



NSW Regional Water Strategies

Draft Connectivity Options

November 2021

Approach to today

1. Connectivity options

- North-west Flow Plan review
- Draft Western Regional Water Strategy connectivity options
- Process for seeking feedback on the s324 critical dry needs triggers

2. Cease to flow and low flow data

- Discussion on data and clarifications sought from Wentworth Group

1. *Water Management Act 2000 – S324*

- Not hard-wired into water sharing plans
- Can be implemented now
- May be replaced by longer-term approach
- Meets critical needs only

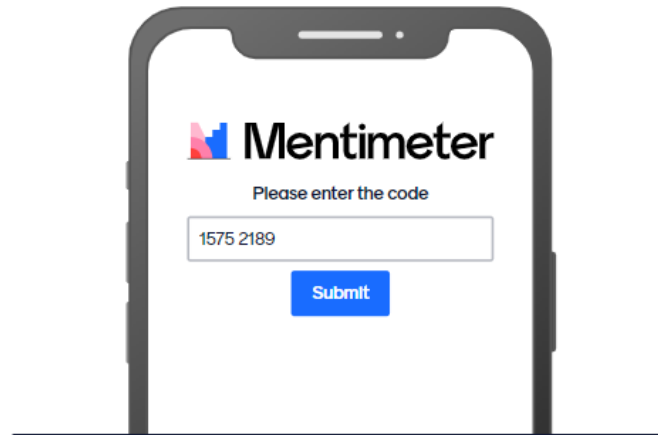
2. Regional Water Strategy and Water Sharing Plans

- May require plan amendments
- Detailed modelling of benefits and impacts

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Agenda item 4: North-west flow plan

What is the North-west flow plan?

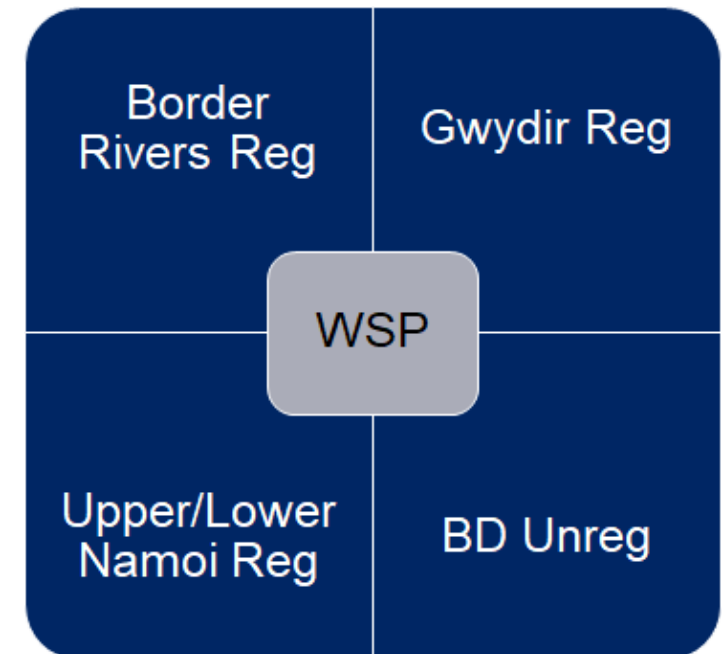
Interim Unregulated Flow Management Plan for the North-west 1992 (North-west Flow Plan)

What is the purpose of it?

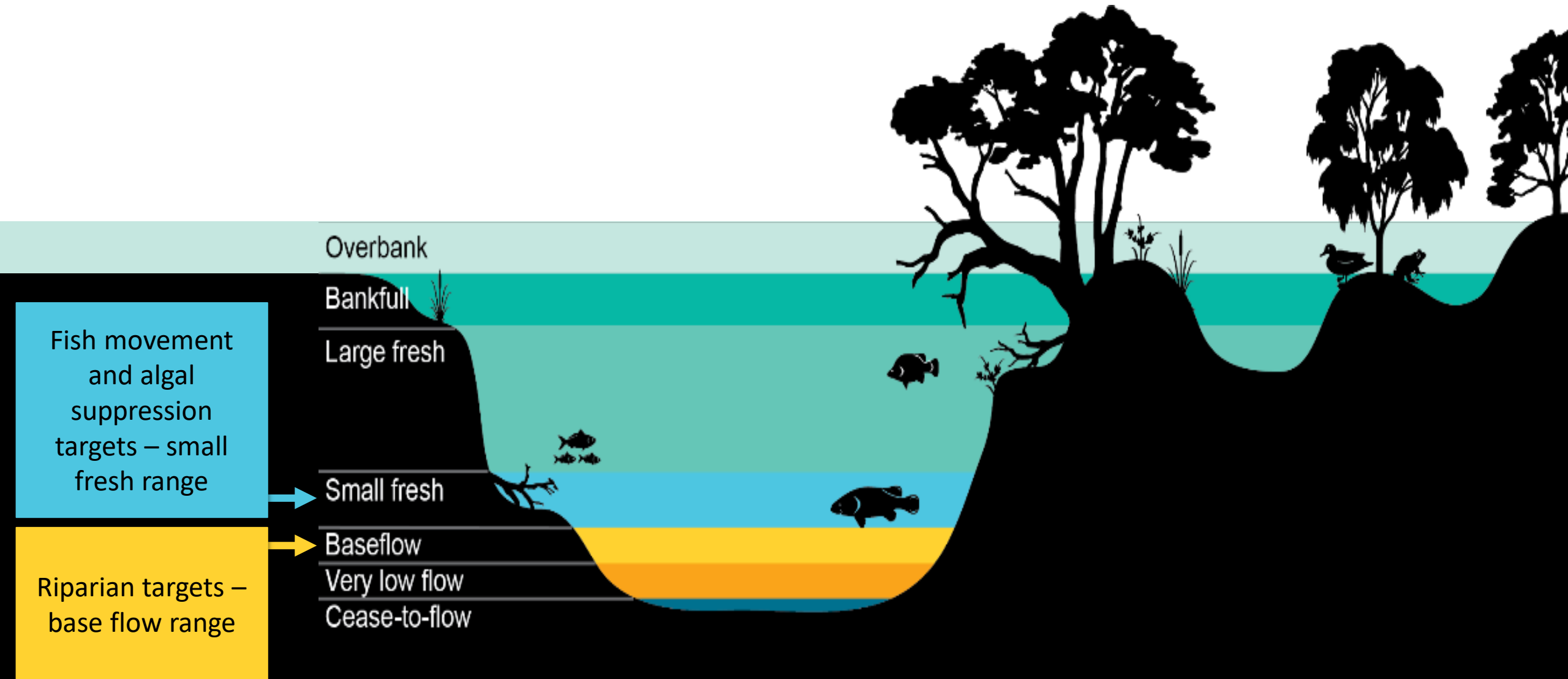
- Limit access to lower priority licences upstream when targets in the Barwon-Darling have not been met

How does it aim to achieve its purpose?

- To meet Barwon-Darling River flow targets the plan limits:
 - Supplementary access in the northern Basin tributaries
 - B- and C-class access in the Barwon-Darling
- The targets are flows required to:
 - meet **riparian** (now called Basic Landholder) rights
 - create opportunities for **fish passage** across the major weirs
 - suppress blue-green **algal blooms**



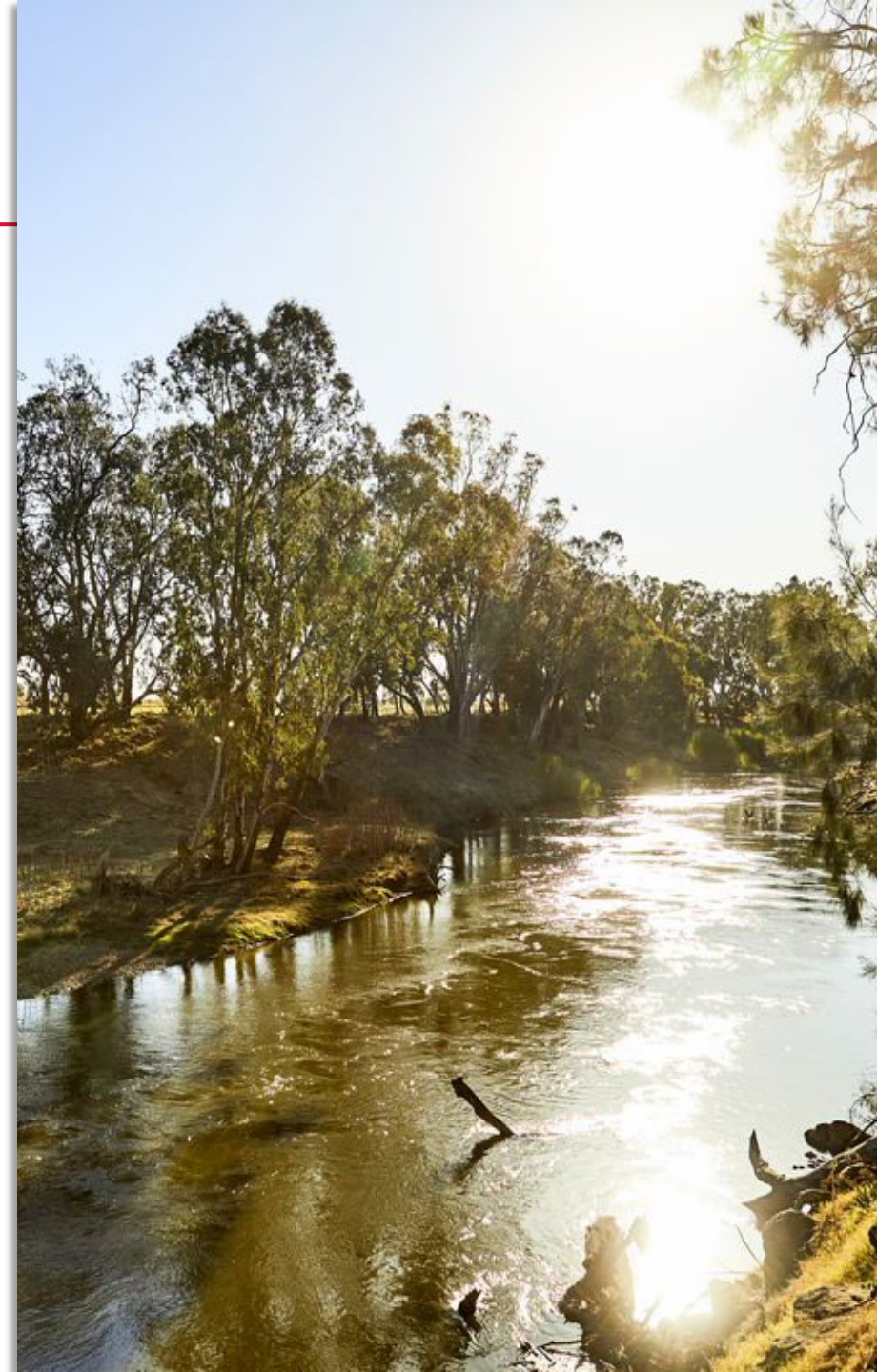
What is the North-west flow plan?



Reviewing the North-west Flow Plan

Alluvium engaged to review the plan. The review involves:

- **A literature review** and suggested revised/updated targets
- **Agency interviews** to establish current procedural practice and identify barriers
- **Analysis of flows** against the current North-west Flow Plan targets and the updated targets using a mass balance spreadsheet and the Barwon-Darling Source model over a 16-year period (2004-2020)



Overview of initial draft outcomes

The interim findings from DPIE-Water and Alluvium are:

- Limiting Supplementary access, and B- and C-class access rarely creates flow events that meet the targets, but adds days/volumes to existing flow events (based on assessment of last 16 years)
- There are a range of options around implementing the targets based on changes since 1992 and updated science
- Most of the barriers to implementation have been overcome, especially flow forecasting

Note: these are interim findings and have not been finalised. They are being presented for the purposes of transparency and to seek feedback before the review is finalised

Question 1: Are the riparian targets still appropriate?

What has happened since 1992?

A-class pump thresholds have been increased twice

- A-class thresholds are now above the NW flow plan riparian targets for most locations
- but the NW Flow Plan only restricts B- and C-class

Resumption of Flow rule has been implemented

- has more conservative triggers during dry periods than the NW Flow plan
- designed for the same objectives as the NW Flow plan targets - protect flows for basic landholder rights and towns

Supplementary sharing rules have been put in place

- Mungindi target – supplementary events can only be announced if the flows are likely to be over 10,000 ML at Goondiwindi and 2,000ML downstream of Goondiwindi over two consecutive days.

Multiple different targets and rules makes it operationally more difficult to implement

- Overlap with resumption of flow rules
- Simplicity is important for implementation

Other water management changes

- Metering now required on a range of pump sizes
- MDB cap on extractions and WSP extraction limits
- Off allocation take subject to licence conditions/ volume limits
- Rules for sharing between users and the environment

Question 1: Are the riparian targets still appropriate?

Location	NW Plan riparian targets	WSP 2020 class thresholds		Resumption of Flow targets	
		A class** (ML/day)	B class	Restrict access	Lift restriction
Mungindi	850*	198	230		
Collarenebri	760*	317	500		
Walgett	700	600	900	<326 for 150 days	>706 for 10 days
Brewarrina	550	550	840	<468 for 150 days	>1008 for 10 days
Bourke	390	605	1250	<450 for 120 days	>972 for 10 days or 30 GL past Bourke
Louth	280	555	1130		
Wilcannia	150	455	850	<200 for 90 days	>400 for 10 days

* Mungindi target – supplementary events can only be announced if the flows are likely to be over 10,000 ML/day over two consecutive days at Goondiwindi.

*New A class CtP thresholds are those recommended by NRC review, and meet low flow needs

Question 1: Are the riparian targets still appropriate?

Option	Comments
1. Implement existing targets	Operationally difficult to implement or understand Does not take into account recent changes or updated science
2. Remove riparian targets Instead rely on A-class cease to pump thresholds and resumption of flow rule	Does not recognise that northern valley flows contribute to the Barwon-Darling However, impacts and benefits are known and we know it can be implemented
3. Remove current targets but extend RoF rule to apply to supplementary access in the tributaries	Based on updated science and recent changes Easier to understand and implement Could meet expectations around improving connectivity but impacts and benefits requires more work

Question 2: are the algal suppression targets still appropriate?

Purpose of algal suppression target: seasonal flow to “flush” the system with smaller flows to replace water in weirs to minimise the conditions for algal growth

Option	Comments
<p>Option 1: maintain current targets:</p> <ul style="list-style-type: none">• 2,000_ML/d at Wilcannia for 5 days between October and April• At least once in the previous three months.	<p>Based on outdated science</p>
<p>Option 2: update targets to align with the long term water plan:</p> <ul style="list-style-type: none">• 3,000 ML/day for 7 days at Wilcannia, if flows fall below the following triggers throughout the spring/summer period:• Walgett – 250 ML/d• Brewarrina – 510 ML/d• Bourke – 450 ML/d• Wilcannia – 350 ML/d	<p>Aligns with targets in the Long term water plan</p> <p>Impacts and benefits requires more work</p>

Question 3: are the fish passage targets still appropriate?

Purpose of fish suppression target: to “drown out” the weirs (Brewarrina and Bourke) to enable fish migration

Note the North West Unreg Flow plan states “once the fishways are operational, the target flows for fish migration will be suspended”

What has happened since 1992?

- Brewarrina fishway installed
- Options to upgrade Bourke weir and install a fishway, as well as option to install fishways on a range of weirs
- Recovery of water for the environment which can be used to support fish movement activities – e.g. Northern Fish Flow event, Northern Connectivity event
- Walgett weir upgraded with a fishway
- Work to start on the Wilcannia weir upgrade and fishway early in 2022.

Question 3: are the fish passage targets still appropriate?

Option	Comments
<p>1. Implement existing targets</p> <ul style="list-style-type: none">• 14,000 ML/d at Brewarrina AND/OR• 10,000 ML/d at Bourke• must be met for five days between September and February, unless two such flows have already occurred in this period.	<ul style="list-style-type: none">• Implements intent of the north west flow plan, and can be done now• May become redundant once fishways are installed at weirs.
<p>2. Infrastructure solution</p> <p>Install fishways at Bourke (and other weirs), remove some non-town weirs and remove the fish passage targets.</p>	<ul style="list-style-type: none">• Reinstates fish passage• Implements intent of the north west flow plan• Removal of some non-town weirs can help improve flows down the system, but needs consultation with landholders• Timeframes for implementing infrastructure changes may be a few years away.
<p>3. Change the purpose of the rule and update the fish passage targets to help improve the health of fish to:</p> <ul style="list-style-type: none">• 15,000 ML/d at Bourke between July and September (dispersal and condition)• 15,000 ML/d at Bourke between October and April (spawning)• 14,000 ML/d for 15 days at Brewarrina between October and April	<ul style="list-style-type: none">• Will change the purpose and intent of the north west flow plan – the plan states that the fish passage targets should be removed once fishways are installed• Impacts and benefits unknown at this stage• Can help support the improvement of fish health.

Process to amend targets in North-west flow plan

- 2021 changes to Border Rivers WSP require the north west flow plan targets to be reviewed by an independent expert panel and, if changes recommended, views sought from the public.
- Requires assessment of:
 - critical needs of the environment, basic landholder rights, domestic and stock, towns in the Barwon-Darling River
 - adequacy of targets to meet these needs
 - impact of any changes on supplementary access.



Next steps

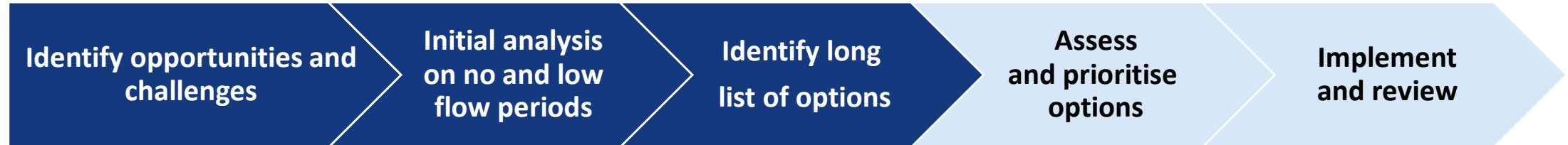
- Review and finalise Alluvium report
- Undertake impact analysis on preferred options
- Activate expert panel
- Public consultation
- Implementation (if needed, amend water sharing plans).





Agenda item 5: Connectivity options in the draft Western Regional Water Strategy

Process for investigating Connectivity options



Important

- All options can be considered in the “long list”
- Benefits / impacts will vary between options
- **Not all options will progress**
- There will be trade-offs in improving connectivity.

Connectivity options: Policy, Planning and Operational options

Temporary water restrictions

Initial proposals have been presented to this group

Water for the environment – prioritising connectivity between catchments for environmental water deliveries

From DPIE - Water

End of system flows – changing or developing end-of-system flow targets in the Macquarie–Castlereagh, Gwydir, Namoi and Border Rivers valleys

From DPIE - Water

Dam reserves - increasing dam reserves in the northern tributaries to store and deliver water to the Barwon-Darling

From DPIE - Water

Connectivity options: Policy, Planning and Operational options

Reviewing and implementing the north west unregulated flow plan

Initial proposals have been presented to this group

Strategic purchase of licences

Being considered under Better Baaka

Review B and C-class licence thresholds

Recommendation from NRC review

Deliver water down the Great Darling Anabranch : Formalising arrangements to deliver water from Lake Cawndilla to the Murray River via the Great Darling Anabranch

From DPIE - Water

Climate change preparedness: Identify gaps in the frequency and adequacy of different flow types under climate change scenarios and investigate options to protect relevant flows

From DPIE Water and EES

Connectivity long list of options: Infrastructure Options

Changing weirs:

- Upgrading some weirs with fishways / gates
- Management or decommissioning of some non-town weirs
- Raising some town weirs

Being considered under Better Baaka

Regulating the Barwon-Darling:

- Feasibility study for an additional headwater storage for the Barwon–Darling in the Border Rivers or Namoi valleys

From DPIE - Water

Removing unapproved floodwork structures - Modify or remove 8 Identified floodwork structures causing adverse impacts

From healthy floodplains reforms

Targeting connectivity options to achieve realistic outcomes

What the data has told us

- There have always been periods of no flow in the Barwon-Darling.
- **It is not possible to maintain a constantly flowing river.**
- Low flows and short cease to flows are impacted by both development and the climate
- Long cease to flow events are primarily driven by the climate
- Climate change could mean more extreme wet and dry periods

What does this mean for low and no flow connectivity options?

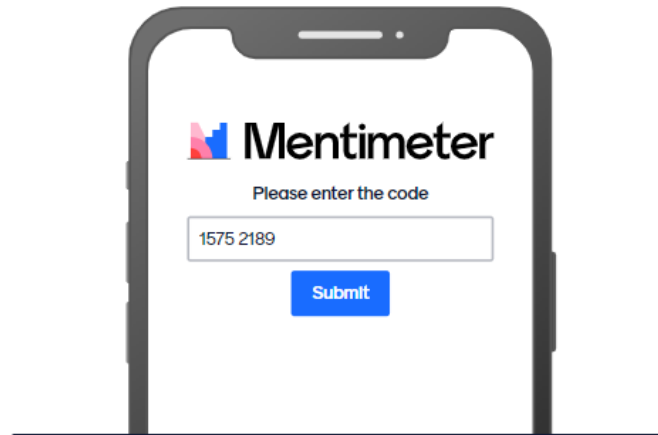
We can either:

- (1) Focus on measures to provide water moving between dry and wet periods, OR
 - (2) Undertake wholesale reform to try and reduce extended dry periods which may mean more and larger storages, and holding water back for much longer
- (2) Is a discussion that would need to be had as part of Basin plan 2.0 – it is not a short term option that NSW can do on its own

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Please identify any options that haven't been considered

Options	
1. Temporary water restrictions	7. Review B and C-class licence thresholds
2. Using water for the environment to achieve connectivity objectives	8. Deliver water down the Great Darling Anabranch
3. Changing end of system flows	9. Climate change preparedness:
4. Increasing dam reserves	10. Changing weirs
5. Reviewing and implementing the North West Unregulated Flow Plan	11. Regulating the Barwon-Darling
6. Strategic purchase of licences	12. Removing unapproved floodwork structures

What additional information would you require to consider these options?

Options

- | | |
|---|---|
| 1. Temporary water restrictions | 7. Review B and C-class licence thresholds |
| 2. Using water for the environment to achieve connectivity objectives | 8. Deliver water down the Great Darling Anabranch |
| 3. Changing end of system flows | 9. Climate change preparedness: |
| 4. Increasing dam reserves | 10. Changing weirs |
| 5. Reviewing and implementing the North West Unregulated Flow Plan | 11. Regulating the Barwon-Darling |
| 6. Strategic purchase of licences | 12. Removing unapproved floodwork structures |



Agenda item 6: Process for feedback on critical dry needs triggers for s324 orders in relation to first flush management

Recap

- Discussion paper has been circulated.
- Comments are due by 20 December 2021
- Responses to comments will be circulated in 2022
- Revised triggers will be publicly consulted on in 2022





Agenda item 7: Cease to flow and low flow data analysis – response to Wentworth Group questions

Wentworth Group Questions



Wentworth Group Comment

DPIE-Water response

1. Cease to flow periods and missing data

DPIE-Water has assumed a cease to flow event for periods where there is missing data

Why was the modelled data, and inferences of cease to flow events for missing data in the observed record not ground-truthed against other lines of evidence?

1886 to 1902 over estimated and confuses low flows with no flow

This is incorrect. DPIE-Water took deliberate care to not assume cease to flow events for missing data. The full details of how missing data was analysed, the decisions made and reasons why are published with the data sheets. DPIE-Water is happy to work through specific events if there is a mistake.

The purpose of the analysis was to investigate what the primary record could tell us about cease to flow and low flow periods. Ultimately, the analysis will be undertaken through model runs which pull in multiple lines of evidence and can help paint the picture across catchments. However, there is some suspicion about data and model runs amongst some stakeholders, which is why we have presented the primary record.

DPIE-Water does not agree with the comment that we confused low flows with no flow. Table 1a in the Wentworth Group critique looks similar to our analysis given monthly vs daily data.

2. Macquarie catchment rain

Comments that given there was rain the in the Macquarie, the catchment should have flowed

Need to consider how dry catchments are. We know that all rain is not equal for producing runoff. Examples of "green droughts" in the last 20 years where semi-frequent light rainfall all soaks in and does not produce notable runoff events – see following slides

MACQUARIE RIVER AT NARROMINE

2. Macquarie catchment rainfall and river flows response continued

- Monthly flows in the Macquarie during the federation drought show multiple periods of cease to flow and the river did not flow continuously in 1902 as asserted by Dr Colloff.
- This table is from the same Water Resources Commission report cited by Dr Colloff
- This report will be published on our website

Year 1901					Year 1902				
Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	..	..	..	..	Jan.	71	43	49	3,052
Feb.	..	..	..	..	Feb.	43	8	19	1,072
Mar.	..	..	..	..	Mar.	7	3	4	244
Apr.	..	..	..	..	Apr.	3	0	1	28
May	..	..	..	..	May	0	0	0	0
June	1654	321	550	32,984	June	0	0	0	0
July	522	263	365	22,628	July	71	0	11	710
Aug.	14108	230	2825	175,168	Aug.	86	43	57	3,528
Sept.	7104	495	1612	96,704	Sept.	185	53	99	8,936
Oct.	4566	297	598	36,934	Oct.	86	34	56	3,500
Nov.	2736	230	686	41,146	Nov.	43	19	21	1,286
Dec.	207	71	111	6,856	Dec.	4099	19	625	38,750
Total	..	..	..	..	Total	..	..	..	58,106

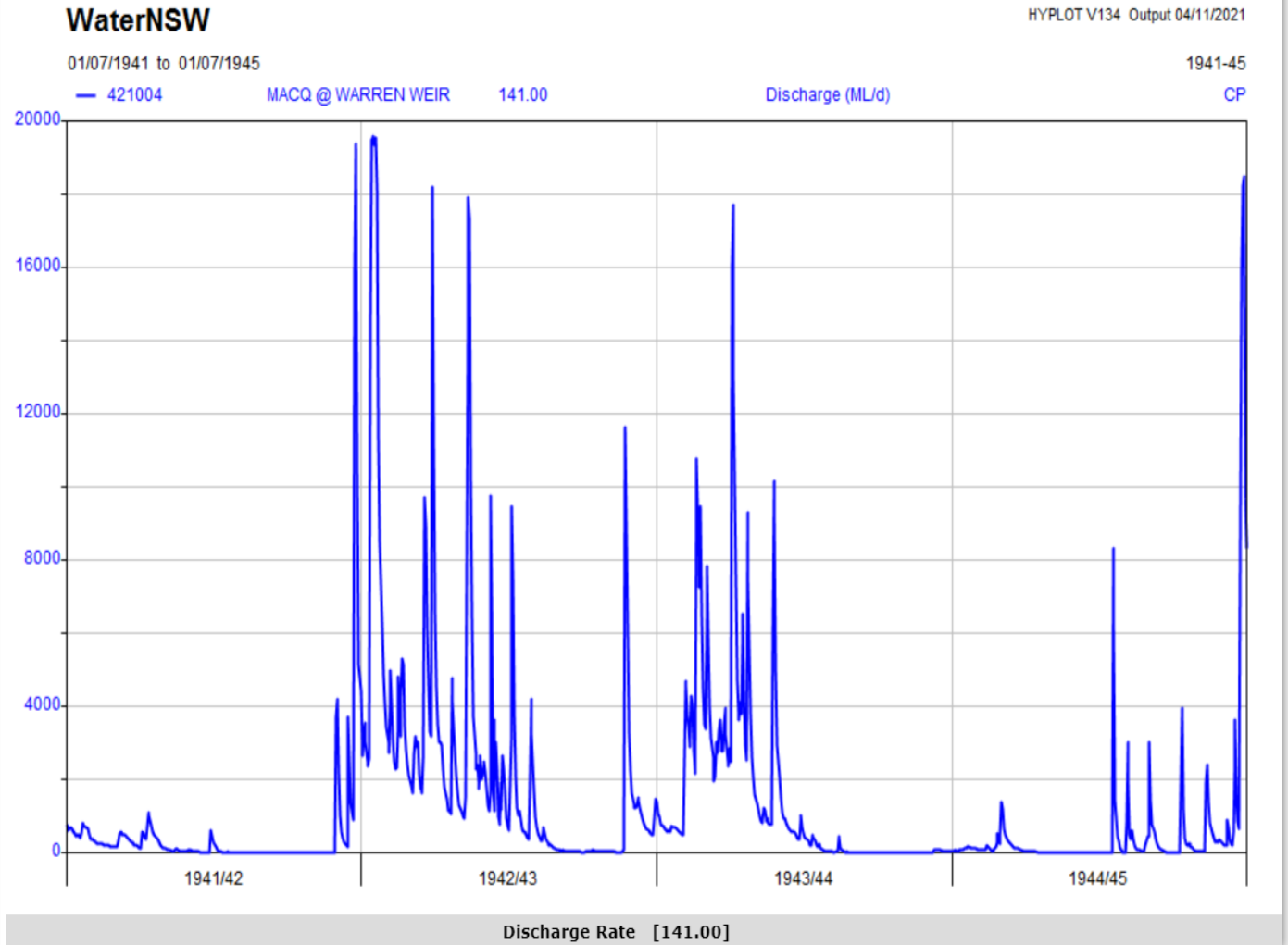
Year 1903					Year 1904				
Jan.	162	16	46	2,840	Jan.	No Records			16,700*
Feb.	12	0	6	334	Feb.	No Records			1,900*
Mar.	86	0	12	716	Mar.	No Records			18,600*
Apr.	11580	12	989	59,324	Apr.	2430	71	269	16,164
May	No Records			29,900*	May	132	71	75	4,644
June	No Records			23,300*	June	71	53	54	3,234
July	No Records			11,000*	July	No Records			97,500*
Aug.	No Records			42,500*	Aug.	No Records			37,000*
Sept.	No Records			134,500*	Sept.	No Records			26,300*
Oct.	No Records			88,700*	Oct.	No Records			31,200*
Nov.	No Records			26,200*	Nov.	No Records			8,200*
Dec.	No Records			39,500*	Dec.	No Records			2,100*
Total	..	..	..	458,814*	Total	..	..	..	263,542*

Year 1905					Year 1906				
Jan.	No Records			1,300*	Jan.	8	4	6	348
Feb.	370	19	44	2,466	Feb.	0	0	0	0
Mar.	19	1	6	394	Mar.	0	0	0	0
Apr.	2797	1	257	15,412	Apr.	117	17	14	856
May	230	34	78	4,858	May	11	11	11	682
June	5100	132	822	49,342	June	297	11	36	2,168
July	No Records			114,400*	July	230	27	96	5,928
Aug.	No Records			40,300*	Aug.	3409	27	485	30,054
Sept.	No Records			20,500*	Sept.	21130	1266	3315	198,922
Oct.	No Records			18,100*	Oct.	32000	394	4408	273,312
Nov.	No Records			22,200*	Nov.	No Records			36,000*
Dec.	No Records			2,600*	Dec.	No Records			13,800*
Total	..	..	..	291,872*	Total	..	..	..	562,070*



2. Macquarie catchment rainfall and river flows response continued

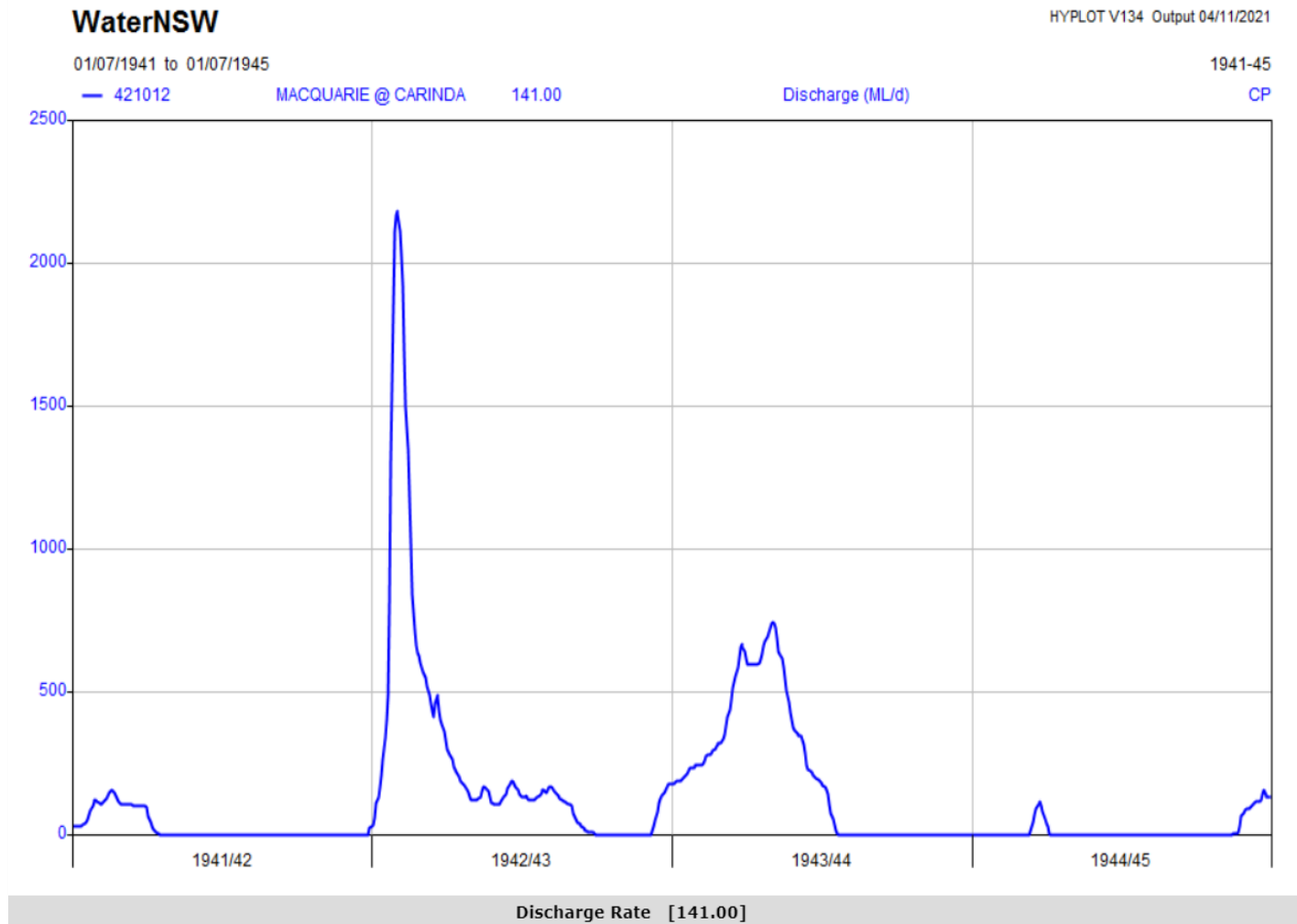
- Rainfall and Macquarie River flows
- Example of cease to flow and no flow periods in the Macquarie River before Burrendong Dam was constructed and upstream of the Macquarie Marshes
- The Macquarie did not flow continuously pre-development.



2. Macquarie catchment rainfall and river flows response continued

Cease to flows pre-development

- Same period as previous slide, but much further down through the marshes.
- We can see the effects flow routing & channel storage to smooth flows, and the consumption of small spikes through natural processes in the flat floodplain areas typical of northern basin valleys.
- Small rain generated inflows don't make it during droughts.



Wentworth Group Questions



Wentworth Group Comment	Response
<p>3. Source of new data</p> <p>What is the source of the 'newly found historic data' used by DPIE? How was this data processed? What would be a corresponding data quality code for this data?</p>	<ul style="list-style-type: none">• Sourced from old files at a regional site.• Unknown processing• We believe it was simply typed in from paper or microfiche.• Quality codes not provided, maybe something like 140 for "not yet coded"
<p>4. Publishing data and methodology</p> <p>Will DPIE release the full set of observed daily flow data for the Barwon–Darling gauges?</p> <p>When will supporting documentation be released that gives details of the methods used in the modelling?</p>	<p>Data and methodology has now been released.</p> <p>Data is available here: https://datasets.seed.nsw.gov.au/dataset/https-www-industry-nsw-gov-au-water-science-cease-to-flow</p> <p>Methodology has been circulated to the stakeholder reference group and will be published on our website</p>
<p>5. Re-doing the analysis</p> <p>Will DPIE undertake to revise their analysis in the light of this assessment and include other ecologically important flow metrics?</p>	<p>The cease to flow and low flow analysis will not be re-done because there aren't specific changes or errors that warrant the analysis being re-done.</p> <p>Broader analysis on other types of flows in the river and how they have been impacted by development can be considered in the broader environmental chapter of the draft Western Regional Water Strategy.</p>
<p>6. Consistency of data</p> <p>Why is the data on numbers of days of cease to flow per year in the DPIE presentation different from the numbers in the observed data in the Excel spreadsheets?</p>	<p>Not aware that there are differences, please provide details on specific cases.</p>



Thank you
