliant upon surface water. Releases will be made to ensure supplies for towns including Goondiwindi and Boggabilla, however releases are not able to be made to supply Mungindi. Tributary inflows that occur upstream of Boggabilla, that are unable to be held in Boggabilla weir and are below the supplementary triggers, will be utilised for instream requirements to Mungindi.

Basic Landholder Rights

Under the Water Management Act 2000, extraction of water for Basic Landholder Rights (BLR) does not require a licence, although in the case of accessing groundwater under BLR the water supply work must still be approved. BLR includes water for domestic and stock purposes extracted from a water source fronting a landholder’s property or from any aquifer underlying the land.

Scenarios

Inflow scenarios and management outcomes:

1. **Inflow event upstream of the dams**
   - All small to medium inflow events up to 31,000 ML upstream of the dams will be captured in the dams to continue to support critical human needs.
   
   The current shortfall is around 31,000ML as per the 1 September 2019 resources assessment. Any inflows above the shortfall volume may be made available for general security users.

2. **Small inflow event downstream of the dams**
   - All small tributary inflows up to 5,000 ML will be captured and stored in Boggabilla weir where possible to extend supply for critical human needs.

3. **Medium inflow event downstream of the dams**
   - Tributary inflows that are above the volume able to be stored in Boggabilla weir, but are less than the supplementary event triggers (10,000 ML over two days at Goondiwindi), will be utilised for instream requirements to Mungindi.
   
   If it is clear, water will reach and fill Mungindi weir, and up to 25% of the flow as measured at Boomi will be diverted to the Boomi River (permitted under the Intergovernmental Agreement IGA).

4. **Large inflow event downstream of the dams**
   - For inflows above the supplementary trigger levels, permission will be sought from the Border Rivers Commission (BRC) to share inflows in line with the Intergovernmental Agreement. Should BRC permission be granted, permission from the NSW Department of Planning, Industry and Environment - Water (DPIE-Water) is then required to make supplementary access available for NSW licence holders.
   
   For events that will likely exceed channel capacity, permission will be sought from DPIE-Water to extract the NSW share of inflows above the channel restriction.
## Deliverability of ordered water

<table>
<thead>
<tr>
<th>River Section</th>
<th>Licence Category</th>
<th>Type of restriction</th>
<th>Period of applicability</th>
<th>Method of placing water order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenlyon Dam to the Junction</td>
<td>High Security</td>
<td>Delivery of account water only with tributary flows and not with dam releases. A water order is still required to be placed and needs to be approved by WaterNSW.</td>
<td>Until further notice</td>
<td>Only via customer help desk. Orders cannot be placed via iWAS. Confirmation of water order from WaterNSW is required.</td>
</tr>
<tr>
<td></td>
<td>General Security</td>
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<td>Domestic and Stock</td>
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<tr>
<td>Pindari Dam to the junction</td>
<td>High Security</td>
<td>Very limited access may be available, however access is most likely to become available from tributary inflows or possibly from existing river pools. A water order is still required to be placed and needs to be approved by WaterNSW.</td>
<td>Until further notice</td>
<td>Only via customer help desk. Orders cannot be placed via iWAS. Confirmation of water order from WaterNSW is required.</td>
</tr>
<tr>
<td></td>
<td>General Security</td>
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<td>Domestic and Stock</td>
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<tr>
<td>Downstream of the Junction to Mungindi</td>
<td>High Security</td>
<td>No dam releases will be made to supply orders or the Boomi replenishment flow. Limited access may become available from tributary inflows. A water order is still required to be placed and needs to be approved by WaterNSW.</td>
<td>Until further notice</td>
<td>Only via customer help desk. Orders cannot be placed via iWAS. Confirmation of water order from WaterNSW is required.</td>
</tr>
<tr>
<td></td>
<td>General Security</td>
<td></td>
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<tr>
<td></td>
<td>Domestic and Stock</td>
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<tr>
<td>All river sections</td>
<td>Local Water Utility and Town Water supplies</td>
<td>Releases will be made to ensure supplies for towns including Goondiwindi and Boggabilla, however releases are not able to be made to supply Mungindi.</td>
<td>Until further notice</td>
<td>Only via customer help desk. Orders cannot be placed via iWAS. Confirmation of water order from WaterNSW is required.</td>
</tr>
</tbody>
</table>
Critical dates

Note:
The above forecast critical dates are based on the end of October 2019 assessment, considering same assumptions in the above depletion curves of Pindari and Glenlyon Dams.

Projects

Drought response plans and investigations in the Border Rivers include:

1. Groundwater as an alternate source.
2. Bathymetry survey for Boggabilla weir.