OPERATING RULES FOR

THE LOWER GOULBURN RIVER

JUNE 2021

1 Purpose

The Goulburn River operating rules need to be updated to limit further environmental damage caused by transfers of large volumes of water over summer and autumn to the Murray River.

The total amount of water delivered from the Goulburn River to the Murray River has increased because of sustained irrigation demand in the Murray system and increased environmental flows across the South Australian border[1]. In recent years this has been exacerbated by low water availability in NSW tributaries and the sale of allocations by Goulburn entitlement holders.

Deliveries of traded water from the Goulburn system jumped from an average of 60 GL per year before 2014, to 320 GL and then 433 GL in 2017-18 and 2018-19 respectively. Similarly, the tagged use component of this trade water jumped from an average of 25 GL per year between 2007-08 and 2016-17 to about 120 GL in 2017-18 and 75 GL in 2018-19. These 2017-18 and 2018-19 water years saw record volumes of water delivered down the Goulburn River in an unseasonal pattern with constant high flows over summer, which caused damage to riverbanks, loss of important vegetation, and a reduction in native fish habitat. Ongoing monitoring, as well as advice from a scientific panel has confirmed this environmental damage[2].

Current operating rules in the lower Goulburn River have not been designed to prevent this environmental damage over summer and autumn months when natural flows in the waterway would have been lower.

The objective of the new rules is to set limits on the amount of water that can be transferred through the lower Goulburn River to the Murray River over the peak irrigation period, striking a balance between enabling trade and avoiding further environmental damage caused by high summer and autumn flows.

The rules will support delivery of legacy commitments to the Murray, and allocations traded on the southern connected Murray Darling Basin water market.

[1] *Managing Delivery Risks in the River Murray System*, MDBA 2021 - https://waterregister.vic.gov.au/images/documents/Managing-delivery-risks-in-the-River-Murray-system.pdf

[2] *Environmental risk and opportunities assessment of flow scenarios in the lower Goulburn* available at https://waterregister.vic.gov.au/

2 How the rules were developed

The proposed operating rules are informed by the findings of a scientific panel established by DELWP. This panel assessed the risks and opportunities of six different flow scenarios in the lower Goulburn River to understand the likely environmental outcomes of possible future management frameworks. The scenarios were designed to identify the most important aspects of the summer and autumn flow regime for environmental outcomes and where opportunities to supply water to downstream areas can be maximised.

The ecological risk assessment was a key input but given that the Goulburn River is a 'sustainable working river', it must be managed to provide a broad range of social, economic, environmental, and cultural benefits. The new operating practices and rules have been developed with consideration of all these benefits.

The scientific panel was given an opportunity to comment on the environmental consequences to the lower Goulburn of the proposed operating rules, as these are different to the six flow scenarios assessed by the panel. Noting there is scientific uncertainty in predicting such outcomes, the panel advised that the proposed rules would avoid the kind of environmental damage to the river caused in 2017/18 and 2018/19.

3 Goulburn River operating rules

The operating rules apply to **regulated** flows managed from Goulburn Weir and measured at McCoys Bridge gauging station[3]. They do not apply to natural unregulated flows. Regulated flows include all water released to first meet passing flow commitments, then IVT deliveries and then environmental water orders (including Goulburn Water Quality reserve). The operating rules include the following base flow and pulse components. Note these are maximum flows and the actual volume of IVT delivered will depend on the volumes required after taking into necessary variations to the default delivery pattern.

Base flow

- The base flows specified below are the maximum monthly averages for river operators to target during regulated periods outside pulses[4]
    - 1 July to 31 October: average monthly flow of 1,300 ML/day[5]
    - 1 November to 30 June: average monthly flow of 1,100 ML/day.
- Base flows must be varied over the year to avoid erosion. The base flow must be varied at least weekly by at least 150 ML/day with larger variations where desirable.
- Between 1 November and 30 June base flows may be varied up to 1,360 ML/day.
- Between 1 July and 31 October base flows may be varied up to a ceiling agreed with the environmental manager.

See **Appendix 1 – Estimated volumes of monthly flows** for more information.

Timing of pulses during summer and autumn

- The first pulse following the environmental spring fresh may not occur until average regulated flows are equal to or less than 1,100 ML/day for at least 6 weeks (or 42 days)[6]. This means that the timing of the pulse will depend on the natural and environmental freshes that occur prior to 30 October (see section below on assumptions regarding timing of environmental freshes).
- A second pulse may commence when average flows have been equal to or less than 1,100 ML/day for at least 28 days.
- A third pulse (and any subsequent pulses) may commence when average flows have been equal to or less than 1,100 ML/day for at least 35 days.

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[3] Except during periods when high unregulated flows between the Murchison and McCoys Bridge gauging stations make this impractical and the flow rates then apply to regulated flows at Murchison.

[4] In practice, this means that when the full capacity of these base flows is required, river operators should aim meet these monthly average flow rates within a 5 per cent operational tolerance to be reflective of the capacity to measure and control flows. River operators should discuss any significant variations from this target with environmental managers. The monthly average should be based only on days when flow at the Murchison gauging station is regulated, and no pulses (or freshes), recession flows, or blackwater flows are occurring.

[5] A higher base flow than the 1,300 ML/day winter and spring limit was not adopted because of the risks of notching the lower bank associated with higher base flows.

[6] Where possible, river operators will aim to have 8 weeks (or 56 days) of lower 1,100 ML/day average regulated baseflows before the first pulse to achieve better ecological outcomes

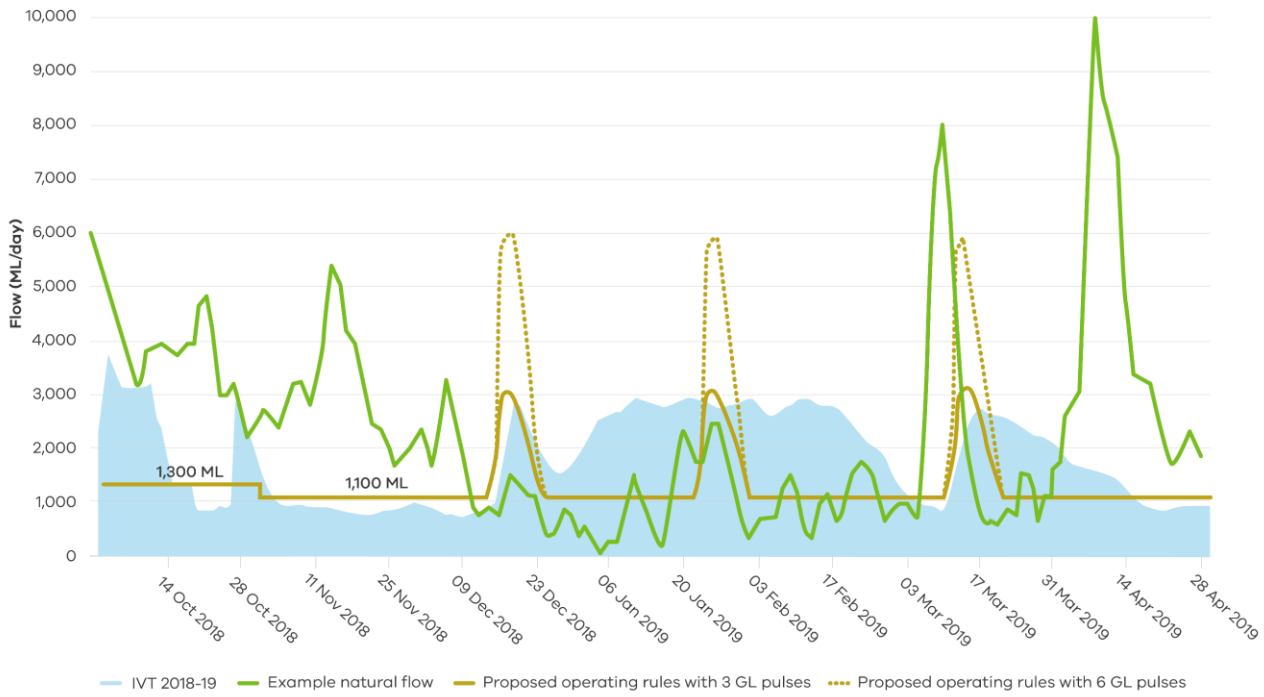


Figure 1: Example of natural variable flows compared to proposed base flow and pulses from October to April

Shape of pulses

- Pulses of up to 3,000 ML/day, or 6,000 ML/day (pending the outcomes of feasibility work) may be delivered in accordance with defined rates of rise and fall between 1 November and 30 April.
- The proposed target rate of rise is less than or equal to 0.8 m/day.
- The proposed target rates of fall are:
    - 0.4 m/day when flows are greater than 3,000 ML/day
    - 0.25 m/day when flows are less than 3,000 ML/day.

See **Appendix 2 – Pulse flow rates, water levels and rates of rise and fall** for more information.

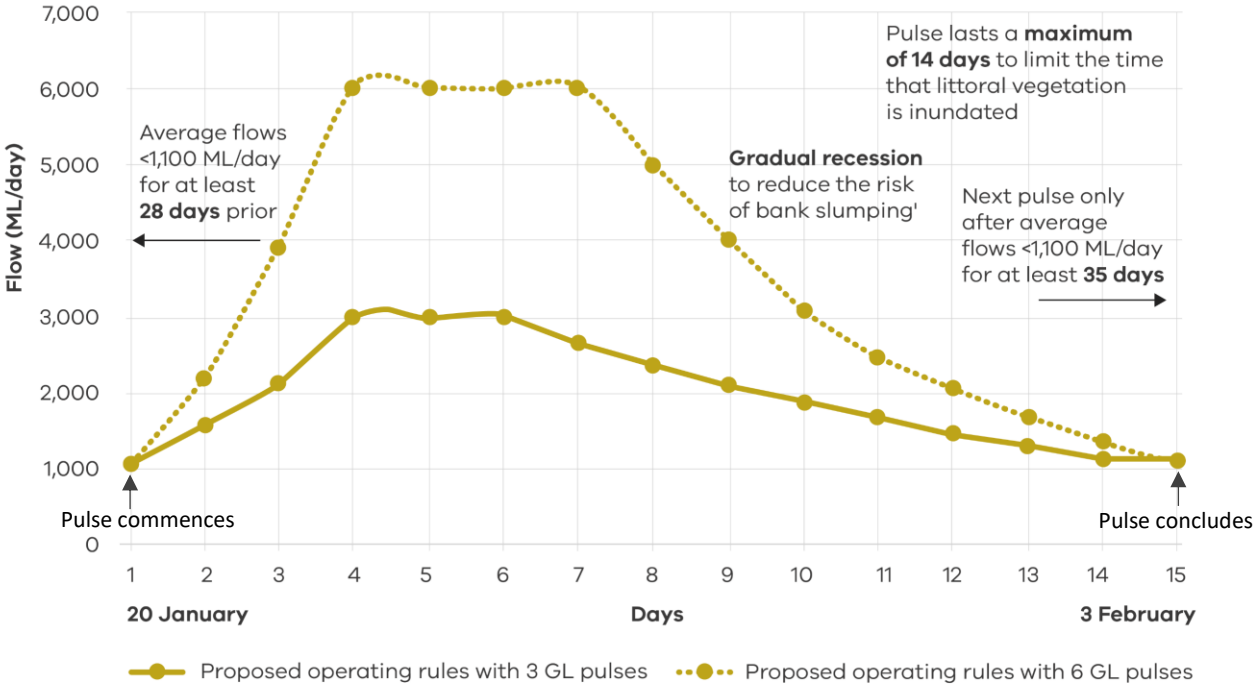


Figure 2: Example pulse

Unregulated flows and complementary environmental considerations

Throughout the year, IVT delivery can be used to achieve shared benefits. Additionally, environmental water deliveries may be delivered up to the prescribed height, shape and timing of pulses in these rules.

Shoulder season flexibility

- Between 1 May and 31 October pulses of IVT deliveries and/or environmental water deliveries may occur on top of prescribed base flow limits – this will be informed by consultation with environmental managers.
- Between 1 November and 30 April, pulse flows may exceed 6,000 ML/day on advice of environmental managers and agreed to by river operators.
- Between 1 November and 30 November, environmental managers may advise river operators that a late spring fresh is more desirable than the prescribed 6-week base flow prior to the first pulse. If this is the case:
    - River operators will consider if IVT pulses can be brought forward, so the first pulse occurs in November
    - If it is not desirable for an IVT pulse to occur in November, environmental managers may seek an additional pulse of environmental water in November. This will not preclude the first IVT pulse occurring in December.
- Between 1 March and 30 April, environmental managers may advise river operators that an autumn fresh is more desirable than the prescribed 35-day base flow period between pulses.

Regulated releases to manage water quality issues

- When environmental managers advise river operators that additional flow will help mitigate lower Goulburn water quality issues, river operators may agree to additional regulated releases.
- These releases will be comprised of IVT delivery as a priority, and alternatively may be either environmental water or the Goulburn Water Quality Reserve.[7]

Regulated releases to manage recession following unregulated flows

- When, after an unregulated flow event in the lower Goulburn River, environmental managers advise river operators that a recession flow is required to slow the rate of fall to protect the banks (erosion), river operators may agree to additional regulated releases.
- These releases will be comprised of IVT delivery as a priority, and alternatively environmental water.

Calculating average base flows

In calculating the timing between pulses, the following events should be excluded from calculating average baseflows:

- Unregulated flows on the lower Goulburn River.
- Late spring fresh deliveries between 1 November and 30 November.
- Autumn fresh deliveries between 1 March and 30 April
- Regulated releases to manage water quality issues.
- Regulated releases to manage recession following unregulated flows.

[7] defined in Schedule 3 of *Bulk Entitlement (Eildon – Goulburn Weir) Conversion Order 1995*

4 Reviewing the rules

Because environmental condition depends on many factors, it is difficult to be certain how the river will respond. An adaptive management approach is proposed with an option to review the rules in three years (i.e. by June 2024). Such a review should be informed by monitoring of environmental condition and scientific evaluation of that monitoring.

An earlier review by DELWP should be triggered if the extent of mass failure of the banks at designated reaches at McCoys Bridge caused by regulated flows increase by more than 10% or if other significant issues arise.

Base flows for the period 1 May to 31 October may be reviewed sooner to incorporate up to date flows studies and outcomes from scientific analysis and monitoring.

Relocating pump infrastructure

Existing operating practices limit pulses in the lower Goulburn River between December and April to a maximum of 3,000 ML/day to protect in-channel private pump infrastructure in use over that period. Implementation of the proposed pulses of up to 6,000 ML/day would likely require a program of works to relocate pumps up on top of riverbanks, in consultation with affected landholders, to enable higher flows to be delivered while mitigating impacts on diverters' ability to access water and/or damage to in-channel infrastructure. A feasibility study will be undertaken to determine the number of pumps that would be impacted by pulses up to 6,000 ML/day over the summer and autumn period and to inform any adjustments to the timing, height and shape of pulses above 3,000 ML/day.

5 Expected benefits of new operating rules

Drawing on the analysis and advice from the scientific panel, it can be expected that the proposed rules would avoid the kind of damage to the river caused in 2017/18 and 2018/19, protect Aboriginal Victorian cultural values from unseasonal high flows and maintain or improve outcomes for recreational values.

It is expected that by implementing the proposed operating rules it would:

- Likely enable the river to slowly rehabilitate, with continuation of environmental flow management through winter and spring.
- Substantially reduce the risks of erosion compared to recent years.
- Avoid erosional 'notching' of riverbanks by varying flows, preventing steepened banks that are more prone to mass failure/ erosion.
- Result in more prevalent flood-tolerant vegetation along the edges of the riverbank (though likely limited to a narrow band), and maintained or increased vegetation along the lower elevations of the banks.

The panel's ecological risk assessment and associated discussions noted that the following have also been accounted for as part of developing the proposed operating rules:

- Provide sufficient time for small bodied fish to breed over summer months by providing a period of lower flow in the warmer months of at least four weeks.
- Enable vegetation along riverbank edges to establish after spring high flows recede.
- Avoid prolonged inundation of vegetation along riverbank edges over the summer months by limiting inundation to about two weeks (for a single event).
- Provide about four weeks of lower flows for vegetation along riverbank edges to recover after a summer pulse.
- Consider coordinating higher flows with tributary inflows to raise sediment and seeds onto banks to assist with vegetation regeneration.

The current habitat and flow-regulated conditions for small-bodied and large-bodied fish species for low-flow (summer/autumn) months would be maintained.

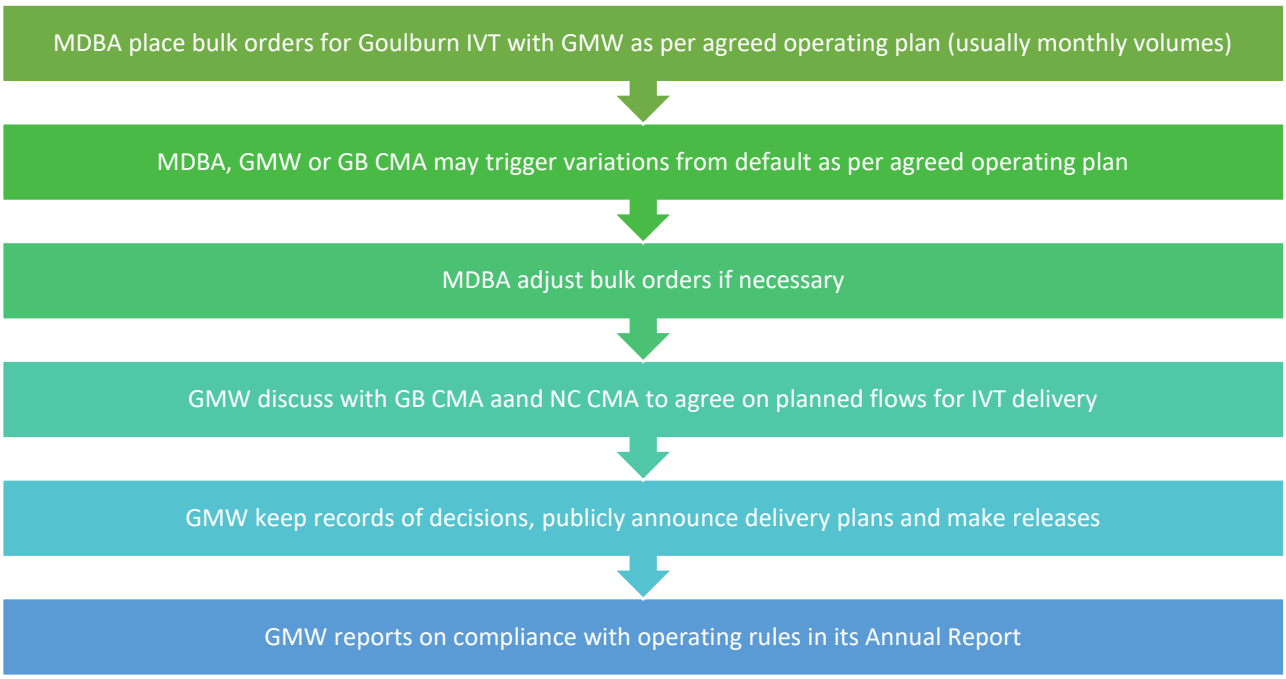
The proposed operating rules have also been designed so that:

- Legacy water delivery commitments could be comfortably met, without using all available capacity so that there is scope for further transfer of traded water.
- The volume of 205 GL of IVT delivered in 2019/20 could be accommodated, including 125 GL between 1 December and 28 February assuming pulses of 3,000 ML/day are possible.
- If works were done to enable 6,000 ML/day pulses, the volume that could be delivered between 1 December and 28 February could increase to 170 GL.
- There is scope for river operators to better align IVT delivery with lower Murray irrigation demand patterns.
- Additional transfers would be possible in the shoulder months of October and November and March and April.

6 Operational responsibilities

The operating rules are proposed to be authorised in *Bulk Entitlement (Eildon – Goulburn Weir) Conversion Order 1995*. The river operators responsible for delivering regulated flows in accordance with the proposed new operating rules are Goulburn-Murray Water (GMW) and Murray-Darling Basin Authority (MDBA). The environmental managers with responsibilities related to delivering water within the proposed new operating rules are Goulburn-Broken Catchment Management Authority (GB CMA).

The figure below sets out the proposed process for delivering Goulburn IVT within these new operating rules (including deliveries via Lower Broken Creek and Campaspe River). An operating plan with MDBA is proposed, in accordance the *Murray-Darling Basin Agreement (Schedule D — Adjusting Valley Accounts and State Transfer Accounts) Protocol 2010*. The operating plan will specify default monthly volumes of Goulburn IVT delivery, and triggers for varying from the default in response to seasonal conditions (including flooding, unexpected demand, complementary environmental outcomes and Lake Victoria operations).



Orders for any environmental water to be delivered on top of Goulburn IVT will be placed through existing processes (i.e. GB CMA, on behalf of the Victorian Environmental Water Holder, place orders with GMW who assess whether the orders can be met within operational constraints, including proposed new operating rules).

7 Conclusions and next steps

These proposed operating rules will support improved outcomes for the lower Goulburn River into the future compared to current arrangements and underpin the development of improved rules for Goulburn to Murray trade and IVT delivery.

The proposed operating rules should be implemented alongside any changes to trade rules to ensure that water that is traded from the Goulburn to the Murray can be delivered in accordance with the operating rules and without adverse impacts to Victorian Murray entitlements or increasing delivery shortfall risks.

Appendix 1 – Estimated volumes of monthly flows

Table 1 – Monthly flow associated with the proposed operating rules using a design pulse with a peak flow of 6,000 ML/day (note: this is the total flow, including the minimum flows in the lower Goulburn River at McCoys Bridge gauging station, excluding environmental release events outside of the November to April period.

Month	No. Days	Pulse	Baseflow (average ML/day)	Baseflow Volume (total ML)	Pulse Volume (total ML)	Total Volume (ML)
July	31	No	1,300	40,300	0	40,300
August	31	No	1,300	40,300	0	40,300
September	30	No	1,300	39,000	0	39,000
October	31	No	1,300	40,300	0	40,300
November	30	No	1,100	33,000	0	33,000
December	31	Yes	1,100	34,100	35,361	69,461
January	31	No	1,100	34,100	11,787	45,887
February	28	Yes	1,100	30,800	23,574	54,374
March	31	No	1,100	34,100	35,361	69,461
April	30	No	1,100	33,000	0	33,000
May	31	No	1,100	34,100	0	34,100
June	30	No	1,100	33,000	0	33,000
TOTAL				**426,100**	**106,083**	**532,183**

Table 1 – Monthly flow associated with the proposed operating rules using a design pulse with a peak flow of 3,000 ML/day McCoys Bridge gauging station, excluding environmental release events outside the November to April period.

Month	No. Days	Pulse	Baseflow (average ML/day)	Baseflow Volume (total ML)	Pulse Volume (total ML)	Total Volume (ML)
July	31	No	1,300	40,300	0	40,300
August	31	No	1,300	40,300	0	40,300
September	30	No	1,300	39,000	0	39,000
October	31	No	1,300	40,300	0	40,300
November	30	No	1,100	33,000	0	33,000
December	31	Yes	1,100	34,100	12,878	46,978
January	31	No	1,100	34,100	4,293	38,393
February	28	Yes	1,100	30,800	8,585	39,385
March	31	No	1,100	34,100	12,878	46,978
April	30	No	1,100	33,000	0	33,000
May	31	No	1,100	34,100	0	34,100
June	30	No	1,100	33,000	0	33,000
TOTAL				**426,100**	**38,634**	**464,734**

Appendix 2 – Pulse flow rates, water levels and rates of rise and fall

Table 2 – Approximate shape of 3,000 ML/day design pulse

Day	Flow (ML/day)	Approximate water level (m)	Approximate change in water level (m)[1]
1	1,100	0.92	n/a
2	1,561	1.3	0.38
3	2,111	1.68	0.38
4	3,000	2.13	0.45
5	3,000	2.13	0
6	3,000	2.13	0
7	2,642	1.98	-0.15
8	2,357	1.83	-0.15
9	2,111	1.68	-0.15
10	1,883	1.53	-0.15
11	1,669	1.38	-0.15
12	1,467	1.23	-0.15
13	1,277	1.08	-0.15
14	1,100	0.92	-0.16
15	1,100	0.92	0

1. Based on Murchison gauge; 2. The river operator would be asked to vary the pulse at the peak

Table 2 – Approximate shape of 6,000 ML/day design pulse

Day	Flow (ML/day)	Approximate water level (m)	Approximate Change in water level (m)[1]
1	1,100	0.92	n/a
2	2,175	1.72	0.8
3	3,933	2.52	0.8
4	6,000[2]	3.32	0.8
5	6,000	3.32	0
6	6,000	3.32	0
7	6,000	3.32	0
8	4,979	2.94	-0.38
9	4,010	2.56	-0.38
10	3,072	2.18	-0.38
11	2,451	1.88	-0.3
12	2,032	1.63	-0.25
13	1,669	1.38	-0.25
14	1,340	1.13	-0.25
15	1,100	0.92	-0.21

1. Based on Murchison gauge; 2. The river operator would be asked to vary the pulse at the peak

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