Regulatory Impact Statement

Goulburn to Murray Trade Review – assessing changes to trade, tagging and operating arrangements

March 2021

Regulatory Impact Statement Consultation Paper

VICTORIA State Government | Environment, Land, Water and Planning

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Front cover image courtesy of Andrea Sparks. Goulburn Weir, July 2019.

Acknowledgment

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

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Glossary of terms

Term	Definition
Allocation	Water that is actually available to use or trade is stored in dams and allocated each year against water shares. The seasonal allocation is the percentage of a water share volume available under current resource conditions, as determined by the Northern Victoria resource manager. The total allocation available is the sum of carried over allocation plus seasonal allocation less take.
Allocation trade	The transfer of a volume of an allocation from a seller to a buyer.
Allocation trade rules	Set by the Victorian Minister for Water to govern when and how water allocations within and between trading zones can be transferred.
Base flow	Average daily flow for a given month as a result of river operations, measured in megalitres (ML) per day. This does not include flows that are a result of rainfall.
Basin Plan	The Murray-Darling Basin Plan adopted by the Commonwealth Minister responsible for water on 22 November 2012.
Ecological tolerances	The range of environmental conditions that can be tolerated by an ecosystem or species without damaging its long-term health and sustainability.
Entitlement	The entitlement to take/use/extract/have water delivered, for example the ongoing share of the available water (water share).
Entitlement holder	The owner of an entitlement.
Environmental water	Entitlements and allocations owned by the Commonwealth or the State and actively managed to benefit the environment.
Environmental water holder	A government agency responsible for the environmental water entitlements owned by the Commonwealth or the State and managing the associated allocations for the benefit of the environment.
Environmental watering	Delivery of environmental water to rivers and wetlands that are connected to the systems where environmental water allocations are held, in line with an annual seasonal watering plan.
Flow regime	The quantity, duration and seasonal pattern of flows of a river, which influence the health of its ecosystem. Flow regimes can be natural or altered by human intervention.
Goulburn Inter-Valley Trade (IVT) account	An account kept in the Victorian Water Register which records how much water is 'owed' between the Goulburn and Murray systems.
Legacy commitments	Commitments made under historical decisions that mean about 140 GL of Goulburn water entitlements are owed to the Murray system. Legacy' Goulburn water consists of about 100 GL of entitlement issued to the Murray, including some to South Australia through exchange rate trade prior to 2007, and about 40 GL of water entitlement recovered as part the Snowy Water Initiative prior to 2012. Allocations made to these entitlement needs to be delivered each year to support the reliability of existing Victorian Murray entitlements. These can only be reduced when there is permanent exchange-rate trade from the Murray to the Goulburn, which effectively extinguishes that volume of legacy commitment.
Lower Goulburn River	The section of the Goulburn River between the Goulburn Weir and its junction with the River Murray.
Net allocation trade	Net allocation trade is defined as the sum of trade into the selected trading zone less the sum of trade out of the selected trading zone.
Northern Victoria resource manager	A role which the Minister for Water designated to Goulburn-Murray Water, to make seasonal determinations for all northern Victorian regulated river systems (including the Goulburn and Murray systems).
Operating rules	Set by the Victorian Minster for Water to govern when, how much and how fast river operators release water from storages.

Term	Definition
Pulse	A larger volume of water above the river's base flow for a short period of time – in this case, up to 3,000 or 6,000 ML per day for a period of 14 days with flow rates, rise and fall, prescribed by operating rules.
Tagged trade	A type of allocation trade between allocation accounts in different valleys. It occurs when the owner of an allocation in one trading zone 'tags' the water allocation for extraction or trade in another trading zone.
Trading zone	Part of a water system in which trade of water can occur.
Water share	A water share is an ongoing entitlement to a share of the water available in a defined water system. The volume of a water share defines the maximum amount of water that can be allocated under that entitlement each year.

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1. Executive summary

The Victorian Government is considering changing the rules governing the trade and delivery of water from the Goulburn River to the Murray River to avoid further environmental damage by sustained high flows during summer and autumn, when the lower Goulburn River would naturally be lowest.

There have been significant changes in the southern connected Murray-Darling Basin over the past 20 years. Change in both demand (more water being delivered to the Murray downstream of Barmah Choke) and supply (reduced capacity of Barmah Choke and decreased inflows from the Menindee Lakes) have increased the challenge of delivering water to Murray users where and when it is needed. Climate change will likely further decrease supply due to less rainfall and increased demand in warmer weather – this is expected to further exacerbate delivery risks in the Murray downstream of Barmah Choke.

These changes, combined with the recent severe drought conditions in New South Wales, have led to increasing reliance on accessing water from the Goulburn River and delivery to the Murray River below Barmah Choke. While delivery risks have been increasing, water continues to be moved from the Goulburn to the Murray because:

From 2008-09 to 2016-17, the volume of net allocation trade (including tagged use) from the Goulburn to the Murray was between -40 GL and +80 GL per year. In 2017-18 and 2018-19, this net volume grew to 250 GL and 230 GL respectively.

- Each year, water known as 'legacy commitments', which were made under historical decisions[1], mean 140 GL of water is owed to Murray entitlement holders that must be delivered from the Goulburn,
- Water allocation is traded to Murray irrigators to meet annual demands over summer and autumn,
- Water held by some entitlement holders in eligible tagged water accounts, is moved as a standing trade arrangement so their Goulburn water allocations can be used in the Murray.

The delivery of traded water, including tagged water, has kept river flows in the lower Goulburn River (the part of the Goulburn River below the Goulburn Weir to the junction with the Murray River) consistently high in recent years – from 2017-2019 record volumes of water were traded from the Goulburn River to the Murray.

Sustained high flows during times when flows would be naturally low (i.e. over summer and autumn), together with limited variability of flow rates, has seriously damaged the lower Goulburn River, causing considerable concern for Aboriginal Victorians, recreational river users and environmental water managers. These unseasonal high flows have prevented plants from growing along the river's edges and banks, causing significant riverbank erosion and reducing habitat for native fish and animals.

It is clear that the delivery of traded water is exceeding the ecological tolerances of the Goulburn River. The Department of Environment, Land, Water and Planning (DELWP) is reviewing Goulburn to Murray trade rules and regulation of tagged water, and also proposing new operating rules for how this water should be delivered. This is being done to help protect the health of the lower Goulburn River, without increasing water delivery risks in the Murray, and while enabling opportunities for water trading.

The purpose of this Regulatory Impact Statement is to assess and seek comment on long-term options for allocation trade, tagged use and operating rules in the Goulburn River and the possible economic, environmental, Aboriginal cultural and recreational impacts these changes could have.

The Victorian Government is proposing to change trade rules so that irrigators and businesses can still buy water according to Basin Plan trade objectives, without escalating damage to our waterways. Irrigators and

[1] 'Legacy' Goulburn water consists of 100 GL of water shares issued pre-2007 to the Murray, including some to South Australia, and 40 GL of water recovered pre-2012 for environmental flows in the Snowy and Murray rivers. This water needs to be delivered each year to support the reliability of existing Victorian Murray entitlements.

other water entitlement holders have become increasingly reliant on trade from the Goulburn River to meet their water needs and any reduction in trade opportunity will have economic impacts – it is likely that water will need to be sourced elsewhere (for example, from other tributaries) to meet sustained demands.

There are currently no formal operating rules for summer and autumn that prescribe upper limits on the volume of water that can be delivered down the lower Goulburn River. Historically, flows have been kept below 3,000 ML per day during summer and autumn to prevent impacts to in-channel privately owned pumps in operation over that period, but this is still much higher than natural flows for this time of the year.

The current rule that manages trade from the Goulburn system to the Murray system does not reflect how much water can be delivered without seriously damaging the health of the river system over summer and autumn. The trade rule was historically set to manage the risk of storing large amounts of traded water in the upstream storage as carryover from one year to the next, as this water may spill if conditions turn very wet in winter and spring. Such a spill could negatively affect Victorian Murray entitlement holders, as the spilled water was being used to underpin their allocations.

To manage this spill risk, the current trade rule allows trade from the Goulburn to the Murray throughout the year, as long as the balance of the Inter-Valley Trade (IVT) account remains below 200 GL[2]. This means the more river operators draw water from the account (or water is traded in), the greater the opportunity for trade and the greater the volume of annual delivery to the Murray. The significant demand of water delivered out of the Goulburn system in 2017-18 and 2018-19 made it clear that managing the risks associated with the delivery of water, particularly environmental damage, must also be taken into account in the trade rule.

Until December 2019, when interim measures were brought in, there were also no restrictions on the use of water in tagged accounts, which added to the volume of water river operators had to deliver throughout the year. Historically, tagged arrangements were treated differently than allocation trade as the two types of trade posed different risks to the system. Until recently, use from tagged accounts was also small, averaging 25 GL between 2007-08 and 2016-17. However, the volume of tagged water use has increased significantly in recent years, up to about 120 GL in 2017-18 and 75 GL in 2018-19.

In 2017-18, market pressures caused allocation trade under the current 200 GL IVT rule to remain mostly closed – in response irrigators used substantial volumes of water through tagged accounts. This further contributed to environmental damage in the lower Goulburn, highlighting the need for some controls on the use of tagged arrangements.

As part of this review DELWP has prepared this regulatory impact statement (RIS) for consultation on long-term options to improve Goulburn to Murray trade rules, regulation of tagged water and propose new operating arrangements. This is a combined RIS for both the proposed changes to the Goulburn to Murray trade rule and the proposed enduring regulation of tagged water, due to their inter-related nature. While operating rules are not a legislative instrument and therefore not formally subject to the RIS process, the various flow options under consideration have been included in this RIS analysis in order to openly consult on all the tools being used to address threats to the health of the lower Goulburn River. The flow rules also have a direct link in determining what is feasible for a trade rule – trade opportunity should only be made available if it can be sustainably delivered.

This RIS sets out a preferred option and makes the case for regulatory change to address issues on the lower Goulburn River. As part of this process, DELWP is seeking feedback on the RIS from all interested stakeholders, which will help to inform a Victorian Government decision on long-term Goulburn to Murray trade and operating rules that will start to come into effect from 1 July 2021 over a one-year transitional period, with long-term arrangements fully in place by 1 July 2022.

[2] The IVT account tracks how much water is 'owed' from one river system to another. For example, water that has been traded from the Goulburn to the Murray is recorded as a debt of water owed that must be delivered from the Goulburn system to the Murray system when river operators deliver water from the account to meet downstream demands in the Murray.

1.1 What is the Victorian Government's preferred option?

The preferred option is to set **operating rules that prescribe variable base flows that provide an average monthly flow of 1,100 ML per day over summer and autumn, and enable three additional short pulses of water** between 3,000 ML per day and 6,000 ML per day within prescribed rates of rise and fall for the changing water level. To enable pulses of up to 6,000 ML, it is recommended that further investigation of moving in-channel, privately owned pumps in the lower Goulburn is pursued.

OPERATING RULES

- Average variable base flows averaging 1,100 ML/day over summer and autumn
- Up to three separate 3 GL pulses

TRADE RULE

- Two-part trade rule that matches seasonal opportunities to deliver water

TAGGED USE

- Restricted in line with trade rule

INFRASTRUCTURE

- Further investigate moving in-channel privately owned pumps in the lower Goulburn River to enable three separate 6,000 ML/day pulses (rather than limited to 3,000 ML/day)

The preferred option will help to prevent further riverbank erosion and other environmental damage from unseasonal high flows. This more closely aligns with the natural flow variability of the river over summer and autumn and is much lower than the base case (no regulatory change), which has seen base flows held at around 2,700 ML per day over this high environmental risk period. These flows would be measured at McCoys Bridge[3] in the lower Goulburn River.

The preferred option will also introduce a **two-part allocation trade rule**,[4] and restrict tagged water use in line with this rule. This would mean that:

- **A rolling winter-spring limit applies (July to mid-December)** – this allows trade to open up from the Goulburn to the Murray whenever the balance in the IVT account is below 190 GL. During this period the more water that is delivered from the IVT account, the greater the opportunity for trade in this period. This reflects the ability to deliver more water in winter and spring when the river is naturally highest.
- **A fixed summer-autumn limit applies (mid-December to June)** – this effectively caps trade opportunity for the rest of the year to ensure all traded water can be delivered according to the preferred operating rules for the lower Goulburn River.
- **Tagged water use is restricted in line with trade limits** – this means tagged water use is only possible when allocation trade is possible. The rule would allow water made under 'grandfathered' tagged entitlements to retain a transitional exemption, while clarifying which change of ownership approvals would result in these tags being restricted in Victoria. Over time, these grandfathered tags would become subject to restrictions as they changed status through changes in volume, place of take, change of ownership, or change in source. We are also seeking feedback on a faster transition to restricting grandfathered tags, in which all such tags are restricted from a certain date. This alternative scenario is also assessed in this RIS, to further support why Victoria is advocating for changes to Basin Plan section 12.23.

  For the purposes of this RIS, 'tagged use' restrictions and 'tagging' restrictions are both used to refer to restrictions on the use of water from tagged accounts.

Implementing the preferred option will mean that the environmental condition of the lower Goulburn is expected to recover over time while minimising the risk of further immediate environmental damage, protecting Aboriginal cultural sites from damage from unseasonal high flows over summer and autumn, and maintaining or improving outcomes for recreational river users. As a longer-term measure to further enhance outcomes under the preferred option, 6,000 ML per day pulses could be implemented (rather than limited to 3,000 ML per day pulses). To do this, existing in-channel privately owned pumps in the lower Goulburn River would need to be moved up on to the riverbank – the feasibility of this will need to be investigated.

It is estimated that the preferred option would enable new trade opportunity each year of up to around 130 GL (with three separate 3,000 ML per day pulses), on top of 140 GL of annual legacy commitments[5] from Goulburn water entitlements that are owned by the Murray system. In future, if in-channel pumps are moved to the top

[3] Measured at gauging station 405232

[4] The two-part water trade rule was referred to as the 'dynamic rule' in previous public consultations.

of the bank, trade opportunity each year under the preferred option could be up to 220 GL (with three separate 6,000 ML per day pulses).

A preferred option has also been developed for managing trade between the Goulburn and the Lower Broken Creek. As the Lower Broken Creek is used as an alternative pathway for delivering some water from the Goulburn IVT account without damage to the lower Goulburn River, this option needs to consider any significant impact on the opportunity to continue this during the peak demand period, without causing delivery shortfall risk to the Murray system and within ecological tolerances of the Lower Broken Creek. Without any special management of the Lower Broken Creek, interim exemptions from tagged use regulations will expire and the Lower Broken Creek entitlement holders[6] will be restricted more than is necessary to protect the health of the lower Goulburn River and manage delivery risks in the Murray. **The preferred option for the Lower Broken Creek** is to:

- **Have the same rules for allocation trade from the Goulburn** as the rest of the Murray, **and**
- **Give all eligible entitlement holders with Goulburn entitlements the option to exchange them for local Murray entitlements** (recognising the unique arrangements in place since 2007) so that these users can always use their entitlements in the local Murray trading zone (6B), **and**
- **Have a seasonal tagging rule specific to the Lower Broken Creek** that allows unlimited tagged use during winter and spring, and then restricts tagged use in line with allocation trade from summer onwards. This recognises that some exemption from restrictions on tagged use better reflects the risks posed by this type of use in the Lower Broken Creek.

The preferred options have been designed so that the anticipated increase in peak season Murray demands that arises due to trade from the Goulburn will be supplied by deliveries down the lower Goulburn River within the proposed operating rules. This will mean that delivery risks in the Murray will not increase as a result of trade.

1.2 What options did we assess?

In this RIS, DELWP has assessed five options for Goulburn to Murray trade and operating rules:

- **The base case option (do nothing) – flows around 2,700 ML per day over summer and autumn.** This option considers the scenario that the existing interim operating arrangements and interim restrictions on tagged allocation use both expire, leaving tagged use unrestricted, operating rules unchanged and the existing Goulburn to Murray trade rule. Under the base case option, around 80 GL per month would likely be delivered.
- **Option 1 (best-possible outcome for the environment) – flows around 940 ML per day over summer and autumn.** This option involves operating rules based on a flow regime recommended by a scientific panel assessment and the two-part trade rule to match[7]. Like the preferred option (Option 2 below), it includes a two-part water allocation trade rule and restricts tagged water use in line with this rule. The key difference is that from mid-December to June, it allows less water to be delivered to the Murray (around 28 GL per month plus a single pulse of up to 5 GL per day in May[8]).
- **Option 2 (long-term environmental recovery, low risk of further environmental damage) – flows around 1,100 ML per day over summer and autumn.** This is the preferred option, as described earlier and includes three pulses of up to 3,000 ML per day over summer and autumn. The proposed operating rules were developed based on the findings of the scientific panel. As with Options 1 and 3, the proposed two-part trade rule (with tagged use restricted in line with allocation trade) was refined based on initial community consultation undertaken in early 2020. From mid-December to June, it allows more water to be delivered to the Murray than Option 2, but less than Option 3 (around 33 GL per month plus 39 GL in pulses).
- **Option 3 (limited long-term environmental recovery, high risk of further environmental damage) – flows around 1,300 ML per day over summer and autumn.** This option poses greater risk to the environment over the long-term, with higher base flows of 1,300 ML per day and monthly pulses of up to

[6] In 2007, when water entitlements were unbundled from land, entitlement holders in the Lower Broken Creek were given a choice to convert entitlements into Murray or Goulburn water shares – most chose Murray water shares, though some chose Goulburn water shares tagged for use in the Lower Broken Creek.

[7] The scientific panel was formed to provide advice to Goulburn-Murray Water, Goulburn Broken Catchment Management Authority, and DELWP on the expected environmental and river health outcomes of a series of flow scenarios. The panel's work also informed the development of the operational flow scenario used in Options 2 to 4.

[8] The timing of this May pulse – late in the water year – means that this does not increase delivery of IVT over the peak period.

3,000 ML per day over summer and autumn. Like Options 1 and 2, this option includes a two-part water allocation trade rule and restricts tagged water use in line with this rule. The key difference is that from mid-December to June, it allows more water to delivered to the Murray (around 40 GL per month, plus an additional 70 GL in pulses).

- **Option 4 (same operating rules as Option 2, but with unlimited seasonal tagged use and less trade opportunity) – flows around 1,100 ML per day over summer and autumn.** This option has the same operating rules as Option 2 (flows of up to 1,100 ML per day and three pulses), but with different trade and tagged use arrangements. Environmental outcomes are therefore expected to be the same as Option 2, however trade opportunity is greater. From July through to October tagged use is unlimited and allocation trade would subject to an annual limit, based on what can be delivered from November to April under the operating rule. From November to June the annual trade limit is applied for both tagged allocation use and allocation trade. This option means essentially unlimited use from tagged accounts could occur for the first part of the year. There was significant community interest in this option during initial consultation, but further analysis has shown that this option presents unacceptable third-party impacts through increased delivery shortfall risks in the lower Murray during the peak summer demand period.

The RIS also includes a review of engineering alternatives to regulatory change such as environmental remediation works (e.g. armouring of the waterway banks using rock beaching to prevent further erosion) and infrastructure solutions (e.g. bypasses, moving in-channel pumps to the top of the bank). During our initial community consultation, some stakeholders indicated support for larger infrastructure options such as bypassing the Goulburn River, to allow higher volumes of water to be delivered from the Goulburn to the Murray without impacting the lower Goulburn.

Our initial review indicates that, at best, infrastructure options would provide a partial solution to the problem,

✘ **Environmental remediation works** to armour the riverbanks require significant cost and only address erosion impacts, not loss of ecological habitat.

✘ **Creating a river bypass** would require upfront capital costs of about $50M and at best it would only be a partial solution and take many years to implement.

✓ **Moving in-channel privately-owned pumps** in the lower Goulburn (subject to negotiation) to the top of the bank would enable pulse flows of up to 6,000 ML per day over summer and autumn, providing more trade opportunity in future and greater operational flexibility to deliver water.

would be costly, could have significant impacts to local Aboriginal cultural, social and environmental values and would take many years to implement.

This means changes to the trade and operational rules are the mechanism needed to address issues in the lower Goulburn that exist now, whether or not infrastructure options are pursued in future.

1.3 Why do we prefer Option 2?

We assessed the four options compared to the base case by analysing their impacts (costs and benefits) and considering how each option performs against our objectives for the review (see **Box 1**). These objectives recognise that the lower Goulburn River is classified as a 'sustainable working river'[9] that supports social, economic, environmental and Aboriginal cultural values – all of which are important.

Our analysis indicates that Option 2 best balances these objectives. While the environmental outcomes would be better under Option 1, Option 2 will still lead to environmental improvements compared to the base case option. The scientific panel noted that the proposed flow regime under Option 2 would avoid further damage of the kind caused in 2017-18 and 2018-19, and is likely to allow the condition of the river to recover over time (alongside continued environmental flow management through winter and spring).

[9] In the Goulburn Broken Waterway Strategy 2014-2022 – see Appendices at: https://www.gbcma.vic.gov.au/downloads/GB_Waterway_Strategy_2014_-_2022/GBCMA_Waterway_Strategy_2014-2022_Part_E_-_Appendices.pdf

Box 1: Objectives for changes to the Goulburn to Murray trade rules, tagged use restrictions and operating arrangements

This review aims to recommend changes to the allocation trade, tagged use and operational rules that strike the best balance between the following seven objectives:

1. **Support lower Goulburn environmental values –** in particular, the changes should minimise the risk of further environmental damage and enable the environmental condition of the lower Goulburn River to recover from the damage caused in 2017-18 and 2018-19 from sustained high summer and autumn flows
2. **Provide as much opportunity as possible for water trade from the Goulburn to the Murray based on what can sustainably be delivered** – at a minimum, the changes should ensure the legacy commitments of up to 140 GL per year can be delivered to the Murray and, where possible, enable trade opportunity on top of these commitments
3. **Prevent trade from being unnecessarily restricted** – consistent with Basin Plan water trading rules, trade should only be restricted when it is necessary[10], for example to manage connectivity of the systems, protect the environment or prevent impact to other entitlement holders. Trade rules should appropriately reflect the risk trade may have on the system.
4. **Prevent delivery risks in the Murray from increasing as a result of trade that occurs from the Goulburn** – the changes should not increase the risk of river operators being unable to deliver traded water to meet the demand of entitlement holders on the Murray below the Barmah Choke, compared to if the trade did not occur
5. **Support lower Goulburn Aboriginal cultural values** – the changes should protect Aboriginal cultural values, including cultural sites and Traditional Owners' connection with and care for Country, from adverse impacts of traded water over summer and autumn. This additionally includes supporting the ecological life cycles of the flora and fauna used by Traditional Owners as food, fibre and medicine in the landscape, and therefore considered to have high cultural value.
6. **Support lower Goulburn recreational values** – the changes should maintain or improve the outcomes for people using the lower Goulburn River for camping, fishing and other recreational activities in summer and other peak periods
7. **Support environmental objectives in the Goulburn and Murray systems** – the changes should enable current environmental outcomes to continue to be achieved and prevent environmental problems from shifting elsewhere in the Goulburn and Murray systems.

In addition, any changes to trade and operational rules must comply with the broader regulatory framework, including Basin Plan water trading rules, the Objectives and Outcomes for River Murray Operations, the objectives of the *Water Act 1989* (Vic), and the Victorian Government's water management policies.

Option 2 would also provide greater opportunities for water trade than Option 1. Our analysis indicates it would ensure the lower Goulburn's 140 GL of annual legacy commitments to the Murray can be delivered consistently. It will also allow additional allocation trade of around 130 GL per year (or up to 220 GL if 6 GL per day pulses are enabled). With 3 GL per day pulses (possible without moving in-channel privately owned pumps), this option provides almost twice the volume of additional trade than Option 1. This trade opportunity is of significant value to irrigators and other water users.

The value of trade comes from being able to use the water in the Murray system (such as for irrigating horticultural crops in the lower Murray) rather than in the Goulburn system (such as for dairy, pasture or cropping which are currently typical in this system). The value of the trade will depend on the relative availability of water in both systems, commodity prices and seasonal conditions. Further, if a given volume of water cannot be traded to the Murray due to trade being closed, it will still be available for use in the Goulburn system, but the value of that extra water use may be less in the Goulburn than in the Murray.

Unlike Option 3, Option 2 would protect Aboriginal cultural values from further damage over summer and autumn, and maintain or improve the outcomes for recreational values. It also provides more likelihood of environmental recovery over time.

Unlike Option 4, Option 2 would minimise the impacts of trade to the Murray on other Murray entitlement holders (and the environmental water holder) and is consistent with Basin Plan section 12.23[11] that requires allocation trade and tagged water use to be treated in the same way.

[10] sections 12.16 and 12.18 of the Basin Plan water trading rules outlines allowable reasons for restricting trade – see 3.4.2 of this RIS for more information.

[11] Basin Plan section 12.23 is within scope of the Australian Competition and Consumer Commission (ACCC's) Murray-Darling Basin water markets inquiry. The ACCC's findings may influence the long-term approach to applying Basin Plan section 12.23.

1.4 What does the rest of this RIS cover?

The rest of this document explains the long-term options to improve the Goulburn to Murray trade and operational rules in more detail. It is structured as follows:

- **Chapters 2 and 3** provide a brief outline of the purpose and context for the review, and the review process to date.
- **Chapter 4** summarises the problem and challenges we are facing.
- **Chapter 5** sets out the objectives that any solution to this problem should meet.
- **Chapter 6** explains the feasible options for this solution, including how we identified these options.
- **Chapters 7 and 8** show our analysis of the costs and benefits of the feasible options, and why we have identified Option 2 as the preferred option.
- **Chapter 9** describes the preferred option for managing trade between the Goulburn and the Lower Broken Creek in the presence of the Goulburn to Murray trade rule and any impact the option may have on the use of the Lower Broken Creek as an alternative delivery pathway for delivery of water from the Goulburn IVT account.
- **Chapters 10 and 11** set out implementation and evaluation strategies to support the preferred option.
- The **Appendices** provide more detail on the assessment of the feasible options.

1.5 Making a submission

Stakeholders are invited to make formal submissions or comments on the RIS and the proposed operating rules, trade rule and tagged use regulations. Submissions may present analysis of alternative options and recommend changes to the proposed rules and regulations.

Submissions are required to be made in writing and submitted no later than **5pm on 30 April 2021** via the **Engage Victoria website**:

https://engage.vic.gov.au/goulburn-murray-trade-rule-review

All submissions will be treated as public documents and published on the Engage Victoria website unless they are marked as confidential.

After the consultation period, the Department will consider all feedback received from stakeholders and the community and consider whether any changes to the proposed operating rules, trade rule and tagged use regulations are required. The Department will make recommendations to the Minister for Water about the final form and content of these rules and regulations for the Minister to make the final decision.

We are seeking your feedback on the preferred option for Goulburn to Murray trade and operating arrangements. Submissions can be made by 30 Apr 2021 at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

A public notice on the Victorian Government's decision will be made, with the new trade rule and tagged use regulations planned to start to come into effect from 1 July 2021.

Once the trade rule and tagged use regulations are made, copies of all submissions will be provided to the Parliament's Scrutiny of Acts and Regulations Committee. This committee examines these submissions to ensure that the Department has considered the views of all stakeholders.

2. Background

2.1 Purpose

The Department of Environment, Land, Water and Planning (DELWP) is exploring changes to trade rules and tagged use restrictions, and proposing operational rules to ensure that water traded from the Goulburn system to the Murray system can be delivered without unacceptable impacts on the environment or the reliability and deliverability of entitlements.

This paper is a regulatory impact statement (RIS) that has been prepared to demonstrate the impacts of feasible options to change trade rules and tagged use regulations, alongside new operational rules, and whether one option is superior in managing impacts on the environment, other water entitlement holders and stakeholders in the broader community.

In line with the guidelines of Better Regulation Victoria, the assessment framework of this RIS:

- examines the nature and extent of the problem to be addressed
- states the objectives of the proposed changes to rules
- outlines the effects on various stakeholders
- assesses the costs and benefits of options, to identify a preferred option, and compares its impacts to other feasible alternatives.

The draft legislative instruments of the preferred options are now available for review at https://www.vic.gov.au/regulatory-impact-statements and via the Engage Victoria website – namely the Order to modify the existing Goulburn to Murray trade rule, and the proposed regulations on tagged use.

Public input is a critical element of the RIS process. While previous consultation has informed the analysis contained in this paper, the release of this RIS represents a further opportunity for interested stakeholders and community members to provide comment. All submissions will be considered by DELWP before a final decision is made about the future of changes to the Goulburn to Murray trade rule, tagged regulations and proposed new operating rules.

2.2 About this review

In conducting the review to date, DELWP has consulted with stakeholders, considered scientific studies and conducted independent analysis. We drew on all this input to develop the feasible options for the long-term allocation trade, tagged use and operating rules that we assessed to identify the preferred option (see Chapter 5). To date, we have:

- **Released a consultation paper**[12] in March 2020 that outlined the preliminary options for regulatory change, and invited the public to provide input to the review by completing a survey or making a written submission. We received 60 surveys responses and 35 submissions from diverse stakeholders, including irrigators, industry groups, Traditional Owner groups, environmental groups, and fishing and recreational river users.
- **Held more than 30 webinars and virtual meetings** (in line COVID safety requirements) between March and June 2020 to hear community perspectives. We also released a report in August 2020 that brought together the messages from our initial consultations.[13]
- **Reviewed scientific studies on the environmental impact of different flow regimes**. The key study we drew on was a 2020 report by a scientific panel formed to provide advice to Goulburn-Murray Water, Goulburn Broken Catchment Management Authority and DELWP on the expected environmental and river health outcomes of a series of flow scenarios.[14] The scientific panel assessed six flow scenarios, with base flows ranging from 940ML/day to 2,700ML/day, with the option of additional pulses.
- **Held direct discussions with Murray-Darling Basin Authority (MDBA) river operators** to better understand the impact of changes to whole of system operations.

[12] *Goulburn to Murray trade rule review: Consultation Paper* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

[13] *Closing the Loop – Initial* Consultation available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

[14] *Environmental risk and opportunities assessment of flow scenarios in the lower Goulburn* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

- **Commissioned an independent consultant to further analyse the scientific panel's scenarios** to suggest possible ways to optimise delivery of traded water from the Goulburn to the Murray and facilitate environmental improvements from current arrangements, by creating new operating rules informed by the panel's analysis.[15] We also sought comment on the new operating rules from the scientific panel[16].

[15] *Summary: Proposed new operating rules for the lower Goulburn River* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

[16] *Scientific panel consideration of operating rules for the Lower Goulburn River* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

3. Context

3.1 Managing the Goulburn River

The Victorian Government wants to ensure that Victorian rivers are healthy and well managed. Healthy rivers provide us with clean drinking water, water to grow our food and support industry as well as places for recreation. Our rivers hold significant cultural and spiritual values for Traditional Owners and they also support a diverse range of native plants and animals.

The lower Goulburn River (downstream of the Goulburn Weir to the junction with the Murray River) has a long history of regulation and delivery of water for irrigation. Although flows have been altered, the lower Goulburn River retains some of its natural flow patterns. This flow pattern has provided some protection of the river channel and floodplain, which provides important habitat for threatened fauna such as white-bellied sea-eagles, the squirrel glider, the Murray River crayfish and Murray cod[17].

The lower Goulburn River is classified in the Goulburn Broken Waterway Strategy 2014-2022[18] as a 'sustainable working river', acknowledging that it supports important social, economic, environmental and Aboriginal cultural values. We need to manage and protect the lower Goulburn River so that these values are sustained now and into the future.

Balancing all these objectives and values for healthy rivers is challenging, particularly in light of declining rainfall from climate change. It is important that we do not demand too much of our rivers and risk causing long-term environmental damage.

3.2 Water market trends

Water trade has been a feature of water resource management in Victoria since the 1990s, and since the Millennium Drought (1997-2009) it has become increasingly important for people in managing their water needs. The southern connected Murray-Darling Basin[19] water market is worth $7 billion a year to the Australian economy[20].

The introduction of the Basin Plan and the recovery of significant volumes of water for the environment reduced the volume of water available for irrigation downstream of the Barmah Choke. Since then, we have seen increasing pressure on tributaries like the Goulburn and Murrumbidgee Rivers over summer and autumn. This is because water recovered from the environment has required large volumes of water to be delivered over this period (not just through winter and spring), while irrigation demands have not reduced – and more water is being used by horticultural crops which need water every year. This has meant that since 2014-15, the region downstream of the Barmah Choke has increasingly relied on traded water from the Goulburn and Murrumbidgee Rivers to support demands. This reliance on trade and the need to deliver that traded water is exceeding the ecological tolerances of the lower Goulburn River.

More recently, pressure on water availability in the Murray system has also been driven by extreme drought in New South Wales. Due to drought conditions, the Darling River system has not contributed to Murray system demands since late 2017, placing more pressure on southern catchments.

The recent NSW drought meant that for 2017-18 and 2018-19, there was no allocation in New South Wales for Murray general security entitlements and very limited availability in 2019-20. This has created greater demand for water across the southern connected Basin, resulting in higher water market prices and increased incentive for people with Goulburn water allocations to trade to those in the Murray.

Compounding these market changes, high prices for cotton meant that even with reduced water supply during 2017-18 and 2018-19, cotton growers in the Murrumbidgee valley in New South Wales held on to their water for local irrigation and did not trade water to Murray irrigators, meaning there was less trade opportunity out of New South Wales in those years. Figure 1 shows that in 2017-18 and 2018-19 only the Goulburn IVT account contributed to the Murray system, whereas in previous years, both the Murrumbidgee and the Goulburn IVT accounts contributed traded water to the Murray.

17 See Victorian Government Action Statements available at https://www.environment.vic.gov.au/conserving-threatened-species/action-statements

18. See Goulburn Broken Waterway Strategy 2014-2022 Appendices at: https://www.gbcma.vic.gov.au/downloads/GB_Waterway_Strategy_2014_-_2022/GBCMA_Waterway_Strategy_2014-2022_Part_E_-_Appendices.pdf

19. The Southern Connected Basin incorporates northern Victoria, southern New South Wales and South Australia

20 https://www.environment.sa.gov.au/topics/river-murray-new/basin-plan/importance-of-murray-darling-basin

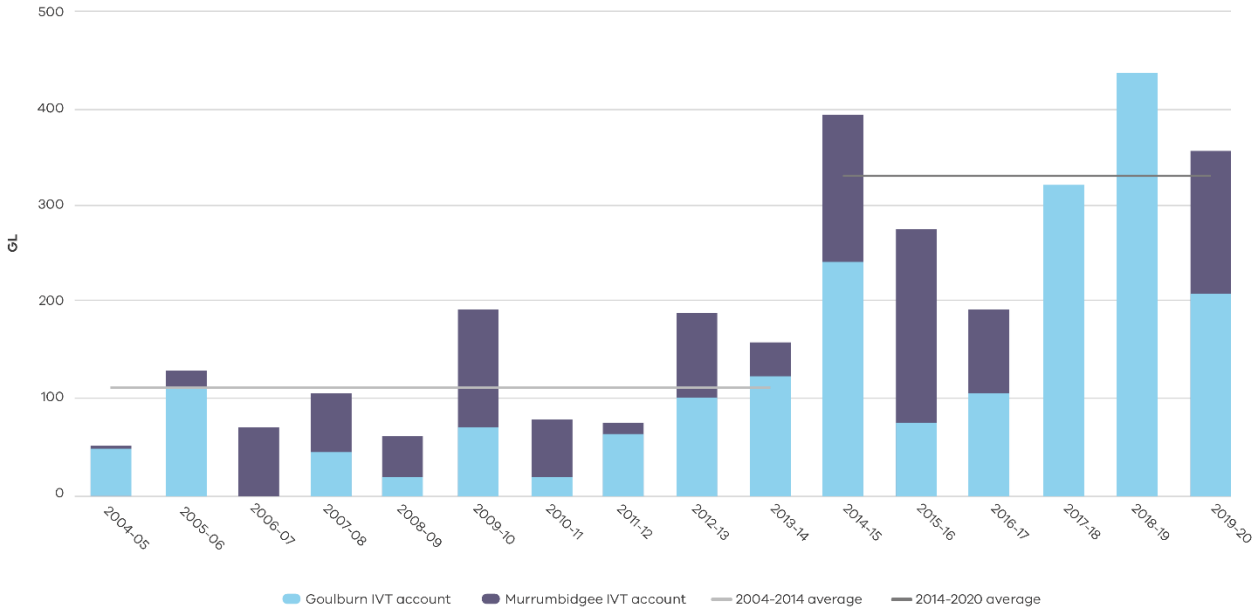

Figure 1: Delivery of water from Goulburn and Murrumbidgee IVT accounts[21]

3.3 Increasing delivery risks in the Murray

Over the past 20 years there have been significant changes in both supply and demand that are making it increasingly difficult to move water to where and when it is needed for irrigation and the environment. The Murray-Darling Basin Authority and Basin states jointly released a new report on *Managing Delivery Risks in the River Murray System*[22], which notes key factors driving this increased delivery risk.

On the **supply** side this includes:

- The capacity of the Barmah Choke has reduced by 20% (from 11,500 ML/day in the 1980s to 9,200 ML/day today) due to instream sand deposition. This is around 70 GL less capacity each month.
- There has been less frequent access to Menindee Lakes to supply Murray demand downstream of Wentworth. In the 1990s, Menindee supplied half of South Australia's summer entitlement flow 44% of the time, but since 2009 has only supplied it 19% of the time[23].
- Climate change is expected to further decrease supply due to less rainfall and increased demand due to warmer weather – this would further exacerbate delivery risks.

On the **demand** side, other changes are occurring:

- The total amount of water being delivered below the Barmah Choke over summer and autumn has increased, including water for both the environment and irrigation, and for all three southern basin states – Victoria, New South Wales and South Australia.
- Water recovered under the Basin Plan from the lower Murray to protect the environmental health of the river has meant since 2012-13, at least 150 GL of environmental water is being delivered downstream each year over summer and autumn.
- The water recovered did not result in less irrigation demand – irrigation use has been sustained at pre-Millennium Drought levels, supported by record volumes of trade from the Goulburn (and to a lesser extent Murrumbidgee) valley.

These changes have highlighted the importance of government action to ensure trade rules enable the sustainable delivery of water throughout the southern connected Murray-Darling Basin, in line with the objectives of Basin Plan water trading rules.

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21 These IVT volumes include water delivered to meet legacy, allocation trade and tagged use commitments. Note that these annual IVT volumes include water delivered during spring when there can be environmental benefits from these IVT deliveries. For example in 2014-15 88 GL of the 240 GL was delivered in spring

22 https://www.mdba.gov.au/sites/default/files/pubs/managing-%20delivery-risks-in-the-river-murray-system.pdf

23 https://waterregister.vic.gov.au/images/documents/Murray_Delivery_Risks_FACT_SHEET_Jan2021.pdf

3.4 Regulatory context

3.4.1 Regulatory objectives and values

An appropriate regulatory regime for striking this balance between objectives and values for healthy rivers must be consistent with the:

- Basin Plan water trading rules[24]
- The Objectives and Outcomes for River Murray Operations[25]
- The objectives of the *Water Act 1989* (Victoria)
- The policies of the Victorian Government (as currently expressed in *Water for Victoria*[26]).

Section 12.16 of the Basin Plan water trading rules establishes that a person may trade a water access right within a regulated system or between regulated systems … free of any restriction on changing the location at which the water to which the right relates may be taken, other than a restriction that is necessary [under section 12.18] because of:

- the existence of a physical constraint; or
- the need to address hydrologic connections and water supply considerations; or
- the need to protect the needs of the environment; or
- the level of hydraulic connectivity; or
- a combination of any of the above.

Relevant Objectives and Outcomes for River Murray operations include the need to operate the system efficiently to deliver entitlements, maximise water available, and contribute to protection and restoration of environmental assets in the River Murray System.

The relevant objectives of the *Water Act 1989* include:

- to provide for the integrated management of all elements of the terrestrial phase of the water cycle;
- to promote the orderly, equitable and efficient use of water resources;
- to make sure that water resources are conserved and properly managed for sustainable use for the benefit of present and future Victorians;
- to maximise community involvement in the making and implementation of arrangements relating to the use, conservation or management of water resources;
- to ensure that Victoria's water resources and waterways are managed in a way that considers—
    - Aboriginal cultural values and uses of waterways; and
    - the social and recreational uses and values of waterways.
- to provide formal means for the protection and enhancement of the environmental qualities of waterways and their in-stream uses.

Water for Victoria (2016) includes several relevant objectives and one particularly relevant action that collectively help to frame the context for this RIS. The objectives are:

- We will protect waterways and their catchments from the adverse impacts of future human use. We will improve the health of priority waterways and their catchments to support our environmental, social, Aboriginal cultural and economic needs and values now and into the future.
- Victoria's water grid and markets will help us realise the greatest benefit from our valuable water resources.
- We will recognise the values that water has for Traditional Owners and Aboriginal Victorians. The water sector will support Aboriginal participation in Victorian water planning and management frameworks through consultative structures that address the rights and interests of Victoria's Traditional Owners.

[24] https://www.mdba.gov.au/managing-water/water-markets-trade/basin-plan-water-trading-rules

[25] Available at https://www.mdba.gov.au/publications/mdba-reports/objectives-outcomes-river-operations-river-murray-system

[26] https://www.water.vic.gov.au/__data/assets/pdf_file/0030/58827/Water-Plan-strategy2.pdf

- We will support the wellbeing of rural and regional communities who enjoy the recreational benefits our regional waterways provide. We will consider these values in the way we manage water.

Action 9.6 of *Water for Victoria* aims to improve trading rules in northern Victoria. Under that action, DELWP will:

- ensure trading rules in northern Victoria are appropriate given physical and operational constraints
- work with the Murray-Darling Basin Authority to:
    - provide appropriate and timely information for northern Victorian water users about the risk of congestion in the southern-connected Murray system
    - improve transparency in applying water trading rules in the southern connected system.

3.4.2 Regulatory framework

The Victorian Trading Rules made under the *Water Act 1989*, are rules set by the Minister for Water to govern the trade of water shares and water allocation.[27] These trading rules aim to facilitate trade wherever possible, while minimising negative impacts on other entitlement holders and the environment. Arrangements must also be consistent with Victoria's obligations under the *Commonwealth Water Act 2007*, including the Murray-Darling Basin Plan and the Basin Plan Water Trading Rules.

The Victorian Trading Rules govern when an application can be approved or refused for a 'one-off' trade of water allocation(s) or a 'one-off' trade of a water share(s).They also govern when a 'standing' trade arrangement can be approved or must be refused. A tagged arrangement is one such standing trade arrangement that can be used to move water between valleys. The tagged arrangement allows water users to access water allocations originating in one water source, for use (or take) at another location.

Tagged water arrangements in Victoria include both:

- Tagged water shares (water access entitlements) – water enters its associated account either through allocations made under the water shares, or through trade in.
- Tagged accounts not linked to a water share – water can only enter the account by trade in, and the approval to tag the allocation is given at the time the trade is approved.

Permanent trade of water entitlements between valleys (exchange rate trade) is no longer allowed as discussed later in section 4.2 of this RIS. The ability to set up tagged arrangements is an alternative approach used across the Murray-Darling Basin to accomplish the same outcome as a permanent trade, without having impacts on other entitlement holders. Creating such a standing trade arrangement is also an efficient way to streamline allocation trading – it is like a direct debit arrangement rather than having to do a new allocation trade each time water is to be used between valleys.

The Goulburn to Murray trade rule was first introduced on 22 November 2012, in order to manage spill risk and thereby protect ongoing allocations to Victorian water entitlement holders. The Goulburn to Murray trade rule was not applied to tagged use at that time, as such volumes were small and were not seen as posing the same spill risk as allocation trade. Tagged use is debited in the immediate water year, and it is expected that such volumes would be called out throughout the water year by river operators to support meeting the downstream demand. In contrast, allocation trade may be carried over into the following water year rather than being used – and therefore would not require a commensurate callout by the river operator. Instead the allocation trade water remains in the Goulburn storage and contributes to spill risk again the following year. With the introduction of the Basin Plan in 2014, Victoria also needed to comply with the Basin Plan water trading rules which are contained in Chapter 12 of the Basin Plan. Under these Commonwealth rules, both allocation trade and use from tagged accounts are considered trades, and subject to these Chapter 12 trade rules. Of particular importance for tagged arrangements is section 12.23, often referred to as Rule 12.23. The aim of section 12.23 is to essentially apply the same rules to both allocation trade and tagged use. This requirement does not apply if the tagged water access entitlement, i.e. a tagged water share, was established before 22 October 2010, which is when the details of the Basin Plan were made public. These historic tagged water shares that are exempt under section 12.23 are known as 'grandfathered' tags. If a water user requests a change to the tagged water share, the approval represents an establishment of a new tag, and the grandfather status is removed[28].

[27] https://waterregister.vic.gov.au/water-trading/trading-rules

[28] Rule 12.23 grandfathered exemption eligibility rules in Victoria FAQ, available on the Victorian Water Register trading rules website.

There are challenges with the interpretation and implementation of section 12.23 within the Victorian regulatory framework, as the rule's wording could be interpreted to apply to some but not all tagged arrangements in Victoria. For example:

- *Ordering water*: the rule requires that water ordered under tagged arrangements be subject to the same restrictions that would apply to a trade of water allocation. The way the rule was written assumes that ordering is always mandatory, however not all water users are required to order in Victoria.

  Therefore, in order to consistently and equitably apply the intent[29] of section 12.23 in Victoria, Victoria needs to develop a Victorian rule that applies restrictions on tagged use even if an order is not placed. As this situation is not covered by a direct interpretation of section 12.23, any regulatory instrument Victoria may adopt to apply such a new restriction, must comply with Basin Pan section 12.16 that such a restriction is necessary, for one of the allowable reasons listed in section 12.18, which includes among other reasons, the need to protect the environment or to protect the reliability of water entitlements held by other water users.

- *Regulating use after a tag has been approved*: the Victorian trading rules specify when a request to establish a given tagged arrangement can be approved or refused, however, once approved, those trading rules cannot be used to restrict the taking or use of water. Any such subsequent restrictions on the standing trade arrangement must be undertaken through a different Victorian regulatory instrument.

The *Water Act 1989* contains provisions that allow regulations to be made to fill these gaps and restrict take and use of water after a tagged use arrangement has been approved. These authorising provisions were used to develop interim regulations which took effect on 12 December 2019, and which require that tagged use be restricted using the same rules as allocation trade, with limited exemptions, including for grandfathered tags.[30]

The initial interim regulations were able to remain in effect for 12 months. These have since been replaced by a second set of interim regulations, which came into effect in November 2020 to continue protection of the lower Goulburn River in 2020-21 while the Goulburn to Murray trade review was being completed. This RIS includes a proposed set of enduring tagged use regulations which would replace the interim regulations and be in operation for up to 10 years.

As mentioned above, historically Victoria did not apply the Goulburn to Murray trade rule to tagged use as such volumes were small and were not seen as posing the same spill risk as allocation trade. With significant increases in both allocation trade and tagged use in 2017-18 and 2018-19, this picture changed and required the delivery of record volumes of water to the Murray, leading to unacceptable environmental impacts to the lower Goulburn River. The unrestricted use of tagged arrangements became a 'workaround' or 'loophole' allowing water users in the Murray to continue using Goulburn water allocations, thereby significantly driving up the IVT balance even though allocation trade was closed.

Tagged use began nearing between a third to half of the total volume of water trade out of the Goulburn (net allocation trade plus tagged use), and helped contribute to IVT balances being much higher than the spill risk limit of 200 GL. For example, in 2017-18 continued unrestricted tagged use kept the IVT balance above 200 GL from July 2017 to March 2018, even reaching a peak of 270 GL in December 2017, despite significant volumes of IVT being called out. Apart from these rule differences having resulted in greater volumes of water moving out of the system, they have also led to different access to trade opportunities for different water users.

The damage to the lower Goulburn River from these high IVT delivery years and the driver to provide a level playing field in which all water users in northern Victoria were subject to trade rules, resulted in the Victorian government undertaking a review of Goulburn to Murray trade arrangements. As announced on 20 August 2019, three key actions were to be undertaken: interim operational rules to manage Goulburn River flows, the introduction of new rules to restrict tagged use in line with allocation trade from December 2019, and public consultation to commence to develop a long-term Goulburn to Murray trade rule.

Victoria has also committed to removing permanent exemptions in trading rules, including for grandfathered tags, and thereby providing equitable trade opportunity to all water users. There are about 20 water users with grandfathered tags in Victoria, all of which have Goulburn water shares that are tagged for use in the Murray system. Water allocations used by owners of these grandfathered tags need to be delivered down the lower Goulburn River, contributing to environmental impacts. The grandfathered tagged use also contributes to the IVT balance reaching levels higher than the 200 GL trade limit, increasing risk of spill.

[29] Intent is demonstrated in MDBA"s Guideline for section 12.23, the Basin Plan explanatory memorandum, and ACCC water trading rules advice documents.

[30] Tagged water use restriction FAQs – November 2019, available on the Victorian Water Register trading rules website.

Under section 12.16 of the Basin Plan water trading rules, States can place restrictions on traded water within their State, if the restrictions are necessary for one or more of the reasons listed in section 12.18. Of particular note is the need to protect the needs of the environment, or for water supply or delivery considerations such as the need to limit a potential impact on the reliability of entitlements held by other water users in the system. Both of these reasons underlie the need to restrict grandfathered tags.

For the purposes of this RIS, ‘tagged use’ restrictions and ‘tagging’ restrictions are both used to refer to restrictions on the use of water from tagged accounts.

4. Problem analysis

In recent years there has been significant environmental damage to the lower Goulburn River due to long periods of unseasonal high summer and autumn flows (see **Box 2**). This is due to changes in both demand (more water being delivered to the lower Murray) and supply (reduced capacity), which have increased the challenge of delivering water to users where and when it is needed, without damaging the environmental health of our waterways.

To prevent this damage from occurring in future, and to ensure trade from the Goulburn doesn't increase delivery risks for Murray entitlement holders, the Victorian Government is assessing options for operating, trade and tagging rules that recognise the ecological tolerances of the lower Goulburn River.

Current arrangements need to be reviewed as they do not account for different environmental needs throughout the year, or match trade opportunity to what can sustainably be delivered to avoid creating delivery risks.

Box 2: Environmental impacts of high flows

Running the Goulburn River at consistently high flow rates during summer and autumn, when flows would naturally be low, leads to two associated problems.

1. The lack of flow variability with sustained high flows drowns existing vegetation and the lower riverbank and prevents new vegetation from growing. This vegetation loss is important in its own right, and it also means a loss of habitat for aquatic and terrestrial fauna. Careful environmental water management has the potential to reverse these losses, but the associated increase in riverbank erosion caused by the vegetation loss introduces the potential for irreversible damage.
2. Consistent high flows also mean that wave action and boating wash are concentrated on those parts of the lower channel where vegetation has been lost, which exacerbates erosion.

In combination, these problems lead to increased erosion and notching (large incisions in the bank), which have been observed and measured along the channel of the Lower Goulburn River (for example, Figure 2). If left unchecked, this erosion of the lower riverbank could lead to the loss of support for the upper riverbank, with increased risk of mass failure or "slumping" and steepening of the riverbank. This process is illustrated conceptually in Figure 3 below. Apart from the environmental impacts of riverbank slumping, the recreational and amenity values of the river would be severely affected. In particular, it would significantly affect recreational fishing opportunities due to reduced access and lower fish numbers.

Figure 2: Evidence of erosion, notching and loss of bank on the Lower Goulburn

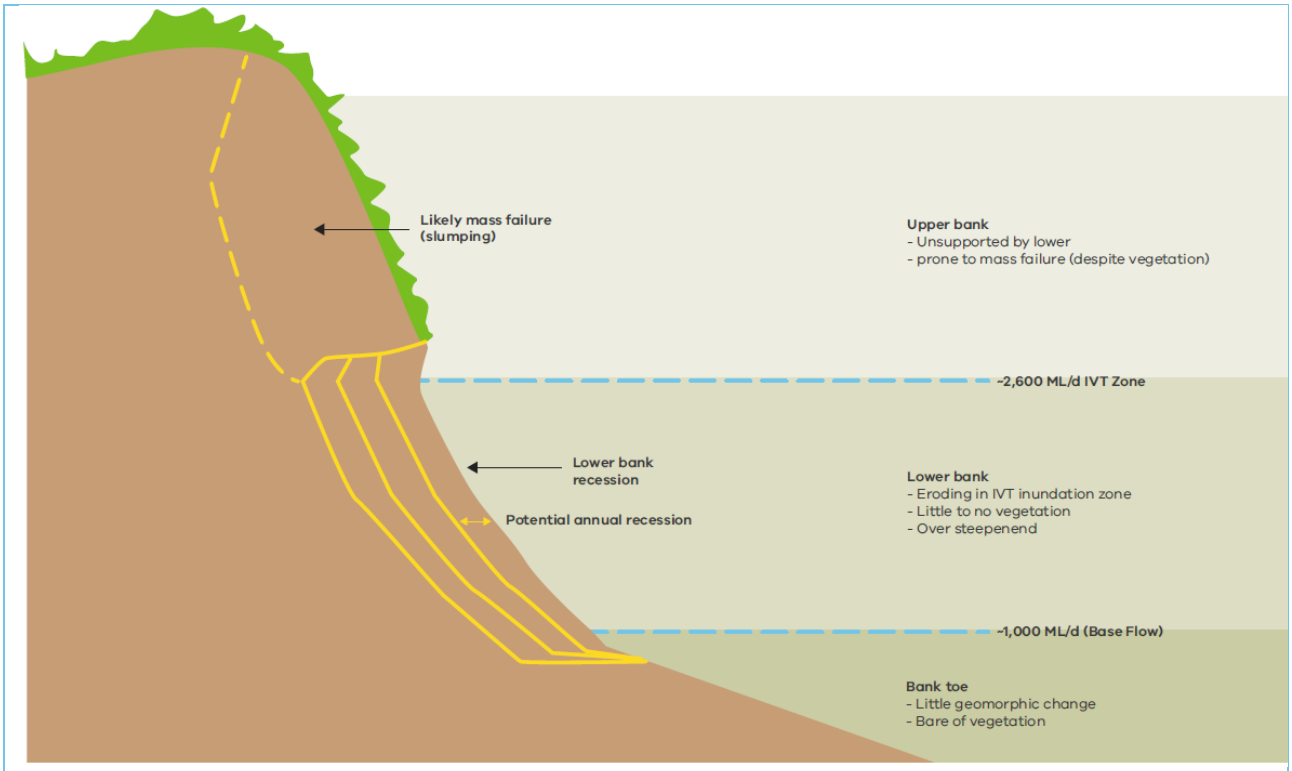

Figure 3: The impact of successive years of prolonged high flows on the lower Goulburn River

Sources: Vietz, G., Donges, M., Houghton, J., Mole, B., Morris, K., Clarke, S., 2019. Goulburn riverbanks and bank vegetation: Influence of Inter-Valley Transfers (IVT). Report by Streamology for the Goulburn Broken Catchment Management Authority and Victorian Environmental Water Holder, July 2019

4.1 Operating rules for the lower Goulburn

There are currently no formal operating rules for summer and autumn that prescribe upper limits on the volume of water that can be delivered down the lower Goulburn River. Historically, river operators have kept flows below 3,000 ML per day over summer and autumn to prevent impacts to in-channel privately owned pumps operating over that period, but this is much higher than natural flows for this time of the year.

River operators have particular obligations that must be met, which drive their decisions to deliver water down the lower Goulburn River. When making releases to the lower Goulburn River, river operators look to:

- Meet passing flow requirements, ensuring the minimum amount of water is flowing through the river; then
- Make operational deliveries to meet demands from Murray and Goulburn water users (i.e. people that own water and want to use it); and
- Make environmental water deliveries, ordered by environmental water managers on top of operational deliveries to help achieve environmental objectives.

When IVT deliveries are made, GBCMA provides advice to river operators to assist in shaping the baseflows and pulses to best support environmental outcomes. In particular, IVT deliveries in spring are used to meet environmental objectives that would otherwise require the use of environmental water holdings.

In 2019, the Victorian Minister for Water introduced interim operating measures for the Goulburn River to keep flows lower over summer and autumn, while long-term arrangements are pursued through this review. These measures have resulted in river operators aiming to keep the monthly volume of water delivered from the Goulburn IVT account to the Murray to below 50 GL in 2019-20, and 40 GL in 2020-21, well below the amount delivered in recent years.

However, no changes have yet been made to the allocation trade rules for Goulburn to Murray trade, which means trade opportunity does not reflect what can be delivered over summer and autumn.

4.2 Inter-valley trade accounting

IVT accounting is needed to keep track of how much water has been traded between valleys and reconcile water resource outcomes. The Goulburn IVT account is used to track how much water is ‘owed’ to the Murray as a result of trade activity, compared to water that has been called out by river operators. The Northern

Victoria Water Resource Manager tracks water supply obligations to maintain the balance of water needed to and from the Goulburn and Murray systems. Figure 4 summarises the mechanisms that increase and decrease the obligation to supply water to the Murray from the Goulburn IVT account.

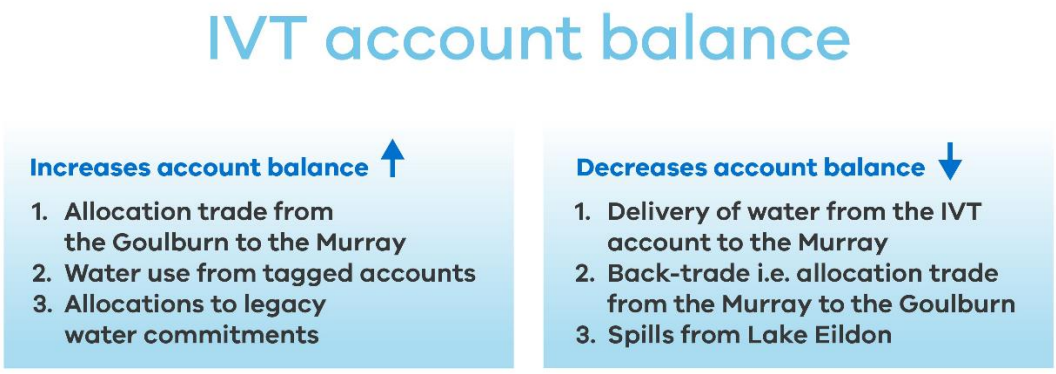

Figure 4: Mechanisms that contribute to the Goulburn IVT account balance

The following three mechanisms increase the obligation to supply volumes to the Murray water resource from the Goulburn IVT account:

1. Allocation trade, from Goulburn allocation accounts to Murray allocation accounts (or to NSW or SA water users)
    - Credits to the Goulburn IVT account are made at the time the trade occurs (not when the water is used by the buyer).
    - Between 2008-09 and 2016-17, the net annual allocation trade out of the Goulburn was generally within +50 GL to -50 GL (negative indicates trade back into the Goulburn). However, in 2017-18 and 2018-19 it expanded to +130 GL and +150 GL, respectively.
2. Water use via tagged accounts, which allow Goulburn entitlements to be used in the Murray
    - Credits to the Goulburn IVT account are made at the time the use occurs.
    - After commencing in 2007, annual tagged water use from the Goulburn to the Murray increased from very small volumes of about 10 to 30 GL to an average of about 40 GL from 2013-14 to 2016-17. Then, in 2017-18 and 2018-19, tagged water use increased to 120 GL and 75 GL, respectively.
3. 'Legacy commitments'
    - When the market for water entitlement trade was first established, entitlement trade from the Goulburn system to the Murray system was managed by cancelling water shares in the Goulburn and issuing replacement water shares in the Murray. This created a standing commitment for the Goulburn system to deliver water to the Murray every year. Under the Minister for Water's trading rules for declared water systems, exchange-rate trade is no longer allowed, and since 2007 all entitlement trade between valleys has been managed through tagged accounts, so that the source of a water share never changes. However, before 2007, approximately 100 GL of water shares were issued in this way to the Murray, including around 10 GL to South Australia. This volume is often referred to as the legacy of exchange-rate trade or 'legacy commitments'. Credits to the Goulburn IVT account for this component are made during the season when improvements are announced to Goulburn high-reliability seasonal determinations.
    - In addition, the joint government project Water for Rivers[31] recovered about 40 GL[32] of water for environmental flows in the Snowy and Murray rivers through water savings investments in the Goulburn system. This meant that this 40 GL per year is now supplied from the Goulburn system to

[31] Water for Rivers was funded by Victoria, New South Wales and the Commonwealth governments to recover environmental water for the Murray and Snowy rivers.

[32] Water for Rivers recovered about 40 GL of high reliability entailment and 26 GL of low reliability entitlement in the Goulburn and Loddon systems. This means in some years with allocation against low reliability entitlement the Snowy commitment may be up to 66 GL. Snowy water requirements are known by February each year and set aside in the Goulburn IVT the following July.

support all Victorian Murray entitlements rather than being supplied into the Murray from the Snowy scheme. Credits to the Goulburn IVT account for this component are made on 1 July each year.

- As a result of both of these 'legacy commitments', up to about 140 GL of water entitlement in the Goulburn system is effectively owned by the Murray system. This water needs to be delivered to the Murray every year to support the reliability of all Victorian Murray entitlements.

The following three mechanisms decrease the obligation to supply volumes to the Murray water resource from the Goulburn IVT account:

1. Delivery of water from the Goulburn IVT account to the Murray
    - Debits to the Goulburn IVT account are made when river operators deliver Goulburn IVT account water through the lower Goulburn River to the Murray. Deliveries are accounted for at McCoys Bridge and are debited from the account on a weekly basis when deliveries are occurring.
2. Back-trade from the Murray to the Goulburn
    - Debits to the Goulburn IVT account are made when trade from Murray allocation accounts (or NSW or SA water users) to Goulburn allocation accounts occur.
3. Spills from Eildon storage
    - Water held in the IVT account at 30 June each year is carried over to the following year, but like other Goulburn carryover, is subject to spill rules. When Lake Eildon spills, an equal proportion of all spillable accounts in the Goulburn, including the carried over Goulburn IVT account volume is debited, to offset the volume that physically spilled from storage.
    - The current (200 GL) upper limit on the Goulburn IVT account reflects an acceptable upper limit on the IVT volumes that may be lost in the event of a spill at Lake Eildon.

4.3 Goulburn to Murray trade rule

Water trade arrangements and policies were first put in place to facilitate the trade of water so that water could be used for the highest value. As the volumes of trade grew, additional policies were required to ensure that moving these increasing volumes to different locations did not have unintended consequences.

The current trade rule that manages allocation trade from the Goulburn system to the Murray system does not take into account how much water can be delivered without seriously damaging the health of the waterways that deliver the traded water – this risk has only become apparent in recent years. Rather, the trade rule was historically set to manage the risk of 'spill' from Eildon, Goulburn's main upstream storage dam, as such a spill could negatively impact Victorian Murray entitlement holders. This spill risk refers to traded water that is held in storage in the dam from one year to the next and can spill due to wet conditions over winter. When such water is lost through a spill, it means that water that underpins Victorian Murray allocations is no longer available, which negatively affects entitlement holders in the Victorian Murray.

With a focus on spill risk, the current trade rule allows trade from the Goulburn to the Murray throughout the year, as long as the balance of the IVT account is below 200 GL. This means the more river operators draw water from the account, the greater the opportunity for trade and delivery to the Murray. The huge demand of water delivered out of the Goulburn system in 2017-18 and 2018-19 made apparent that delivery risks must also be taken into account in the trade rule.

4.4 Tagged allocation use

Until December 2019, when interim restrictions were brought in, there were no restrictions on the use of water in tagged accounts, which added to the volume of water river operators had to deliver throughout the year.

The unseasonal, high summer flows in 2017-18 and 2018-19 were driven by the highest ever volumes of water traded from the Goulburn to the Murray. This happened, in part, as a result of record volumes used from tagged water allocation accounts to trade water out of the Goulburn valley. At the time, this was possible even when allocation trade was closed. Apart from resulting in greater volumes of water moving out of the system, these rule differences meant different access to trade opportunities for different water users.

As discussed in section 3.4.2 of this RIS, Victoria must also comply with the Basin Plan water trading rules, and make sure that they are implemented in Victoria's regulatory framework to provide a consistent and equitable outcome for all water users.

4.5 Use of the Lower Broken Creek

The Lower Broken Creek and the Campaspe River are used to deliver limited amounts of water from the Goulburn IVT account to the Murray, taking some pressure off the lower Goulburn River. The Loddon River is unlikely to be used similarly, due to significant delivery losses that would occur (e.g. seepage, evaporation). The assessment undertaken for the design of the Goulburn to Murray trade rule assumes that similar volumes of water from the Goulburn IVT account would continue to be delivered through these alternate pathways into the future. However, it is essential to ensure that this happens within environmental thresholds and the damage seen in the lower Goulburn is not simply shifted to the Lower Broken Creek or Campaspe River.

The development of options for the management of trade between the Goulburn and the Lower Broken Creek has been occurring alongside the Goulburn to Murray trade review. The Lower Broken Creek is different to other parts of the Murray system as it can be supplied from either the Goulburn or Murray systems and in most circumstances is supplied from bulk resource in the Goulburn via the East Goulburn Main Channel.

To reflect the way the Lower Broken Creek is supplied from the Goulburn system, which does not add pressure on the lower Goulburn River, the Lower Broken Creek customers have been exempt from the interim restrictions on tagged use put in place in 2019, while a longer-term solution was investigated. If this interim exemption expires without corresponding implementation of alternate arrangements, customers in the Lower Broken Creek will be unnecessarily restricted under the preferred Goulburn to Murray trade rule.

Restricting the Lower Broken Creek customers in line with the rest of the Murray does not reflect the unique supply arrangements or the risks posed by delivering water to the Lower Broken Creek. However, any change in management could change the use of the Lower Broken Creek to deliver water from the Goulburn IVT account, which is proposed to continue. Therefore, the proposed arrangement to recognise the Lower Broken Creek differently to the rest of the Murray (i.e. reflecting the unique characteristics of this system), must also consider any significant impact it would have on the delivery of IVT through the Lower Broken Creek.

5. Objectives

5.1 Overall objective

As set out in section 3.1, the lower Goulburn River is classified as a 'sustainable working river', acknowledging that it supports important social, economic, environmental and Aboriginal cultural values. The lower Goulburn River needs to be managed so that these values are protected now and into the future.

Accordingly, the overall objective for this RIS is to enable the trade of water from the Goulburn to the Murray to support irrigators and other entitlement holders, within the identified ecological tolerances of the lower Goulburn River, and without causing unacceptable impacts to other entitlement holders. This will be done in ways that support the Aboriginal cultural values and the recreational values of the lower Goulburn River, and it will also consider the impacts on waterway health in the lower Murray.

Further, if the reforms to tagged accounts and operational rules – both currently applied as interim measures - are to be maintained, then there may be unintended consequences if complementary refinements to trade rules are not also made. A disconnect between trade rules and operational rules for the delivery of traded water has the potential to allow more water to build up in the IVT account than can be delivered, with negative effects on the reliability of Victorian Murray water entitlements due to increased spill risk.

Any changes to water trading, tagged accounts and operational rules will affect the condition of Victorian ecosystems, with flow on effects for the condition of the Coorong and Lower Lakes and river management more broadly (namely, decisions by MDBA river operators). Given the connectivity of water markets across the southern connected Murray-Darling Basin, changes will impact not only Victorian water users and environmental water holders in the Goulburn and the Victorian Murray, but also water users in New South Wales and South Australia.

The RIS process requires that the 'base case' – consisting of the current situation if all interim measures lapse and existing rules (or lack thereof) remain in place – be compared against a range of feasible options, to identify potential impacts of each option in relation to the base case. The base case for analysis includes the current allocation trade rule with a 200 GL limit, no restrictions on tagged use, and operational rules that take into account infrastructure limitations due to location of water user pumps in the lower Goulburn but which do not yet formally take into account ecological tolerances of the waterway.

5.2 Objectives for comparing options

We assessed the feasible options against the base case by analysing their impacts (costs and benefits) and considering how each option performs against following objectives. This review aims to recommend changes to the allocation trade, tagged use and operational rules that strike the best balance between the following seven objectives:

1. **Support lower Goulburn environmental values –** in particular, the changes should avoid further environmental damage and enable the environmental condition of the lower Goulburn River to recover from the damage caused in 2017-18 and 2018-19 from sustained high summer and autumn flows.
2. **Provide as much opportunity as possible for water trade from the Goulburn to the Murray based on what can sustainably be delivered** – at a minimum, the changes should ensure the legacy commitments of up to 140 GL per year can be delivered to the Murray and, where possible, enable trade opportunity on top of these commitments.
3. **Prevent trade from being unnecessarily restricted** – consistent with Basin Plan water trading rules, trade should only be restricted when it is necessary for one of the allowable reasons (refer s.12.16 and s.12.18) which includes to manage connectivity of the systems, protect the environment and prevent impacts to other entitlement holders. Trade rules should appropriately reflect the risk trade may have on the system.
4. **Prevent delivery risks in the Murray from increasing as a result of trade that occurs from the Goulburn** – the changes should not increase the risk of river operators being unable to deliver traded water to meet the demand of entitlement holders on the Murray below the Barmah Choke, compared to if the trade did not occur.
5. **Support lower Goulburn Aboriginal cultural values** – the changes should protect Aboriginal cultural values, including cultural sites and Traditional Owners' connection with and care for Country, from adverse impacts of traded water over summer and autumn. This additionally includes supporting the ecological life

cycles of the flora and fauna used by Traditional Owners as food, fibre and medicine in the landscape, and therefore considered to have high cultural value.

6. **Support lower Goulburn recreational values** – the changes should maintain or improve the outcomes for people using the lower Goulburn River for camping, fishing and other recreational activities in summer and other peak periods.
7. **Support environmental objectives in the Goulburn and Murray systems** – the changes should enable current environmental outcomes to continue to be achieved and prevent environmental problems from shifting elsewhere in the Goulburn and Murray systems.

6. Identification of feasible options

The following sections describe the process DELWP undertook to develop feasible options in order to address the problems identified and aligned with the objectives above. Accordingly, section 6.3 of this RIS looks at options for:

- Operating rules – to set flow regimes, which have been chosen based on scientific evaluation, and mean delivery of water out of the Goulburn River is closer to natural variability and lower over summer and autumn; and
- Trade rules – to enable trade to occur in line with what can actually be delivered under new operating rules, so that traded water can be delivered within the same year and without increasing delivery risks; and
- Tagging regulations – to ensure the risks of tagged water use are managed consistently.

Unlike trade rules and tagging regulations, which are Victorian subordinate legislative instruments, operating rules for the lower Goulburn River are not regulatory instruments that require assessment under a RIS (they are instead embedded in operating plans for river operators). However, they are included in this RIS due to their inherent connection with the trade rule (i.e. that trade opportunity is dependent on how much water can be delivered under different operating rules).

Infrastructure options have also been assessed, but do not present an alternative to pursuing new operating rules, trade rules and tagging regulations. These are explored in in section 6.4 below.

This RIS also looks at long-term arrangements for the Lower Broken Creek so that any changes to the above consider impacts this could have on existing entitlement holders, and does not simply shift environmental issues elsewhere. This is further explored in section 9.3.

6.1 Context for identification of options

6.1.1 Aligning options with objectives

As discussed in section 5.1, the overall objective of this RIS is to maximise opportunities to trade water from the Goulburn to the Murray without delivering traded water above ecological tolerances in the lower Goulburn or causing unacceptable impacts to other water entitlements. This will be done in ways that support the Aboriginal cultural values and the recreational values of the lower Goulburn River, and it will also consider the impacts on waterway health in the lower Murray.

For options to achieve the objectives outlined above and in section 5.2, including avoiding or minimising further environmental damage on the lower Goulburn River, and for enabling some recovery from existing damage if possible, the options must focus on:

- Identifying ecologically tolerable flow regimes
- Outlining the parameters within which river operators can deliver water from the Goulburn River in patterns that fit within those ecologically tolerable flow regimes while also supporting the expected patterns of demand
- Setting allocation trade rules based on what can be sustainably delivered by the operational flow rules – noting that since high flows are desirable in spring and undesirable in summer, those rules may differ by season
- Ensuring that the trade rule options and tagged use restrictions applied are consistent with Basin Plan water trading rules, including that trade is not unnecessarily restricted and that rules for allocation trade tagged water reflect the risk that trade may have on the system.

Broad options for managing trade must accommodate demands in the Murray which increase the Goulburn IVT balance including the legacy commitments, allocation trade and tagged use. Given that any changes that puts at risk the delivery of legacy commitments to the Murray would significantly undermine the reliability of all Victorian Murray entitlements, thereby leading to negative impacts on water users and raising issues of 'sovereign risk' (arbitrary change to the value of a government-backed asset), this RIS does not include any option that would do this. Only options in which legacy commitments can be fully met have been included.

The options all assume that water is called out of the Goulburn IVT account in the same pattern as the traded water is being used in the Murray. This helps ensure there are no material impacts to Murray entitlement water

availability due to the trade, and to minimise the likelihood of a shortfall risk in the Murray as a result of the trade. While use of traded water is difficult to track for allocation trade and therefore assumptions would need to be made about typical demand patterns, the information is readily available for tagged use.

In consideration of all of the above, this RIS therefore focuses on the introduction of new operational rules for IVT delivery over summer and autumn, and changes to the other mechanisms that add to the IVT account — water allocation trade and water use via tagged accounts.

6.1.2 Incorporating feedback from initial consultation

The choice of feasible options considered in this RIS has been informed by initial public consultation on changes to the Goulburn to Murray trade rule[33]. For example, consultation revealed a range of characteristics that people preferred in a trade rule option, including:

- Some level of environmental protection for the lower Goulburn with lower flows over the summer period that would minimise the damage of delivering traded water further downstream
- The maximum possible trade opportunity from the Goulburn to the Murray while recognising ecological tolerances – many people who answered the consultation questionnaire suggested that the design of trade and operational rules should look for opportunities for water to be traded and delivered downstream at times that minimise environmental damage
- Flexibility for the trade rule to respond to different seasonal conditions — so that it was more relaxed in years when more water could be delivered without environmental damage, and more restrictive in years when less water could be delivered without environmental damage.

It was not considered feasible to change trade and operational rules to manage summer flow rates in the absence of reforms to tagging arrangements — i.e. by restricting tagged water use in line with allocation trade rule. This is because allowing unrestricted tagged water use provides a 'work-around' or 'loophole' that would undermine the achievement of the desired objectives of action to prevent long-term environmental damage to the lower Goulburn River.

6.1.3 Incorporating technical knowledge

The choice of feasible options has also been informed by studies on the environmental impact of changes to operational rules, and discussions with MDBA river operators regarding the impact of changes to whole of system operations.

An important input study to this RIS was the 2020 report from a scientific panel formed to provide advice to the Goulburn Broken Catchment Management Authority (CMA), GMW and DELWP on the expected environmental and river health outcomes of a series of flow scenarios. This work informed the development of proposed operating rules for the lower Goulburn River. The scientific panel assessed six flow scenarios, with base flows ranging from 940 ML/day to 2,700 ML/day, with the option of additional pulses, such as an autumn fresh.[34]

In 2020, DELWP commissioned an independent consultant to further analyse the scientific panel's scenarios to suggest a possible way to optimise delivery of traded water from the Goulburn to the Murray and facilitate environmental improvements from current arrangements.[35] There was also comment from the scientific panel on this report[36] and ongoing work with river operations and water trade personnel at MDBA.

6.2 The base case

The base case describes the regulatory position that would exist in the absence of any proposed changes and if interim measures lapsed. This is required as a reference point to assess the impacts of each of the identified options[37]. The base case for this RIS includes allowing the following interim measures to lapse:

- the interim operating regimes which have aimed to keep deliveries of Goulburn IVT lower in order to minimise environmental damage; and,

[33] https://engage.vic.gov.au/goulburn-murray-trade-rule-review

[34] *Environmental risk and opportunities assessment of flow scenarios in the lower Goulburn* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

[35] *Summary: Proposed new operating rules for the lower Goulburn River* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

[36] *Scientific panel consideration of operating rules for the Lower Goulburn River* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review

[37] Per *Victorian Guide to Regulation* available at https://www.vic.gov.au/sites/default/files/2019-10/Victorian-Guide-to-Regulation.pdf

- the interim tagging regulations which are restricting tagged use in line with allocation trade.

Under the base case, the current Goulburn to Murray trade rule would govern how allocation can be traded between the Goulburn and the Murray systems. This rule would allow trade from the Goulburn, Broken, Campaspe and Loddon systems to the Murray system (including interstate) when the balance of the Goulburn IVT account is less than 200 GL. Allocation trade out would be stopped when the IVT account reaches 200 GL. Tagged water use, by contrast, would be unrestricted and allowed throughout the season.

Under the base case there would be no formal restrictions on how much water could be delivered from the Goulburn IVT account per month. This means that in some years, it would be possible to deliver large volumes of water from the IVT account throughout the season, thereby creating large opportunities for allocation trade as the balance is drawn down. It would be expected that such large flow volumes would continue to cause severe environmental damage to the lower Goulburn River as seen in 2017-18 and 2018-19, and have related detrimental implications to Aboriginal cultural values and recreational values.

In order to gauge the effect of no operational rule, the base case is aligned to scenario 6 assessed by the scientific panel. Based on an average of 2,700 ML per day between 1 November and 30 April, flow would be varied between 2,550 - 2,850 ML per day to achieve the 2,700 ML per day average. This is close to the current 3,000 ML per day limit in place to avoid flooding privately owned in-channel pumps in the lower Goulburn River. By delivering in the order of 80 GL per month, this scenario is based on IVT deliveries between 1 November and 30 April totalling 480 GL.

6.3 Options evaluated in this RIS

As discussed in the sections above, the feasible options evaluated in this RIS were chosen in light of the objectives of this review, and built on stakeholder consultation and technical input. This RIS revolves around comparisons between the base case and four identified alternative options. The alternative options all include a flow regime, which would be set by operating rules for river operators to follow when delivering water out of the Goulburn River, and trade rules which provide opportunities for people to trade water between the Goulburn and the Murray in line with what could actually be delivered under each of the operating rules.

The flow regimes, which would be set by operating rules, have been chosen to provide a range of environmental risk scenarios (from environmentally preferred, to higher risk of further damage) and are informed by the work of the scientific panel.

The trade rule options included in this RIS have been informed by initial consultation with the community on changes to the Goulburn to Murray trade rule and refined based on technical input by river operators and water trade personnel at MDBA.

These are summarised in the table below, before each is discussed in turn in more detail.

Table 1: Key aspects of feasible options

Option	Basis for operational rule for IVT delivery	Water allocation trade rule	Tagged water use rule
Base case	Return to operational limits based solely on in-channel privately owned pump levels (around 80 GL/mth of IVT delivered)	Current Goulburn to Murray trade rule (trade is allowed whenever the volume in the IVT account falls below 200 GL)	Not restricted
Option 1:	Environmental flow regime recommended by the scientific panel (around 28 GL/mth of IVT delivered)	Two-part trade rule with: 'Rolling winter-spring limit' where trade is stopped when the IVT balance exceeds a designated balance (like current/base case rule) 'Fixed summer-autumn limit' where trade is capped from mid-December onwards to ensure that all water in the IVT account can be delivered that year within the recommended environmental flow regime	Restricted in line with allocation trade rule
Option 2:	Long-term environmental recovery and low risk of further environmental damage (around 33 GL/mth, plus 39 GL in pulses of IVT delivered, or 106 GL in pulses if in-channel privately owned pumps are moved)	Two-part trade rule (as above modified to accommodate the different flow regime)	Restricted in line with allocation trade rule
Option 3:	Partial environmental recovery and low risk of further environmental damage (around 40 GL/mth, plus 70 GL in pulses of IVT delivered)	Two-part trade rule (as above modified to accommodate the different flow regime)	Restricted in line with allocation trade rule
Option 4:	Long-term environmental recovery and low risk of further environmental damage – with seasonal tagged trade (around. 33 GL/mth, plus 39 GL in pulses of IVT delivered)	Trade rule consisting of an annual cap (set based on volume that can be delivered from November)	July to October: Not restricted November to June: Restricted in line with allocation trade rule

Note: * Operational rule on IVT applies lower average flows for November to April, inclusive.

6.3.1 Option 1: Two-part water trade rule with the environmental flow regime recommended by the scientific panel

Options 1, 2 and 3 each involve a conceptually similar change to the current water trade rule. That is, each involves a two-part allocation trade rule with a restriction on tagged water use in line with that rule. The two-part trade rule involves an allocation trade rule the same as the base case during the period from July to November – whereby water can trade to the Murray whenever the Goulburn IVT account is less than a certain value (200 GL for the base case, 190 with preferred operating rules in option 2). Then, from December to June, net trade into the Murray would capped to ensure that all water in the IVT account can be delivered within the different environmental flow regimes dictated by the different operational rules that apply to Options 1, 2 and 3 for that period. The aim would be to have the IVT account close to zero by the end of June each year to minimise the spill risks for Murray water resources stored in the Goulburn system.

The main difference between each of these three options is the annual volume of IVT (including both allocation trade and tagged water use) that could be delivered into the Murray over the summer and autumn period under each of the different operational rules; it increases from 126 GL for Option 1, to 190 GL for Option 2, and 250 GL for Option 3.

Each part of the two-part trade rule (referred to as the 'dynamic rule' during public consultation in early 2020) involves:

- **Part 1 – 'rolling' winter-spring limit – 1 July to 14 December:** During this period any delivery of Goulburn IVT draws the Goulburn IVT account down below 190 GL (preferred operating rules for option 2 used as an example). Therefore, the greater the delivery of water from the IVT account between July and mid-December, the greater the opportunity for trade. Options 1, 2 and 3 are similar to the base case during this period, in that call-out of the IVT creates additional trade opportunity.
- **Part 2 – 'fixed' summer-autumn limit – 15 December to 30 June:** From mid-December onwards, net trade out is capped and the IVT account balance reduces as IVT is delivered. The fixed limit is set based on the volume that can be delivered under the flow regime, according to operating rules. The fixed limit is announced by the Northern Victoria resource manager each year on the 15 December (or next business day). Delivery of IVT during this second half of the year would not create any additional opportunity to trade out of the Goulburn.

  The volume of annual legacy water commitments (typically up to 140 GL) is quarantined at the beginning of the water year under this rule. This quarantined volume may be reduced in mid-December if the seasonal outlook indicates that allocations to Goulburn high reliability water shares are likely to be less than 100%. The volume not required to be quarantined would then be available for allocation trade. If the fixed limit is reached, then trade can occur only if there has been back-trade from the Murray to the Goulburn, and it cannot exceed the volume of back-trade.

The flow regime under Option 1 corresponds to Scenario 1 assessed by the scientific panel. This scenario limits base flows to an average of 940 ML per day between 1 November and 30 April. Flow would be varied between 830 – 1,100 ML per day to achieve the 940 ML per day average which is a 0.20 m variation at Murchison gauging station. This option also includes a pulse up to a flow rate of 5,000 ML per day in May.

This option is included in the analysis because the scientific panel identified it as the recommended environmental flow regime to protect against unseasonal high flows.

6.3.2 Option 2: Two-part water trade rule with long-term environmental recovery and low risk of further environmental damage

As with Option 1, Option 2 involves the two-part trade rule and the restriction of tagged water use in line with the allocation trade rule.

The key difference between Options 1 and 2 is that the operating rules for Option 2 prescribe a flow regime that allows increased IVT deliveries from November to April, with a higher base flow and more pulses making up the flow regime than under Option 1.

The operating rules for Option 2 were developed by independent analysis of the scientific panel's advice, which aimed to further understand the balance between delivering water from the IVT within the environmental tolerances of the lower Goulburn River, meeting the demands arising from trade, and not unnecessarily restricting trade (consistent with Basin Plan water trading rules). Option 2 aims to find a balance between environmental outcomes, consistent delivery of legacy water commitments to the Murray, and some capacity for net annual trade.[38]

These operating rules prescribe variable base flows with a maximum monthly average of 1,100 ML per day from November to April. Flows would be varied between 960 – 1,360 ML/day to achieve an 1,100 ML per day average. The rules also prescribe up to three pulses over 14 days each, with periods of returning to 1,100 ML per day base flows in between each pulse.

The scientific panel advised that this flow regime would not represent the best outcome for environmental values and waterway health, but it would be expected to likely avoid further environmental damage, retain the current condition of the lower Goulburn and would allow for some improvement in river health in the long-term in combination with environmental watering actions.

6.3.3 Option 3: Two-part water trade rule, partial long-term environmental recovery and low risk of further environmental damage

Similar to Options 1 and 2, Option 3 involves the two-part trade rule and the restriction of tagged water use in line with allocation trade rule. It caps IVT deliveries from December to April at a greater volume than the IVT cap embodied in Options 1 and 2.

[38] This flow regime was not assessed as a scenario by the scientific panel, but the panel consider and provide comments on this flow regime – see *Scientific panel consideration of operating rules for the Lower Goulburn River* available at https://engage.vic.gov.au/goulburn-murray-trade-rule-review.

Under this scenario, flow would be varied between 1,150 – 1,450 ML per day to achieve the 1,300 ML per day average. This scenario would likely see a pulse each month up to a flow of 3,000 ML per day and then base flows back down to 1,300 ML/day.

Pulses would last for 15 days and there would be 18 days between pulses, delivering an additional 70 GL in November to April. The pulses and baseline flow can deliver approximately 250 GL in total between November and April.

The scientific panel noted that base flows of 1,300 ML per day over the irrigation season would likely avoid the damage caused in 2017-18 and 2018-19 and enable some environmental recovery, but the river would not return to its pre 2017-18 condition. The regular pulses were also considered a risk for vegetation and small bodied native fish.

6.3.4 Option 4: Long-term environmental recovery and low risk of further environmental damage – with a seasonal tagged water trade rule

Option 4 has a trade rule that is different to Options 1, 2 and 3.

The seasonally-based rule distinguishes between allocation trade and tagged use based on the potential consequences on seasonal flows in the lower Goulburn River. During spring, late autumn and winter, it is ecologically beneficial to have high flows in the system and delivering traded water in those times does not negatively affect the environment.

This rule also involves two-parts, but the key difference is that under this rule, instead of a rolling trade limit applying over winter and spring, there is unrestricted tagging for that period (July to October). From November onwards, tagged use would be restricted in line with allocation trade according to an annual trade limit, which would be set at 240 GL to reflect the operating rules for the lower Goulburn during summer and autumn, noting that the months of the seasonally based are different to those used in options 1 – 3 above (November to June). Under the seasonal rule:

- From July through to October **tagged use is unlimited and allocation trade would subject to an annual limit**, based on what can be delivered from November to April under the same operating rules as option 2. It is assumed that over this time, deliveries would be meeting tagged water use demand, so that the IVT account balance is increasing with trade over this period.
- From November until June **tagged water use and allocation trade are treated equally and both would be subject to the annual trade limit.** This means that the IVT account balance will be drawn down as water is delivered.

The environmental outcomes for Option 4 are also similar to Option 2, as they both have the same operational rules. As mentioned above for Option 2, the scientific panel advised that this flow regime does not represent the best outcome for environmental values and waterway health, but it would be expected to retain the current condition of the lower Goulburn, and it may allow for some improvement in river health in the long-term if combined with environmental watering actions.

6.3.5 Preferred option for regulating tagged use

Regulation of tagged use is needed alongside implementing the preferred trade rule, in order to prevent tagged water use providing a ‘work-around’ or ‘loophole’ to trade rules as this would undermine the effectiveness of the preferred option in meeting the objectives discussed above.

As described in section 3.4.2, Victoria cannot rely on Basin Plan section 12.23 on its own to consistently and equitably apply restrictions on tagged use across Victoria. Victorian rules are required to fill the regulatory gaps and translate the intent of section 12.23 into the Victorian framework.

The preferred option is therefore to make an enduring (i.e. in operation for 10 years) set of regulations that enable the intent of section 12.23 to be implemented within Victoria. Such regulations provide a transparent and straightforward way to restrict the take and use of water under tagged arrangements.

The proposed regulations will enable the Minister to impose restrictions by a written determination, on water users intending to take or use water under a tagged arrangement in circumstances where the Victorian Trading Rules would not allow allocation trade. The Minster may make such a determination if the Minister considers such restrictions are necessary for one of the reasons allowed under the Basin Plan section 12.18. The regulations would also enable the Minister’s determination to specify exemptions from the tagged use restrictions.

The proposed regulations acknowledge that there are tagged water shares exempted from the operation of Basin Plan section 12.23, referred to as grandfathered tags.

The preferred option for managing grandfathered tags in the 2021 regulations is to provide for the continued exemption of grandfathered tags while clarifying which change of ownership actions would result in the tags being restricted in Victoria. Namely, a transfer of ownership of the tagged water share would result in the tag being subject to restrictions, but a change in the ownership of land on its own (and hence a change in the holder of related water-use licence or registration) does not affect the tag's status. When the land is sold, the water-use licence stays with the land and is assigned to the new owner. This does not require a new approval and is updated automatically in the Victorian Water Register through periodic checks with the Victorian Land Register[39].

There are almost 10 GL of high-reliability and almost 2 GL of low-reliability tagged water shares that are considered grandfathered. Based on the adverse impacts that these tagged water shares can have if allowed to be used above the acceptable trade thresholds, we are also seeking feedback on a faster transition to restricting all grandfathered tags, in which all Victorian grandfathered tags would become subject to restrictions from a certain date. This information further supports why Victoria is advocating for changes to Basin Plan section 12.23.

Appendix D includes an impact assessment if restrictions were placed on all such grandfathered tags in Victoria.

6.4 Infrastructure options – for further investigation

A RIS should consider both regulatory and non-regulatory options. Some of the feedback from earlier consultation on preliminary options for a trade rule focussed on the potential for infrastructure as a non-regulatory option.

In the future, it may be possible to deliver higher volumes to the Murray via new and/or changed infrastructure as an alternative to flows being delivered via the lower Goulburn River, which would avoid further environmental damage to the river.

However, the current annual environmental damage to the Goulburn river is an immediate problem that requires immediate action, and there are no readily available infrastructure options that would address this.

DELWP's initial reviews to determine feasible infrastructure options that warrant further investigation are summarised in this section, and more detail is provided in **Appendix B**.

These reviews indicate that these infrastructure changes, which have not been fully developed, tested and costed, would at best provide only a partial solution to the problem. The options would also require substantial funding, such as cost recovery through increased fees paid by irrigators. The willingness of irrigators to pay higher prices to invest in infrastructure solutions to overcome the river's environmental tolerances is untested.

Regardless, given infrastructure options would take time to implement, the changes proposed in this RIS would still be required to address environmental impacts in the lower Goulburn now. Should such an infrastructure option be commissioned and built in the future, the trade rules could be re-assessed based on any increased capacity that may be created.

6.4.1 Moving in-channel privately owned pumps in Lower Goulburn River

Currently, Goulburn-Murray Water (GMW) operate the lower Goulburn to a maximum of 3,000 ML per day over the summer and autumn period when users that divert water from the river are using their in-channel pumps.

Relocating privately owned pumps used for irrigation and domestic and stock from within the river channel to the top of the bank would enable larger pulses over this period (up to 6,000 ML per day bank full flows). This would facilitate minimising environmental damage from the delivery of traded water over summer and autumn and would maximise the benefits from flows of environmental water in winter and spring.

While this option would not provide an alternative to any changes to rules or regulations, it offers additional operational flexibility to sustainably deliver additional volumes of IVT to meet traded demands and is recommended for further investigation.

[39] https://www.land.vic.gov.au/land-registration

DELWP has undertaken concept planning to relocate this pump infrastructure and the estimated costs for pump construction is $10 million, with total budget delivery (subject negotiations with pump owners) in the order of $27.2 million. For further details on implementation and costs of this approach, see **Appendix B**.

6.4.2 Rochester bypass

This option considers utilising GMW's Rochester Channel No 14 (RO14) to increase the ability to transfer IVT water from the Goulburn to the Murray to augment or supplement existing IVT flows.

The RO14 channel is a medium-sized channel (400 ML per day capacity) within GMW's Rochester Irrigation Area. This option would require enlarging the current channel, replacing an existing pipeline, constructing additional channels, and reinstating the inlet to the remaining length of the pipeline.

The estimated cost for delivery of the works is $83.4 million. This is not a recommended option because with an increase in capacity of 400 ML per day, this would only be a partial solution to delivering sustainable IVT volumes to meet traded demands, would take years to implement and still requires to changes to trade and operating rules to address environmental issues in the meantime.

This means significant upfront investment is required without providing an alternative solution to changes to operating rules and trade rules.

For further details on this option, see Appendix 10.3.

6.4.3 Barmah Choke bypass

An option for a Barmah Choke bypass is not considered in this RIS as it would not provide an alternative option to delivery of water out of the Goulburn River or seek to address impacts to the lower Goulburn River from high unseasonal flows over summer and autumn, and as such is considered outside the scope of this review.

Separate to this review, the Commonwealth Government is undertaking a feasibility study to see whether there are options to reinstate some lost capacity at the Barmah Choke in the context of increasing delivery risks in the Murray. The Victorian Government will continue to support exploring feasible options that help to optimise the capacity of the Barmah Choke and reduce the risk of delivery shortfalls in the Murray system, though to date there are no proposals that have been put forward or agreed by the Commonwealth or Murray-Darling Basin state governments.

A number of proposals have been raised in the past for bypassing the Barmah Choke. Such proposals have not been pursued previously because of associated up-front capital cost, ongoing operating costs to irrigators, and impacts to Aboriginal cultural values and environmental values.

In the meantime, the Victorian Government is ensuring through this review that changes to Goulburn allocation trade, tagged use and operating rules do not increase delivery risks in the Murray system and the preferred option reflects this objective.

7. Impact analysis

The full assessment of options is provided in Appendix A.

Analysis was undertaken which draws on the available evidence to model a number of the key impacts identified for each feasible option. These comprise impacts on:

- **Aboriginal cultural values** — including the potential for irreversible damage to important sites such as burials, middens, hearths, scar trees and artefacts along with the diminished ability of Traditional Owners to connect with, and care for, Country. This additionally includes supporting the ecological life cycles of the flora and fauna used by Traditional Owners as food, fibre and medicine in the landscape, and therefore considered to have high cultural value.
- **Environmental values** — including valuing the changes to waterway health in terms of channel condition, vegetation, and aquatic fauna; the cost of remediation if these values were subject to otherwise irreversible decline, and the community's willingness to pay for environmental outcomes. The environmental impacts for the Goulburn and Murray River systems are discussed separately in the analysis.
- **Recreational values** — including the potential to maintain the low summer flows necessary to provide for safe, dispersed camping, attractive fishing and other recreational activities during peak recreational periods including the opening the fishing season for Murray cod. Attractive fishing is used here to refer to the presence of safe, accessible sandbars with low, slow flows, and relatively warm water, adding to the aesthetics of the environment.
- **Water trade opportunities** — including the potential to continue to enable water trading to allow water to be moved to higher value uses, with the benefits of that being measured through higher producer-generated surpluses (such as gross margin benefits).
- **River operations and shortfall risks** — including the potential for lower summer flows to make it more difficult to manage the river system to meet the needs of all water users in a timely fashion and to make it more difficult to deliver sufficient water in response to heatwave-driven spikes in demand in the Murray.

Options were considered on the basis of how they address the underlying problem — of high risk to Goulburn environmental values — and then how they deliver across the other types of impacts.

Table 2 summarises the option assessments across the different impacts.

Table 2: Assessment of the impacts of the different options

Element of assessment	Base case	Option 1	Option 2	Option 3	Option 4
Aboriginal cultural values*	Cultural sites not protected and diminished connections with Country	Cultural sites protected	Cultural sites protected	Cultural sites not protected and diminished connections with Country	Cultural sites protected
Goulburn environmental values*	High overall long-term ecological risk: High Risk of further damage Significant environmental degradation (Requiring at least ~$162 million erosion remediation cost while not addressing other	Lowest overall long-term ecological risk Low Risk of further damage and good prospects for improvement ~$162 million avoided erosion costs compared to base case	Low overall long-term ecological risk Low Risk of further damage, enabling some improvement ~$130-162 million avoided erosion costs compared to base case	High overall long-term ecological risk Risk of further damage with regular monthly flow pulses causing significant environmental harm ~$15-80 million avoided erosion costs compared to base case	Low overall long-term ecological risk Low Risk of further damage, enabling some improvement ~$130-162 million avoided erosion costs compared to base case

	environmental issues)				
Recreational values*	Poor outcomes	Maintained and improved outcomes	Maintained and improved outcomes	Poor outcomes	Maintained and improved outcomes
Inter-valley trade opportunities#	In addition to legacy volumes, ~235 GL/year (Estimated NPV $125-333m)	In addition to legacy volumes, ~66 GL/year (Estimated NPV $73-199m less than base case)	In addition to legacy volumes, ~130 GL/year (Estimated NPV $37-99m less than base case)	In addition to legacy volumes, ~180 GL/year (Estimated NPV $12-32m less than base case)	In addition to legacy volumes, ~130 GL/year (Estimated NPV $37-99m less than base case)
River operations and delivery shortfall risks	Goulburn IVT used to optimise Murray resources (including as a river operations tool to mitigate other delivery risks)	IVT used to meet traded demand - no increased delivery risk from trade	IVT used to meet traded demand - no increased delivery risk from trade	IVT used to meet traded demand - no increased delivery risk from trade	Increase in delivery risks in the Murray with tagging demand substituting for Murray water allocation use

* Values identified relate to risks to the lower Goulburn River.
# Trade opportunity is inclusive of water allocation trade and tagged water use (including deliveries to grandfathered tags).

Impacts on Aboriginal cultural values have been assessed in consultation with the Traditional Owners of the Yorta Yorta Aboriginal Nation Corporation and Taungurung Land and Water Council as well as the Goulburn Broken CMA. These impacts have not been monetised as it is more appropriate to consider these risks qualitatively. Under the base case and Option 3 these values are not expected to be protected, whilst under the other options Aboriginal cultural values are expected to be protected.

The large-scale changes associated with erosion remediation for the base case and option 3 may address erosion issues but would not address the broader range of environmental concerns. The increased risk of further damage to the river lead to a view that such erosion remediation works are not feasible. Further, these erosion remediation works would be in a national park with culturally sensitive areas, and erosion control measures would irreparably change the natural habitat and look of the river — resulting in environmental, recreational, social and Aboriginal cultural implications. A conservative estimate of willingness to pay for environmental outcomes — representing the estimated community willingness to pay for improved vegetation outcomes along the lower Goulburn — is in the order of $94 million (following Bennett *et al*. 2008[40]).

Under Options 1,2 and 4 there are expected benefits from avoided costs to rehabilitate the erosion impacts. These are discussed in **Appendix C**.

Moving from the base case to Option 3 would not result in significant improvements to environmental outcomes — both the base case and Option 3 had an overall environmental risk rating of High. However, relative to the base case, there may be limited environmental benefits, most notably to large bodied native fish. The scientific panel also noted that if more variation could be built into pulses then it may be possible to rate the overall risk associated with Option 3 as Significant (rather than High).

Recreational values have also not been monetised given they likely overlap with the willingness to pay estimates for the environmental values. Nonetheless, it is worth noting that, as discussed in **Appendix C** and below (Section 0), a 2010 survey by Ernst and Young attributed $166 million in annual direct fishing expenditure by anglers targeting Murray cod, much of which takes place in the lower Goulburn River. For example, a tackle shop in Shepparton estimates that 50% of their annual tackle sales are to people targeting Murray cod. The high summer flows under the base case option have seen a decline in fishing in the opening of the cod season, in the first weekend of December, and in the Christmas holiday period.

The economic benefits of IVT opportunities increase with larger volumes of potential trade. The economic value of these trade opportunities will depend on the level of allocations in the Murray systems versus that in the Goulburn, and will vary depending on such things as commodity prices and seasonal conditions. Trade is generally observed from the Goulburn to the Murray (rather than through back-trade in the other direction), as

[40] Bennett, J., Dumsday, R., Howell, G., Lloyd, C., Sturgess, N. and Van Raalte, L., 2008. The economic value of improved environmental health in Victorian rivers. Australasian Journal of Environmental Management, 15(3), pp.138-148.

indicated by the IVT balance being frequently at or near the limit, suggesting there is currently benefit from this direction of trade.

There is inherent value associated with being able to trade water – people have flexibility to trade and use water to support what is most valuable to them. People will buy and sell water, in this case between the Goulburn and Murray systems, in ways that help them get the most value out of their water. For example, for environmental water holders to support environmental outcomes, and for farmers to support different types of farming.

More broadly than individual decisions for how best to use water for their businesses, the productive value associated with trade that supports water use in different regions is dependent on what people choose to farm and commodity prices for their product. Currently in the Murray system, traded water is generally used to support growth of horticultural crops in the lower Murray, while water use in the Goulburn system supports dairy, pasture or cropping which are currently typical in this system.

The trade rules in Options 1 to 4 will constrain trade if the downstream demand for traded volumes exceed the volume allowed under the trade cap:

- If water is able to move freely with no trade constraints, trade would be expected to occur up to the point where the value of extra water use in the Goulburn is equal to the value of extra water use in the Murray. At this point the water allocation prices between the Goulburn and Murray would be expected to be equal.
- If a trade rule constrains trade — to the extent that additional trade is not approved — it will create price differentials between the Murray and Goulburn systems. Importantly, if a given volume of water cannot be traded to the Murray, it is still available for use in the Goulburn system, but the value of that extra water use is less in the Goulburn than in the Murray. The costs associated with this foregone trade can be measured as the difference between the water allocation price differentials between the Murray and Goulburn.

The net present value (economic value) of the large volumes of trade allowed under the base case is expected to be in the order of $125-333 million (m).The net present value of the other options declines with the associated trade opportunity — Option 3 $12-32 m less than base case); Options 2 and 4 $37-99 m less than base case); and Option 1 $73-199 m less than base case). This analysis is set out in **Appendix A**.

Although Options 1 to 4 limit the volume of Goulburn system water that can be traded into (both through allocation trade and tagged use) the Victorian Murray below the Barmah Choke, the water availability in the Murray system depends on a range of factors, including seasonal factors (like drought) and whether water is available to trade into the Victorian Murray below Barmah from the Murray above Barmah or from the Murrumbidgee . Also, by limiting the volume that can be traded into the Murray, these options would be expected to increase the water use in Goulburn system (such as by GMW irrigators in aggregate). These changes in water availability may see a change in the type of irrigated agriculture businesses in the Goulburn, due to the additional water that is expected to remain available in the Goulburn because of the limits on trade.

The operational rules in Options 1 to 3 are designed with the assumption that the capped IVT volumes are delivered to match the demand patterns that they would generate. This is intended to minimise or avoid any impact on rights of other Murray entitlement holders resulting from the trade. Some variability between monthly deliveries and monthly demands is acceptable, provided there is sufficient buffering within the existing Murray system to manage expected delivery or resource risks. The coordinated management of various upstream and mid-river storages – Lake Victoria, Menindee Lakes, Euston Weir, the Murrumbidgee IVT, the Victorian mid-Murray storages, the Edward River system, the Mulwala Canal and the Goulburn IVT – collectively provides that buffering in all but the most extreme situations.

It is important to note that under the base case option, there would be years when allocation trade to the Murray would boost Murray resource and delivery security. However, given the environmental damage this created in the lower Goulburn in 2017-18 and 2018-19, continuing to support this boost for the Murray at the expense of the health of the lower Goulburn River would be inconsistent with the *Water Act 2007* Basin water market and trading objectives[41].

The impact of delivering IVT to match traded demands (therefore likely more frequent transfers in spring) on environmental water holders' ability to move environmental water from one zone to another, beyond existing trade limits, has not been considered as part of this assessment. It is worth noting ongoing work within Victoria to better define delivery rights for different types of entitlement holders that will address this issue separately. For this assessment, the base case assumes volumes of IVT, which includes water held by environmental

[41] Refer to clause 3(d) of Schedule 3 in the *Water Act 2007*.

water holders, can and are currently delivered through spring and this will not change as a result of the assessed options.

8. Summary of the preferred option

The following sections summarise the reasons for choosing the preferred option (section 8.1), identifies the names of the proposed statutory rules and legislative instruments provided for consultation (section 8.2) and describes likely competition effects including a discussion of impacts on small businesses (section 8.3).

8.1 Reasons for choosing the preferred option

The RIS overall objective is to enable the trade of water from the Goulburn to the Murray to support irrigators and other entitlement holders, within the identified ecological tolerances of the lower Goulburn River, and without causing unacceptable impacts to other entitlement holders. This will be done in ways that support the Aboriginal cultural values and the recreational values of the lower Goulburn River, and it will also consider the impacts on waterway health in the lower Murray. This review aims to recommend changes to the allocation trade, tagged use and operational rules that strike the best balance between the following seven objectives:

1. Support lower Goulburn environmental values.
2. Provide as much opportunity as possible for water trade from the Goulburn to the Murray based on what can sustainably be delivered.
3. That trade is not unnecessarily restricted, and appropriately reflects the risks to the system
4. Ensure delivery risks in the Murray do not increase as a result of trade that occurs from the Goulburn.
5. Support lower Goulburn Aboriginal cultural values.
6. Support lower Goulburn recreational values.
7. Support environmental objectives in the Goulburn and Murray systems.

The **base case** does not achieve these objectives. It has unacceptably high impacts on environmental values in the lower Goulburn and was assessed as having a high overall long-term ecological risk due to high impacts on channel condition, vegetation and small bodied native fish. It also has unacceptable impacts on Aboriginal cultural values, and it diminishes recreational fishing opportunities during key periods such as the opening of the Murray cod season on the first weekend in December and over the Christmas-New Year holidays. While the base case provides the greatest opportunities for water trade, this benefit cannot be traded-off against the costs to environmental values, Aboriginal cultural values and recreational values.

Option 3 provides more trade opportunities than **Option 1 and Option 2**, but it does not offer opportunities for recovery from recent environmental damage. It was assessed as having a high overall long-term ecological risk (with significant-to-high impacts to channel condition, vegetation and small bodied native fish). For that reason, it cannot be preferred.

Option 4 provides more trade opportunities than **Option 2**, and it provides similarly low ongoing risks to the environment and recreation, and protects Aboriginal cultural values. However, this option provides Murray water users the chance to use unlimited volumes of Goulburn water from tagged accounts during winter and spring and reserve the use of their local Murray allocations for the peak summer and autumn period. Using significantly more Murray allocation in summer and autumn would create an unacceptable shortfall risk in the Murray system, because the delivery of local allocation through the Barmah Choke would be concentrated during this peak demand period. Analysis indicates that this option could result in more than 100 GL of additional use of Murray allocation in the peak demand period. Therefore, it does not meet the third objective.

The main choice then is between **Option 1** and **Option 2**. Both options reduce the risk of further damage, protect Aboriginal cultural values and provide opportunities for improvement of the current environmental condition compared to the base case, but **Option 2** provides greater trade opportunity for a small increase in environmental risks. For example, although Option 2 does not provide as optimal an environmental outcome as Option 1, the scientific panel found that Option 2 would:

- Avoid the kind of damage to the river caused in 2017-18 and 2018-19
- Substantially reduce risk of riverbank erosion
- Retain current riverbank and habitat diversity
- Maintain or increase vegetation along the lower banks above the water level

- Maintain current habitat and flow-regulated conditions for small-bodied and large-bodied species for low-flow months
- Likely allow the river to slowly heal, given adequate sediment inputs from tributaries and continuation of current environmental flow management.

Option 2 therefore meets the requirements of a sustainable, working river, and of all the options best balances the objectives for this review. Compared to Option 1, the preferred option enables more trade opportunity – up to $100m more – but prevents further environmental damage compared to Option 3. The benefits of this additional trade opportunity also outweigh the costs of potential – though lower risk – erosion remediation works ($0-32m).

Once environmental condition has been restored under **Option 2**, there may be further opportunities to provide greater trade opportunity. This is considered in the implementation plan (see section 10).

8.2 Proposed statutory rules and legislative instrument

The preferred Option 2 would consist of an Order to amend the Victorian trading rules, and a new enduring (i.e. in operation for 10 years) set of regulations to restrict tagged use.

A copy of the tagged use regulations and related Determination are provided for consultation as:

- *Water (Tagged Water Allocations) Regulations 2021*.
- *Ministerial Determination for Tagged Water Allocations – 1 July 2021.*

A copy of the Order amending the Victorian trading rules is provided for consultation as:

- *Order for Amendment of the Trading Rules for Declared Water Systems (Revised Goulburn to Murray Trade Rule).*

Unlike trade rules and tagged use regulations, which are Victorian subordinate legislative instruments, operating rules for the lower Goulburn River are not regulatory instruments that require assessment under a RIS - they are instead embedded in operating plans for river operators. However, the operating rules are included in this RIS due to their inherent connection with the trade rule (i.e. that trade opportunity is dependent on how much water can be delivered by the operating rules).

8.3 Assessment of impacts on competition and small businesses

The preferred option will not create barriers for access to irrigable land nor restrict who can participate in the water market. It will not alter the underlying property rights of water entitlements and the expected allocations to such entitlements (water shares) and will not change the opportunities to carry over water.

The preferred option may affect competition in the water market and small businesses that are irrigating farms in the Goulburn and Murray systems via the changes to the water trading opportunities that are available to them. Decreased opportunities for trades that transfer water between the Goulburn and Murray systems when trade is closed will mean that there is proportionally less water market competition in the Goulburn and more in the Murray.

When trade is restricted, Goulburn water sellers are not be able to sell to Murray buyers, and instead have to seek a Goulburn buyer. Similarly Murray water buyers (below the Barmah Choke) are not be able to buy from Goulburn sellers when trade is restricted, and instead have to seek to purchase water from other sellers in the system, including: other Victorian, NSW or SA Murray sellers below the Barmah Choke; or if trade limits allow - NSW Murrumbidgee sellers, or Victorian and NSW Murray sellers above the Barmah Choke.

The estimated difference in annual trade opportunities between the preferred Option 2 and the base case is about 105 GL (refer to Table 2 in section 7) , meaning that volume of water will remain in the Goulburn system for use by water users in the Goulburn. The reduced water market competition in the Goulburn is expected to result in lower water market prices in the Goulburn, which means it would be less costly to buy water but also means a lower selling price. It will likely be less costly for Goulburn water users that rely on water allocation purchases to meet their water requirements. Those that hold water shares will be less affected as they are less reliant on water allocation purchases to meet their water use needs. For those people looking to sell their water, they will likely get a lower price for water allocation trade.

There will likely be increased water market competition in the Murray system, which is expected to result in higher water market prices in the Murray. This would make it more costly for Murray water users that rely on water allocation purchases to meet their water requirements, depending on how much this market pressure

can be offset by water availability from the other parts of the connected southern Murray-Darling Basin. As above, water users holding water shares are less reliant on water allocation purchases and will likely receive a higher price for water allocations they choose to sell. It is expected that to meet sustained irrigation demands, water users will source their water elsewhere, with trade in from NSW and SA Murray below the Barmah Choke, and, subject to the relevant trade limits, trade in from NSW Murrumbidgee, and the Victorian and NSW Murray above the Barmah Choke.

The change to water market prices in the Murray is difficult to estimate and will vary with seasonal conditions and other factors. Market prices for water allocation are already highly variable in response to lower seasonal allocations in dry or drought conditions as well as other factors like commodity prices.

It is important to note that the preferred option will allow additional trade to occur in years when Goulburn allocations are less than 100%, since if less water needs to be delivered to legacy commitments then more traded water can be delivered within the environmental limits. This will help to minimise the competition impacts in the particularly challenging years of greater water scarcity.

The proposed changes under the preferred option do not change the ability of any sector, including small businesses, to participate in the water market. The likely change in trade opportunity as a result of the proposed changes, and flow-on market price changes, will be the same for all water users in each system. The flow-on effect of this increased competition in the Murray is expected to increase the market price of water allocations in some years and to incentivise water users to seek the use of other connected water resources. In a well-functioning market, water market prices in the Murray will reflect all the water available to access from the connected Murray system including the Menindee Lakes in the Lower Darling system, as well as trade opportunities from the Murrumbidgee and Goulburn Rivers.

Given that the delivery of traded water from the Goulburn to the Murray is the cause of the environmental damage and high risk to ecological outcomes in the lower Goulburn River that this RIS aims to address, and as any feasible infrastructure options would take many years to implement (refer to section 6.4), the objective to deliver traded water sustainably and without causing unacceptable impacts to other entitlement holders can only be achieved by aligning trade opportunity with what can be delivered under operating rules that recognise the ecological tolerances of the river – this will result in less trade opportunity between the Goulburn and the Murray than under current arrangements.

Of the options that achieve a lower risk to ecological outcomes, the preferred option allows the most trade opportunity. This means that the competition impacts have been minimised, given the achievement of this core objective. Further, transitional arrangements have been proposed to ensure that the competition impacts are not exacerbated during the implementation period, while not undermining the environmental outcomes.

Overall, as discussed above in sections 7 and 8, the preferred option protects the health of the lower Goulburn River while providing the best balance of outcomes for the community – improvement to environmental values, protection of Aboriginal cultural sites, provision of recreational opportunities, provision of sustainable trading opportunities, and management of river operational constraints. Therefore, the net benefits to the community from the preferred option outweigh the costs of reducing trade opportunities between the Goulburn and the Murray.

It will be important for water users, including small businesses, to be able to understand the changes to trade opportunities and how the rule governing trade from the Goulburn to the Murray will work. DELWP is working to continually improve our information products for all market participants to increase confidence that the market is operating properly. Strong stakeholder feedback has increased the Department's focus on improving transparency and understanding of the market.[42] Various government information resources are also available to help water users to understand their opportunities to use the water market – for example, the Victorian Water Register website and smart phone application includes up to date information indicating in real-time what opportunities are available for trade and back-trade in Victoria as set by the Victorian Trading Rules[43].

As part of implementation, DELWP will look to provide information to irrigators regarding government support services and programs that are available to them to help with the transition to higher competition within the Murray system. This includes information on programs such as DELWP's Sustainable Irrigation Program,

[42] The Victorian Water Register maintains a News webpage with information of interest to water users including key water market information updates. Recent news items have included information on delivery risks to the River Murray System, reporting of the largest Victorian water entitlement owners, insights into trends and drivers of water allocation prices, online link to Victoria's annual water availability and use information, and introduction of a 'reason for trade' requirement to assist the market to better understand market prices.

[43] Various information is available on the Allocation trading webpage, including a link to the 'Where can I trade?' web-based tool, and to the free 'Water Market Watch' smart phone application.

which includes services and initiatives through Agriculture Victoria's Irrigation Program as well as sustainable irrigation initiatives through Catchment Management Authorities[44].

The Sustainable Irrigation Program is coordinated and funded by DELWP with the aim to support irrigation communities to use water wisely while protecting and improving the environment. This is via land and water management planning, specialist irrigation extension support, cost-share incentives and other activities. The program is a collaborative partnership between DELWP, Agriculture Victoria, CMAs, rural water corporations and the community.[45]

The Irrigation Program within Agriculture Victoria (as part of the Department of Jobs, Precincts and Regions) is part of the Sustainable Irrigation Program and offers a wide range of support to irrigators in northern Victoria with staff located in Mildura, Kerang, Echuca, Tatura, and Rutherglen. The program is delivered in strong partnership with DELWP and the local Catchment Management Authorities. Example support programs include providing advice in the early development stages of irrigation businesses, providing information and services to assist the irrigation community[46] (e.g. fact sheets, training courses, irrigation webinars including on the topic of water markets[47], and irrigation design advice), as well as an extension service to provide irrigators with the latest information on irrigation practices, technologies, management techniques and agriculture research developments which promote the efficient use of water.[48]

[44] For example, CMA Land and Water Management Plans are available for Goulburn Broken CMA, North Central CMA, North East CMA, and Mallee CMA.

[45] Sustainable Irrigation Program: https://www.water.vic.gov.au/water-for-agriculture/sustainable-irrigation-program

[46] Agriculture Victoria's Irrigation Program website: https://agriculture.vic.gov.au/farm-management/water/irrigation

[47] Agriculture Victoria and DELWP have partnered to provide a series of irrigation webinars on the water market, with recent ones on topics such as 'Water Market 101' focusing on outlook in Spring 2020 and 'Where is the water market heading in the long term?'.

[48] ExtensionAUS: https://extensionaus.com.au/

9. Proposed arrangements for the Lower Broken Creek

Despite the Lower Broken Creek being part of the Murray system, under most circumstances water is delivered to the Lower Broken Creek from the Goulburn system. The Lower Broken Creek is also used as a delivery route for some water from the Goulburn IVT account, effectively bypassing the lower Goulburn River. As a result, any changes to how trade and operations are managed between the Goulburn system and the Lower Broken Creek can impact the way IVT is delivered. Therefore, the impact of any changes to the operation of Lower Broken Creek must be considered as part of the Goulburn to Murray trade review.

Although the volumes of allocation trade and tagged use from the Goulburn to the Lower Broken Creek and allocation trade out to other Murray zones is relatively small, there are still delivery risks associated with this trade particularly if it were to continue to increase in total volume. These delivery risks must be carefully monitored and managed with any changes to trade rules tor the Lower Broken Creek to ensure the impact is not borne by other entitlement holders.

Delivery to the Lower Broken Creek poses no environmental risk on the lower Goulburn River. However, use of the Lower Broken Creek to deliver some water from the Goulburn IVT must be monitored to ensure environmental thresholds within the Creek are recognised.

Arrangements for managing trade between the Goulburn and the Lower Broken Creek are described in the sections below, including any impact the proposed options would have on the assumptions underpinning the delivery of IVT from the Goulburn to the Murray. A description of the options for managing trade between the Lower Broken Creek and the Goulburn can also be found in the separate consultation paper ***Managing trade between the Goulburn and the Lower Broken Creek***.

9.1 Lower Broken Creek system

The Lower Broken Creek is part of the declared Murray water system downstream of the Barmah Choke, with its own defined trading zone (zone 6B). Although it receives some unregulated inflows from the upper catchment, its main source of water is from the Goulburn system through the Shepparton Irrigation Area via the East Goulburn Main Channel and some smaller outfalls. However, when the Goulburn seasonal determinations are lower than the Murray, any shortfall in supply is delivered from the Murray system via outfalls from the Murray Valley Irrigation Area.

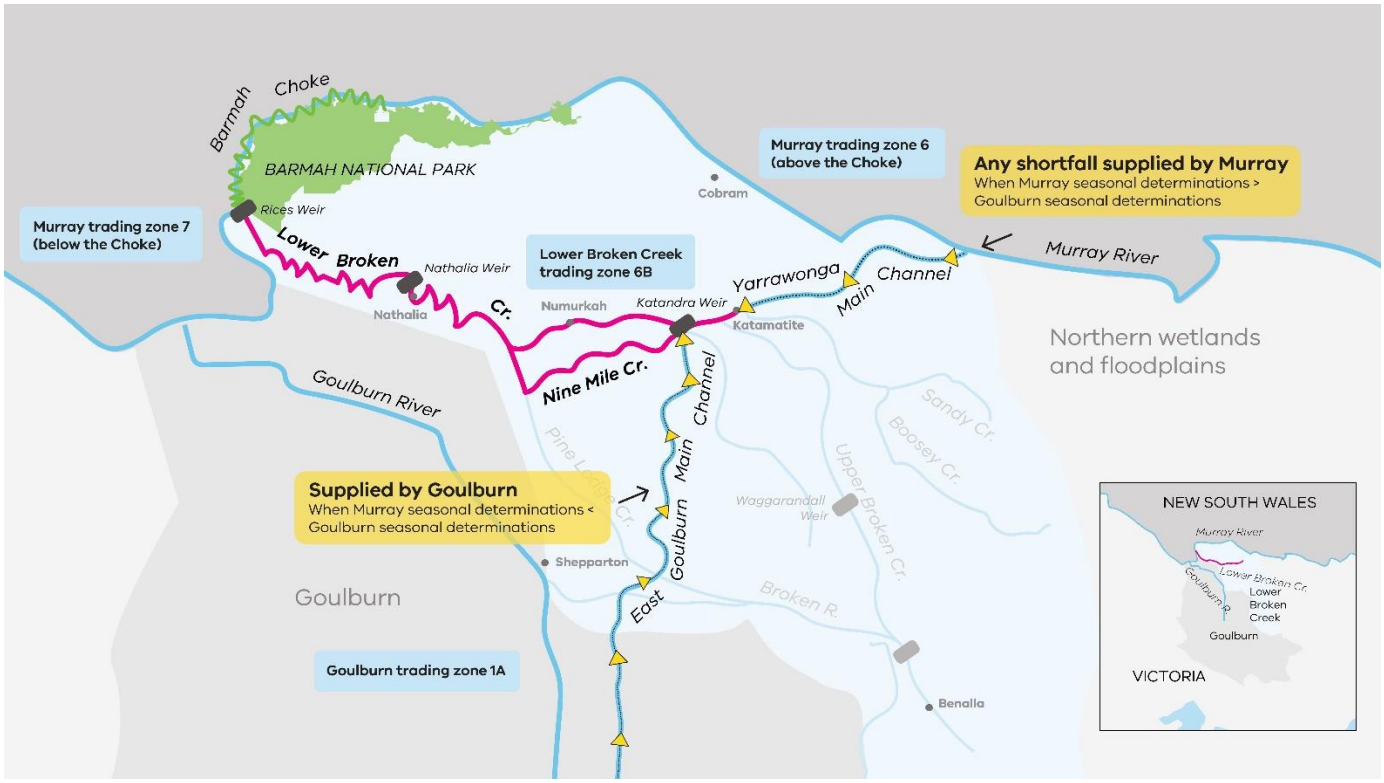

Figure 5: The Lower Broken Creek system supply arrangements

9.2 The Lower Broken Creek and the Goulburn to Murray trade review

The Lower Broken Creek trading zone (zone 6B) is on the Murray system side of the Goulburn to Murray trade rule. Without special arrangements, tagged use from the Goulburn system to the Lower Broken Creek would be subject to the Goulburn to Murray trade limit in the same way as other parts of the Murray system – even though water does not have to travel through the lower Goulburn River to be delivered. This would mean that the customers in the Lower Broken Creek would be unnecessarily restricted in a way that does not reflect the risks to the system.

Because of its unique location and supply arrangements, when water entitlements were unbundled from land in 2007, entitlement holders on the Lower Broken Creek were given a choice of whether they wanted their entitlements converted into Murray (zone 6B) or Goulburn system water shares. The vast majority chose Murray water shares, but some chose Goulburn water shares which were then tagged for use in the Lower Broken Creek 6B trading zone.

Since the Minister for Water introduced new measures to bring tagged water use into line with allocation trade rules in December 2019, customers in the Lower Broken Creek have been given a temporary opportunity to continue to use water from Goulburn tagged accounts in the Lower Broken Creek without restriction until long-term trade arrangements are established. This exemption recognises the unique setting of the Lower Broken Creek, in which water delivered to Lower Broken Creek customers does not rely on the lower Goulburn River and that without exemption the entitlement holders in the Lower Broken Creek would be unnecessarily restricted from using their entitlements. These temporary arrangements for tagged water use in the Lower Broken Creek have meant that customers have been able to continue to use water from the Goulburn system via their tagged accounts, even when Goulburn to Murray trade is closed.

There has been net allocation trade and tagged use from the Goulburn to the Lower Broken Creek in the last three years. However, even with exemptions from tagging restrictions, this has remained relatively stable and historical volumes of tagged use have remained small. Prior to tagged use restrictions taking effect in 2019-20, the highest volume of net allocation trade and tagged use from the Goulburn to the Lower Broken Creek was around 2.7 GL in 2017-18, compared to around 210 GL from the Goulburn to Murray zone 7 in the same year. In the same year allocation trade out of the Lower Broken Creek reached a historical peaked this year of around 13 GL, but in every other year since 2012-13 has been between 5 – 10 GL. In 2019-20 when the Lower Broken Creek customers had an exemption from tagging restrictions tagged water use from the Goulburn to the Lower Broken Creek was around 1.5 GL and allocation trade out to other Murray zones was around 9 GL.

For over a decade, Goulburn-Murray Water (GMW) has been transferring Murray and Goulburn system water through the Lower Broken Creek at the request of the Goulburn-Broken Catchment Management Authority to meet environmental flow objectives. Historically, the use of the Lower Broken Creek to deliver water from the Goulburn IVT account has been primarily for meeting ecological targets for water quality and habitat provision, with the environment covering any losses (i.e. operational losses such as seepage). In recent years, higher IVT demand has led to the volume of IVT transfers increasing in Lower Broken Creek, which helps reduce ecological damage from water transfers in the lower Goulburn River. This is proposed to continue to mitigate some of the damage caused by high summer flows in the lower Goulburn River, although the volume of spare capacity and volumes delivered through the Lower Broken Creek will depend on how people use and trade water in the Lower Broken Creek area and the environmental tolerances of the creek.

To ensure that water from the Goulburn IVT account is only delivered through the creek in a way that does not shift the environmental problems seen in the lower Goulburn River to the Lower Broken Creek, a monitoring program has already commenced to assess the impact of IVT flows in 2020-21. This program is described further in section 11.1.

9.3 Options for Lower Broken Creek

Proposed options for a Lower Broken Creek trade rule, including the preferred option, are discussed below. The preferred option centres around allowing some tagged use during part of the water year, even if allocation trade is closed, while ensuring risks to the environment and other entitlement holders are appropriately managed. The preferred option has been designed to prevent unnecessary restriction on the Lower Broken Creek whilst conservatively managing the risk of trade out of the Lower Broken Creek reaching unsustainable levels.

Currently, the patterns of tagged use from the Goulburn into the Lower Broken Creek and the volumes of allocation trade out to the wider Murray are within the capacity of the system, even when year-round exemptions to tagging restrictions have been in place (since December 2019). Delivery to the Creek presents no environmental risk to the lower Goulburn River. However, it has been the operational practice that some

spare capacity in Lower Broken Creek has been used to deliver small volumes of water from the Goulburn IVT account when there is opportunity, mitigating some environmental pressure on the lower Goulburn River, and this practice is planned to continue.

Additionally, precautions must be taken to ensure that the preferred option does not simply shift the environmental problems to the Lower Broken Creek, and that system operational risks are also managed. A full tagged use exemption from the Goulburn to Murray trade rule could mean trade of allocation from the Lower Broken Creek to other Murray trading zones could become unsustainable. Water users in the Lower Broken Creek could substitute their local water allocations with less expensive Goulburn water allocations and use them in the Creek through a tagged arrangement and sell all their local Lower Broken Creek water allocations to the Murray. This could create unacceptable delivery risks as both the traded water and tagged use water would need to be delivered down Lower Broke Creek, contributing to shortfall risk in the Murray in peak demand periods. Future patterns of use and the risk of this substitution of local entitlements for tagged Goulburn water are difficult to quantify; therefore, the preferred option has been designed conservatively, in order to allow such risks to be monitored and more fully understood.

During initial public consultation three possible options were proposed for managing trade between the Goulburn river and the Lower Broken Creek. Details of the three options can be found in the technical attachment *Goulburn to Murray trade rule review: Lower Broken Creek* available on the Engage Victoria website[49]. Of the three options that were proposed, there was no clear consensus on which option suited the Lower Broken Creek entitlement holders best. As a result, DELWP has done further work to propose options here that are different from the options proposed during initial consultation. These proposed options for the Lower Broken Creek are designed assuming the presence of the preferred Option 2 trade rule, which has been described in sections 6 and 8.

9.3.1 Option A: Do nothing option - interim measures lapse

Under this option, taking into account the preferred option for the Goulburn to Murray trade rule (refer to section 8), when the interim tagged use exemption for the Lower Broken Creek expires on 30 June 2021 the Lower Broken Creek would be treated the same as the wider Murray. This means that all allocation trade and use of Goulburn water shares tagged for use in the Lower Broken Creek would be restricted under the Goulburn to Murray trade rule.

The Lower Broken Creek customers that hold Goulburn water shares tagged for use in the Lower Broken Creek due to the 2007 historical supply arrangements would not be able to use these tagged water shares when the Goulburn to Murray trade rule is closed.

This option is not preferred as it unnecessarily restricts the customers in the Lower Broken Creek and does not reflect that water can be delivered to the Lower Broken Creek without damage to the lower Goulburn River. Restrictions in line with the wider Murray system do not reflect the low risks posed to the environment or shortfall delivery risks to the Murray system by delivering water to and through the Lower Broken Creek. The flow on impacts of trade between the Goulburn and the Lower Broken Creek can be managed with some exemption from these restrictions, which would mean more efficient use of the system and be more aligned with RIS objective 2 (allowing as much trade as can be sustainably delivered) and 3 (not unnecessarily restricting trade) as outlined in section 5.2, and the allowable reasons to restrict trade under the Basin Plan sections 12.16 and 12.18.

9.3.2 Option B: exchange Goulburn water shares tagged to the Lower Broken Creek

As an alternative to simply letting interim tagging exemptions lapse and restricting the use of some Lower Broken Creek customers' entitlements, Option B for managing trade between the Goulburn and the Lower Broken Creek is for the Lower Broken Creek to:

a. Have the same rules for allocation trade and tagged use from the Goulburn as the rest of the Murray, **and**

b. Give all eligible entitlement holders with Goulburn entitlements the option to exchange them for local Murray entitlements (recognising the unique arrangements since 2007) so that these users can always use their entitlements in the local 6B zone.

Under Option B, the use of Goulburn water shares tagged for use in the Lower Broken Creek would be restricted in line with the Goulburn to Murray trade rule, meaning that no tagged use would be allowed when allocation trade is closed.

[49] https://engage.vic.gov.au/goulburn-murray-trade-rule-review

This option would include offering customers holding Goulburn water shares tagged for use in the Lower Broken Creek prior to the Minister for Water's announcement 20 August 2019 the opportunity to exchange these with local Murray (Lower Broken Creek zone 6B) water shares. There is around 1,000 ML of Goulburn high-reliability water share and 1,000 ML of Goulburn low-reliability water share tagged for use in the Lower Broken Creek that would be eligible for the exchange.

This option means that all Lower Broken Creek customers holding tagged Goulburn water shares prior to 20 August 2019 would be given the opportunity to hold local Murray system water shares, and therefore their use will not be restricted when Goulburn to Murray trade is closed. Under this option Lower Broken Creek customers would be treated the same as each other unless they choose to continue to hold Goulburn water in a tagged account where use would be subject to Goulburn to Murray trade restrictions.

A set of principles have been followed while developing this option so that exchanging the water shares:

- Would not change the consumptive volume of water in either system
- Would not increase the commitment from the Goulburn to the Murray systems
- Would not increase the commitment from above to below the Barmah Choke
- Would not impact on the reliability of entitlements for other entitlement holders
- Would align with bulk water supply to the Lower Broken Creek.

Whilst this option allows customers holding Goulburn entitlements tagged for use in the Lower Broken Creek the opportunity to manage their water in a way that will not be subject to restriction, this option does not address that trade between the Goulburn and Lower Broken Creek can be exempt from some of the restrictions placed on the wider Murray whilst still managing environmental and delivery risks in the Goulburn and Murray systems. Similar to Option A, this option is therefore still considered at odds with the RIS objectives of this Goulburn to Murray trade review and the allowable reasons to restrict trade under Basin Plan sections 12.16 and 12.18.

9.3.3 Option C: exchange tagged water shares and special tagged use rules for the Lower Broken Creek (preferred option)

The preferred option for managing trade between the Goulburn and the Lower Broken Creek is for the Lower Broken Creek to:

a. Have the same rules for allocation trade from the Goulburn as the rest of the Murray, **and**

b. Give all eligible entitlement holders with Goulburn entitlements the option to exchange them for local Murray entitlements (recognising the unique arrangements since 2007) so that these users can always use their entitlements in the local 6B zone, **and**

c. Have system-specific tagged use restrictions that are different to those for the wider Murray, in recognition of the unique attributes of this system.

This builds on Option B by offering the same exchange of tagged water shares in addition to adding a zone-specific rule to enable some further tagged use in the Lower Broken Creek. This means that while allocation trade and tagged water use from the Goulburn system to the Murray is restricted under the Goulburn to Murray trade rule, there would be some tagged use allowed in the Lower Broken Creek at certain times[50]. This option reflects the Lower Broken Creek's position in the Murray system, as well as the different risks posed by delivering water to the Lower Broken Creek and the different risks tagged water use has to allocation trade. The proposed exemptions from tagging restrictions recognise that restricting tagged use in the Lower Broken Creek in line with the wider Murray is not commensurate with the risks posed, whilst also managing the risk of flow on impacts if no tagged use restrictions were placed on the Lower Broken Creek.

It is proposed that the zone-specific tagged use rule for the Lower Broken Creek be a seasonal tagged use rule. The proposal is to allow uncapped tagged use through winter and spring when demands are low and tagged use would have lesser impact on delivery during the peak summer and autumn period. During the period of peak demand tagged use will be restricted in line with the Goulburn to Murray trade rule. Table 3 summarises the proposed rule.

[50] This rule allowing tagged use in certain circumstances would be enacted through an exemption for the trading zone in the Victorian tagged use regulations.

Tagged use restrictions that acknowledge the Lower Broken Creek's unique supply arrangements and risks would be more appropriate for efficient use of the system than treating the Lower Broken Creek the same as the wider Murray.

Table 3: Proposed seasonal tagged use rule for the Lower Broken Creek

Season	Allocation trade	Tagged water use rule
Winter and spring	Restricted in line with the Goulburn to Murray trade rule	Uncapped (within supply constraints of the system)
Summer and autumn	Restricted in line with the Goulburn to Murray trade rule	Restricted in line with allocation trade rule

This preferred option is similar to the seasonally-based rule proposed for the wider Goulburn to Murray trade rule (Option 4). The main reason a seasonally-based rule is not the preferred option for the Goulburn to Murray trade rule is that it can create increased delivery shortfall risks in the Murray during peak summer and autumn demand. This would happen if people meet their winter and spring irrigation demands with use from Goulburn tagged accounts and would therefore be able to use much more water from their Murray accounts during summer and autumn.

Under this proposed seasonal rule for the Lower Broken Creek there is considered to be no material delivery risk to the Lower Broken Creek or the Murray downstream of the Barmah Choke. The tagged water would be delivered in spring when there is capacity in the system and would be limited to the demand in the Lower Broken Creek over that period. During the peak summer period, this places an upper boundary on the substitution risks, both within the Creek and arising from the potential trade of allocation water from local (Lower Broken Creek) entitlements out to the wider Murray. Delivery of that additional volume through the Creek during the peak period is considered manageable, without material impact on shortfall delivery risk to the wider Murray and while allowing some spare capacity to be used to mitigate some of the damage to the lower Goulburn River.

The proposed rule better reflects the characteristics of the Lower Broken Creek and the different risks posed by tagged use versus allocation trade in some circumstances. Allowing some additional tagged use in the Lower Broken Creek in the presence of the Goulburn to Murray trade rule is considered to have a low risk of increasing the risk of a shortfall in the Murray downstream of the Barmah Choke. The proposed rule is considered conservative management of any flow on impact that might be felt by allowing exemptions on tagged use in the Lower Broken Creek. The proposed zone-specific tagging rule for the Lower Broken Creek will be monitored to ensure the rule is operating in line with expectations.

This option meets the objectives of the Goulburn to Murray trade rule and the allowable reasons to restrict trade under Basin Plan sections 12.16 and 12.18. However, the intent of Basin Plan section 12.23 is that all tagged use should be restricted the same way as allocation trade, which is at odds with the preferred option for the Lower Broken Creek. This could be subject to change depending on the Australian Competition and Consumer Commission's review of section 12.23 as part of its *Murray-Darling Basin water markets inquiry*. Victoria will advocate for an amendment to section 12.23 as part of the review of the Murray-Darling Basin Plan in 2026, and look to work with the MDBA and partner states to acknowledge that tagged use and allocation trade rules should be allowed to differ to the extent States can show there are different risks in certain circumstances.

9.4 Impact of the preferred option on the Goulburn to Murray operating rules

The use of the Lower Broken Creek as an alternative delivery pathway for water from the Goulburn IVT account has been factored into the assessments used in the wider Goulburn to Murray trade review. Therefore, any significant change in capacity for delivering water from the Goulburn IVT account through the Lower Broken Creek could impact the assumptions underpinning the proposed Goulburn to Murray operating rules.

Currently just over 1,000 ML of Goulburn high-reliability and around 1,000 ML of Goulburn zone low-reliability water shares are tagged for use in the Lower Broken Creek. Under historic arrangements (since unbundling in 2007) and under current interim tagged use exemptions (since December 2019), the use of this volume is unrestricted. This means that all allocations and carryover against these water shares and any allocation

traded to tagged accounts may be delivered from the Goulburn system to the Lower Broken Creek without restriction.

The preferred option to offer Lower Broken Creek customers holding Goulburn water shares tagged for use in Lower Broken Creek prior to August 2019 the opportunity to hold Murray water shares does not change the delivery pathway of this water and means a similar volume of deliveries is expected through the East Goulburn Main Channel. This means that this option would have a neutral impact on the use of the Lower Broken Creek as an alternate delivery pathway for water from the Goulburn IVT account.

The proposed seasonal tagging rule (Option C) for the Lower Broken Creek means that tagged use will only be allowed without restriction through winter and spring, when demand is low. During summer and autumn when demand is at its peak, the use of Goulburn tagged water shares will be restricted in line with the Goulburn to Murray trade rule. This tagged use rule is considered to have no material impact on deliveries to the Lower Broken Creek.

The unlimited tagged use in winter and spring is based on the assumption that demands during this time in Lower Broken Creek will remain similar to historical values. Should this situation change in the future, to the extent the capacity of the East Goulburn Main channel becomes constrained to deliver the tagged use water, this rule may need to be revisited.

10.Putting the preferred option in place

10.1 Transitional trade rule arrangements

As observed in recent years, it is likely that there will be a high IVT balance at the start of the water year when the implementation of Option 2 commences. When implementing Option 2 the change to trade rules (notably the introduction of the approach to quarantine space for expected legacy volumes) means that an IVT balance of close to zero is likely at the end of the first water year.

This means that the immediate implementation of Option 2 would likely result in minimal trade opportunities being available in the first year of implementation if transitional arrangements are not put in place. There is merit to instead transition with a more gradual decline in the IVT balance, over the first water year, to allow the IVT balance to gradually readjust with the new trade rules.

Such a transition year is not expected to impact on the environmental outcomes as the greater trade opportunity is enabled by maintaining a higher end of season IVT balance (which is subject to a risk of spill) rather than requiring greater IVT deliveries in the summer and autumn months.

The choice of the preferred option (being Option 2) is robust to this transitional arrangement that would smooth the impacts of immediate implementation on trade opportunities, without compromising environmental and other outcomes.

10.1.1 How a transitional trade rule would work in the 2021-22 water year

Pending the outcomes of public consultation, transition to the preferred two-part trade rule bound by operating rules under Option 2 would mean that for the first water year a transitional trade rule would apply. This is planned to come into effect from 1 July 2021 and will apply until 30 June 2022:

1. **Part 1 applies from July to mid-February:** this period is extended beyond 14 December 2021 (under the preferred long-term trade rule) to 14 February 2022. During this period the maximum Goulburn IVT balance would be 200 GL. Any delivery of water that draws the Goulburn IVT account down below 200 GL would provide additional trade opportunity.
2. **Part 2 applies from mid-February to June:** From 15 February 2022 onwards, net trade out would be capped and the IVT account balance would reduce as IVT is delivered. Delivery of IVT during this period would not create any additional opportunity to trade out of the Goulburn. As with the proposed long-term trade rule, the volume of annual legacy water commitments (typically up to 140 GL) would be quarantined at the beginning of the water year under this rule. This quarantined volume may be reduced by February 2022 if allocations to Goulburn high-reliability water shares are less than 100%. The volume not required to be quarantined would then be available for allocation trade. If the trade cap is reached, then trade can occur only to the extent there has been back-trade from the Murray to the Goulburn.

Under transitional arrangements, not all trade opportunity will be delivered by the end of the year and the Goulburn will still owe water to the Murray. The remaining balance owed is recorded in the IVT account and rolled over to 1 July 2022 and drawn down over the course of the following year (2022-23) under the long-term trade rule.

10.2 Transitional operating arrangements

To support the transitional trade rule arrangements, transitional operating arrangements are also proposed for the first year (2021-22). These arrangements are required to ensure that, even if there is a high IVT balance at the start of the year, the demands generated from IVT can be supplied without impacting the resource or delivery security of downstream entitlements.

Proposed transitional operating arrangements will allow river operators, in the first year (2021-22), to plan to deliver water from the Goulburn IVT in accordance the new rules, with some flexibility only if circumstances arise where limiting deliveries to the new rules would cause unacceptable impacts on third-parties.

10.3 Transitional tagged use arrangements

As part of implementing the interim 2019 tagged use regulations, a number of IT systems were also updated, business practices of water corporations were changed to accommodate the new requirements, public announcements of the changes were made, and affected water users with tagged accounts were contacted directly by their water corporations via letter.

A description of the changes as well as Frequently Asked Question (FAQ) factsheet were made available via the Victorian Water Register[51],[52], as well as in the letters provided directly to customers. Lower Broken Creek customers were informed that their exemption was an interim exemption until the Goulburn to Murray trade rule review completed.

When the interim arrangements were again extended through 2020, this was likewise announced on the Victorian Water Register[53], and affected Lower Broken Creek customers contacted via letter to inform them of the extension.

DELP proposes that this process is repeated for the 2021 enduring regulations, in which customers are contacted directly if they will be subject to new rules that are different from the interim measures. The general public will also be informed via the Victorian Water Register website.

10.4 Clear communication of new rules

DELWP will work with water corporations to communicate how the new trade rule, tagging restrictions and operating rules work, what it means for trade opportunity and what any tagging restrictions mean for market participants.

DELWP will work with the Goulburn Broken Catchment Management Authority (GBCMA) to transparently monitor and communicate how the proposed operating rules work if implemented and how the river is responding.

11.Evaluation strategy

The scientific panel suggested that a recovery phase in the lower Goulburn River of several years would be needed to allow initial regeneration of vegetation and bank stabilisation. Once the initial recovery has occurred, the river is likely to be able to tolerate a greater variation of flows, with less serious implications.[54] Therefore, once environmental condition has been improved to the extent expected under **Option 2**, there may be further opportunities to provide greater trade opportunity.

Following the recovery period, the operational rule, and the preferred flow regimes will be reviewed to assess whether the lower Goulburn River may be able to tolerate greater flows, or whether there is a need to move towards lower flows.

The proposed review time is 3 years, but an early review of the proposed rules will be triggered if the extent of mass failure of the banks at designated reaches at McCoys Bridge is 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 also be reviewed sooner to incorporate up to date flows studies and outcomes from scientific analysis and monitoring.

If environmental outcomes can be maintained, there would be merit in exploring approaches to provide greater trade opportunity over the long term. This would need to be closely monitored.

An example of an option to provide greater trade opportunity within ecological tolerances is to facilitate the moving of in-channel privately owned pumps in the lower Goulburn River to allow higher volumes during the two pulses of Option 2. As discussed in section 6.4.1, this is a measure that can be pursued without changing legislative instruments. DELWP will accordingly seek funding for a feasibility study and begin preliminary negotiations with pump-owners as a next step to pursuing this option.

11.1 Monitoring impacts of lVT deliveries

It is proposed that a monitoring and evaluation program be undertaken over the first three years after implementation of the new rules, with a formal review point at the end of the third year. DELWP will work with the GBCMA, Yorta Yorta Aboriginal Nation Corporation, Taungurung Land and Water Council and the Victorian Fisheries Authority to coordinate monitoring and evaluation of the effects that the implementation of the new trade rule, operating rules and tagged use regulations are having on the environmental, Aboriginal cultural and

[51] https://waterregister.vic.gov.au/about/news/286-changes-to-tagged-trade-and-operational-regime-for-the-goulburn-system

[52] https://waterregister.vic.gov.au/water-trading/trading-rules

[53] https://waterregister.vic.gov.au/about/news/326-goulburn-to-murray-trade-arrangements-for-2020-21

[54] Environmental risk and opportunities assessment for the Lower Goulburn River, a report prepared by the Scientific Panel , 7 July 2020.

recreational values of the lower Goulburn River, Lower Broken Creek and lower reaches of the Campaspe River. The proposed monitoring will analyse impacts to riverbank condition, vegetation and native fish species.

DELWP will partner with the Yorta Yorta Aboriginal Nation Corporation and the Taungurung Land and Water Council to identify and monitor culturally significant locations in the evaluation process. Yorta Yorta have noted that ongoing monitoring by Traditional Owners needs to be conducted not only for known cultural sites but also ecological conditions that underpin ongoing culture and connection to country.

In recent years, concerns have been raised about the higher transfer volumes increasing erosion in Lower Broken Creek. To determine the long-term sustainability of continued delivery of the higher volumes of water-in-transit along this system and to ensure IVT water is not delivered in a pattern which puts the local environment at risk from increased erosion, a bank condition assessment is being conducted to inform future flow management and weir pool operations. The aims of this project being undertaken by the Goulburn-Broken Catchment Management Authority are to:

- Investigate the impact of consistently high flows from water-in-transit on the bank condition of the lower Broken Creek over the 2020-21 irrigation season.
- Identify what, if any, operational changes may be needed to mitigate any impacts from delivery of consistently high flows.

Before and after the 2020-21 water-in-transit deliveries, drone surveys and bank profile measurements will collect data on erosion, deposition, tree fall and changes in vegetation associated with the high flows. A temporary weir pool drawdown (within operational limits) will also be trialled during the summer and autumn high flow period to identify whether such operational adjustments would provide any benefits for maintaining or improving the bank condition of Lower Broken Creek. The findings of this study will be available mid-2021.

DELWP and the GBCMA will continue to work closely with GMW to monitor the impact of IVT deliveries and flow management in the Lower Broken Creek over the 2020/21 season and use this information to inform future monitoring programs and operations.

DELWP will also continue working with New South Wales, South Australian and the Commonwealth governments to monitor and manage delivery risks in the River Murray System. This work considers all the supply and demand changes that have occurred across the system in recent years. Any material adverse impacts on delivery risks in the River Murray System due to Goulburn trade will be identified through this process. Opportunities to optimise system operations will also be explored, including strategic use of Victoria's Mid-Murray Storages, pending consultation with Traditional Owners.

Appendix A: Option assessment

Approach to option assessment

This economic analysis framework sets out the methodology used to complete the option assessment — consistent with Victorian Department of Treasury and Finance's Economic Evaluation for Business Cases Technical Guidelines and the Victorian Guide to Regulation.

As per the Victorian Guide to Regulation (p. 11), a good impact analysis should clearly answer: "What are the expected impacts (benefits and costs) of options and what is the preferred option?" In order to answer this question, a robust approach to assessing benefits and costs is required.

Our process for the option assessment is set out in Figure 6.

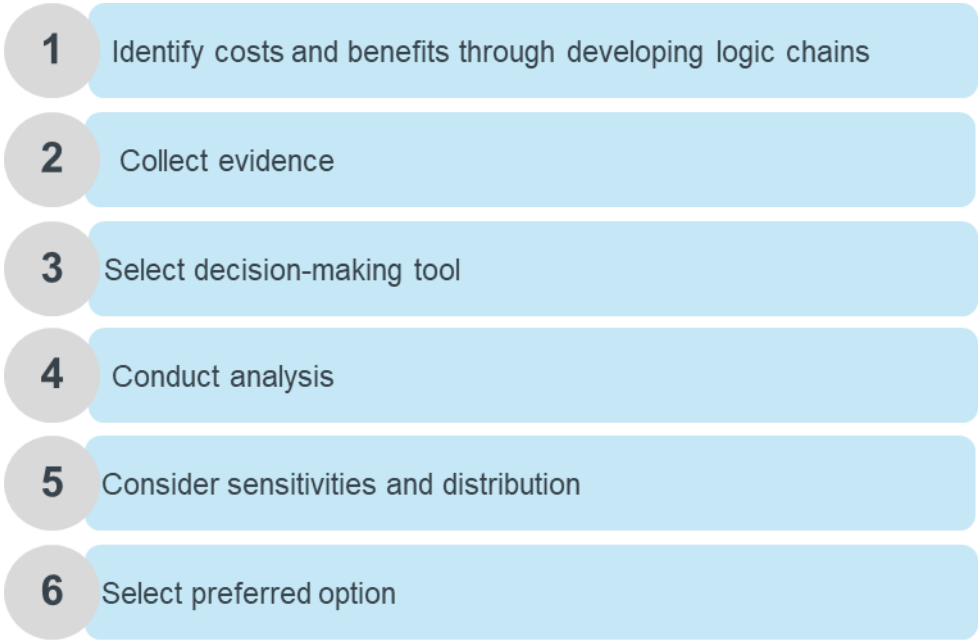

Figure 6: Outline of option assessment process

The first stage is to identify relevant impacts for the option assessment. Given that the policy options have multiple elements (i.e. the trade rule, operational limit and tagged water use rule), a key element of the option assessment is identifying the logic chain of impacts which start from a policy measure. The logic chain starts from a policy measure, identifies in an intermediate implication and then an outcome. In most cases it will be an outcome, rather than an intermediate impact, which should be included in the option assessment. When thinking about options as a whole it is likely that there will be multiple policy measures which all contribute to the same benefit and certain policy measures which contribute to more than one benefit. Given this, logic mapping is an important step in the option assessment process to identify all impacts and ensure they can be assessed in a way that avoids double counting.

The assessment approach also considers how options contribute to the achievement of water market and trading objectives. These objectives are set out in Schedule 3 of the *Commonwealth Water Act 2007*[55] and include:

- Facilitating the operation of efficient and effective water markets
- Minimising transaction costs
- Protecting both third party interests and the needs of the environment.

This suggests a need to manage the trade and delivery of traded water for this review:

- Within the environmental tolerances of the lower Goulburn River

[55] https://www.mdba.gov.au/about-us/governance/water-act

- To meet the demands arising from trade
- To not unnecessarily restrict trade (consistent with Basin Plan water trading rules).

The second stage is to collect evidence to support the approach. The evidence for this analysis includes:

- Information from DELWP's consultation on potential policy options
- Evidence from discussions with the MDBA and River Murray Annual Operating Outlook
- Environmental studies (including scientific panel and WoodWater report)
- Technical input from independent consultants investigating the economic impacts of shortfall events on behalf of DELWP (including RMCG & Tim Cummins & Assoc.).

On the basis of the logic chains and the available evidence, a decision-making tool has been selected. As detailed in the Victorian Guide to Regulation, potential tools comprise Cost-Benefit Analysis (CBA), Break Even Analysis, Cost Effectiveness Analysis and Multi Criteria Analysis. For this option assessment, CBA will be used as the primary decision-making tool. This is the preferred approach according to the Victorian Department of Treasury and Finance's Economic Evaluation for Business Cases Technical guidelines. The nature of the impacts are not well suited to assessment through Break Even Analysis or Cost Effectiveness Analysis. This is because ultimately the analysis of options is a trade-off between irrigators economic benefit from water and the environmental and other impacts on the waterway.

CBA is an assessment tool which compares the costs associated with a potential intervention with the benefits over time. The analysis is incremental i.e. looks at additional costs and benefits over and above the base case. The key results of the CBA are the Net Present Value (present value of benefits less the present value of costs) and the Benefit-Cost Ratio (benefits divided by costs). The option with the highest Benefit-Cost Ratio is the most economically efficient and should be the preferred option.

As per the Victorian Department of Treasury and Finance's Economic Evaluation for Business Cases Technical guidelines, the CBA is from the point of view of society and assesses net impacts within Victoria. The CBA is based on a series of parameters/assumptions which are detailed in Table 4.

Table 4: Key parameters and assumptions informing CBA

Parameter/assumption	Value
Discount rate	7% real
Appraisal period	20 years
Year discounted to	1 July 2020
Price base	1 July 2020

Scope of assessment

The analysis draws on the available evidence to model a number of the key impacts identified for each feasible option. These comprise impacts on:

- **Aboriginal cultural values** — including the potential for irreversible damage to important cultural heritage sites such as burials, middens, hearths, scar trees and artefacts along with the diminished ability to connect with, and care for, Country. This additionally includes supporting the ecological life cycles of the flora and fauna used by traditional Owners as food, fibre and medicine in the landscape, and therefore are considered to have high cultural value.
- **Lower Goulburn River environmental values** — including valuing the changes to waterway health in terms of channel condition, vegetation, and aquatic fauna; the cost of remediation if these values were subject to irreversible decline, and the community's willingness to pay for environmental outcomes.
- **Lower Murray environmental values** – including the Ramsar-listed wetlands such as Gunbower Forest, Hattah Lakes, and the Coorong, Lower Lakes and Murray Mouth which can benefit from flows in the Goulburn River.
- **Recreational values** — including the potential to maintain the low summer flows necessary to provide for safe, dispersed camping, attractive fishing and other recreational activities during peak recreational periods including the opening the fishing season for Murray cod. Attractive fishing is used here to refer to the presence of safe, accessible sandbars with low, slow flows, and relatively warm water, adding to the aesthetics of the environment.

- **Water trade opportunities** — including the potential to continue to enable water trading to allow water to be moved to higher value uses, with the benefits of that being measured through higher producer-generated surpluses (such as gross margin benefits).
- **River operations and entitlements** — including the potential for lower summer flows to make it more difficult to manage the river system to meet the needs of all water users in a timely fashion and to make it more difficult to deliver sufficient water in response to heatwave-driven spikes in demand.

We discuss each in more detail below.

Impacts on Aboriginal cultural values

The formally recognised Traditional Owners of the lower Goulburn River are Taungurung and Yorta Yorta. Yorta Yorta Country also includes the lower Broken Creek[56] and the lower reaches of the Campaspe River (north of Rochester[57]), which are additional waterways used to deliver a portion of IVT water.

In their response to DELWP's consultations on proposed changes to the Goulburn to Murray trade rule, the people of the Taungurung and Yorta Yorta Nations were very clear that unseasonal high flows that erode riverbanks and damage waterway health can also damage important cultural heritage sites including middens, hearths and scar trees. The following information was provided thorough consultation with the Taungurung Land and Waters Council on behalf of the Taungurung people, and by the Yorta Yorta Aboriginal Nation Corporation on behalf of the Yorta Yorta people.

Taungurung

The Taungurung people have a special physical and spiritual connection with Waring, the traditional name for the Goulburn River in the Taungurung language. They are concerned that it has been seriously affected and transformed by past and current water management actions. As custodians of Country, Taungurung see Waring has been turned upside down by the effects of river flow regulation; degrading the river integrity, affecting water quality, disconnecting wetlands and billabongs, damaging significant sites; but most importantly compromising their responsibility for taking care of and healing Country.

Taungurung is concerned that the high flows due to increasing water demand for irrigation and trading have led to critical and severe impacts on Waring. This includes those described in the initial 2020 consultation paper: considerable bank erosion and destabilisation; subsequent loss of bank vegetation, semi-aquatic and aquatic vegetation; and loss of associated habitat conditions and food sources.

Taungurung does not support the commodification of water in Victoria. Their waters have an enormous spiritual meaning and provide the capacity to support life for all species. Hence, water must flow and should not be owned. Taungurung look forward to a drastic transformation in water management within their Country. Nevertheless, in the current scenario, they strongly support changing the Goulburn to Murray trading rule and the operational rules to protect Waring from further long-term cultural and ecological damage.

Taungurung support the flow regimes of 940 ML/day average flows (as found in Option 1) and the 1,100 ML/day average flows (as found in Option 2), which both provide a much lower risk to the cultural heritage sites at risk under the current management conditions. Taungurung highlights that there are no 'little risks' in terms of the protection of Cultural Heritage. As Traditional Owners, they request that river managers should avoid any possible risk, and there should be efforts to continue to identify potential damages and working for the absolute protection of both tangible and intangible cultural heritage.

Taungurung also highlights the importance of a monitoring and evaluation program, given the level of uncertainty if the proposed operational rules would provide full protection of Cultural Heritage, and the ecological health of the river banks remain a concern. Taungurung request resources for a long-term monitoring program of the Waring, and to support additional works and complementary measures to increase Waring's resilience. Taungurung's view is that the monitoring and evaluation program must include and resource a Traditional Owners' engagement component to secure the protection of cultural values (through the implementation of existing assessment tools like Aboriginal Waterway Assessments and securing their involvement in advisory groups). The Traditional Owners component of such a monitoring program would enable Taungurung to work as an equal partner to fully understand the impacts of the new trade rule and the operational rule.

Yorta Yorta

[56] IVT water can be delivered from the Goulburn Weir via the East Goulburn Main Channel to the lower Broken Creek.

[57] IVT water can be delivered from the Goulburn Weir via the Waranga Western Main channel to the lower reaches of the Campaspe River. The IVT water is released into the Campaspe River just north of Rochester.

The Yorta Yorta people similarly have a strong connection to their waterways. The Goulburn (Kaiela) and Murray (Dhungala) rivers hold significant cultural and spiritual values to the Yorta Yorta community. Yorta Yorta are concerned that the rivers be managed in such a way that does not lead to a loss to Yorta Yorta culture, identity and connection to Country.

Yorta Yorta see the high volume of flows created by the IVT as destroying the biodiversity values of their waterways. This is affecting the stability of their ecosystems and aquatic life. It also is damaging to vegetation types that hold cultural significance, such as medicinal plants and weaving grasses. Yorta Yorta have indicated that high-volume flows have created irreversible damage to important cultural heritage sites such as burials, middens, hearths, scar trees and artefacts. The erosional effects have exposed their ancestors who have been buried in situ for thousands of years, and their midden sites and scarred trees have been lost forever due to the cutting and collapsing of banks.

IVT deliveries from the Goulburn River and the operations of the Mid Murray Storages (VMMS) are both used by river operators in the Murray System to manage potential shortfall events. Kow (Ghow) Swamp, one of four waterbodies that make up the Mid Murray Storages (VMMS), has significant cultural value to the Yorta Yorta people. Yorta Yorta are advocating for tighter controls over the management and operating rules for Kow Swamp due to its significance. In Goulburn-Murray Water's (GMW) operation of the VMMS, it aims to reduce adverse environmental impacts such as erosion and protect cultural heritage sites. GMW intends to work more closely with Yorta Yorta to review VMMS operations, particularly to address erosion issues. Meetings have begun between GMW and Yorta Yorta in 2020 to identify what actions may be needed to better manage cultural values at Kow Swamp.

Yorta Yorta strongly recommend DELWP consider:

- minimising the impact of the IVT rules by reducing the volume of water being delivered by means of implementing a pulse flow that would be similar to the distribution of flows delivered by the CMA's environmental watering; and
- different methods of delivery to minimise the volumes of flow in the Goulburn such as out-falling to other potential tributaries.

Option 1 is the preferred option to Yorta Yorta Nation based on the premise it will protect cultural sites and has the lowest ecological damage.

Yorta Yorta would also welcome engagement in any future environmental impact assessment work completed on their waterways. They have also indicated that any ongoing monitoring by Traditional Owners needs to be conducted not only for known cultural sits but also for ecological conditions that underpin ongoing culture and connection to country. This would include flora and fauna that are used by Traditional Owners as food, fibre and medicine in the landscape, and therefore are considered to have high cultural value.

Victorian Fisheries Authority

The Victorian Fisheries Authority says the lower Goulburn River remains critically important to the history, culture and values of indigenous communities that have lived near it, and depended on it, for 40,000 years or more. Scarred trees, mounds, stone artefacts and middens can still be observed along the lower Goulburn River. The rivers unique features and values resulted in it being declared a heritage river in 1992. The Victorian Fisheries Authority's *Victorian Aboriginal Fishing Strategy* identifies the need to undertake sustainable fisheries management in collaboration with Traditional Owner groups. The Victorian Fisheries Authority works closely with Yorta Yorta and Taungurung Indigenous communities to achieve this.

The Victorian Fisheries Authority is concerned that high summer flows will continue to erode the lower banks of the Goulburn River and potentially expose sights of cultural significance and affect cultural fishing practices at this time of the year.

Impacts on Lower Goulburn River environmental values

The scientific panel's advice to DELWP[58] provides the basis for assessing the environmental impacts to the lower Goulburn River of the four options relative to the base case. For example, the panel previously provided advice on six potential operating scenarios in a long-term risk assessment, and an independent consultant has developed an additional operating scenario based on those assessed by the panel that is expected to allow the lower Goulburn River to improve from the damage done during 2017-18 and 2018-19. These scenarios are assessed on environmental metrics and how the environment would change over the next 15 years.

[58] Environmental risk and opportunities assessment for the Lower Goulburn River, a report prepared by the Scientific Panel, 7 July 2020

As can be seen from Table 5, four of these scenarios align directly with the RIS options. These operating scenarios were designed to represent the key features of possible operating rules and they were selected to illustrate the potential environmental impacts at different flow rates in the lower Goulburn River between 1 November and 30 April.[59]

Table 5: **Scientific panel scenarios and alignment with RIS options**

Scientific panel scenario	Base flows in Nov-Apr	Pulses	IVT account that can be delivered (1 November-30 April)	Alignment with RIS options
1	940 ML/day	5,000 ML/day pulse in May	30 GL/month & 180 GL in total	**Option 1**
2	940 ML/day	6,000 ML/day pulse in December and 4500 ML/day pulse in Feb/Mar	30 GL/month, 65 GL in pulses & 245 GL in total	Not assessed in RIS as pulses considered unachievable (at present)[60]
3	1300 ML/day	5,000 ML/day pulse in May	40 GL/month & 240 GL in total	Not assessed in RIS as pulse considered unachievable[60]
4	1,300 ML/day	3,000 ML/day pulse each month	40 GL/month, 70 GL in pulses & 310 GL in total	**Option 3**
5 (similar to interim 2019-20 measures)	1,700 ML/day	No pulses	50 GL/month and 300 GL in total	Not assessed in RIS
6 (similar to base case	2,700 ML/day	No pulses	80 GL/month & 480 GL in total	**Base case**
Additional scenario developed by WoodWater (Comments provided by scientific panel)	1,100 ML/day (1,300ML/day in Nov-Jun)	3,000 ML/day pulses (up to 3 pulses)	225 GL in total	**Options 2 and 4**

Sources: Environmental risk and opportunities assessment for the Lower Goulburn River, a report prepared by the Scientific Panel, 7 July 2020; Summary of Proposed Operating Rules for the Lower Goulburn, WoodWater 2021

Similarly, the panel has also summarised the risks associated with each scenario against each environmental outcome it considered (**Table** 6). This risk assessment assumes that the six flow scenarios occurred every year for 15 years, however the overall results are robust to inter-year variation in flow levels to reflect climate and demand variability.

Table 6: Scientific Panel scenarios risk assessment

RIS option	Scientific panel scenario	Risk				Overall
		Geomorphology (channel condition)	Vegetation	Small bodied native fish	Large Bodied native fish	
	1 (base flows)	Low	Low	Low	Low	**Low**
Option 1	1 (Autumn pulse)	Low	Low	Moderate	Low	

[59] The panel were not asked to consider operating rules for the period between 1 May and 31 October

[60] Current operating rules, which are designed to protect the pumping infrastructure of water users in the lower Goulburn, currently restrict pulses to 3000 ML/day. DELWP is exploring options to manage pump infrastructure so that large pulses may be able to be delivered (to a maximum of 6000 ML/day).

RIS option	Scientific panel scenario	Risk				Overall
		Geomorphology (channel condition)	Vegetation	Small bodied native fish	Large Bodied native fish	
	2 (base flows)	Low	Low	Low	Low	**Low**
	2 (pulses)	Low	Low	Moderate	Low	
	3 (base flows)	Moderate	High	Low	Low	**Moderate****
	3 (autumn pulses	Moderate	High	Moderate	Low	
	4 (base flows)	Significant	High*	Low	Low	**High*****
Option 3	4 (monthly pulses)	Significant	High	Significant	Low	
	5 (base flows)	High	High	Significant	Moderate	**High**
Base case	6 (base flows)	High	High	High	Significant	**High**

Note – Low risk scenarios have low likelihood of environmental damage, and/or any environmental damage is expected to be minor. Moderate and significant scenarios are incrementally more likely to cause environmental damage, and/or the environmental damage is expected to be greater. High risks are for scenarios where major to extreme environmental damage is likely.

* Based on the geomorphological assessment it may be possible to rate vegetation as Moderate risk

** The Moderate rating applies over the 15-year period, however there is Significant to High risk in the short-term due to the poor condition of the lower Goulburn River following 2017/18 and 2018/19.

*** If more variation could be built into pulses then it may be possible to rate the overall risk as Significant

Source: Environmental risk and opportunities assessment for the Lower Goulburn River, a report prepared by the Scientific Panel, 7 July 2020,

Overall, the scientific panel found that the environmental damage to the lower Goulburn River caused by the high summer flows (around 2,700 ML/day) can be avoided by reducing base flows over the summer period. The baseline flows of 940 ML/day in Scenarios 1 and 2 would allow long term recovery to the conditions before 2017-18. Base flows of 1,300 ML/day over the irrigation season would be likely to avoid the damage caused in 2017-18, but they would only enable some recovery to pre 2017-18 conditions. Consistent flows above this would continue to lead to the environmental damage caused in 2017-18 and 2018-19.

The scientific panel found there is scope to provide pulses of flow over the irrigation season with lower environmental risk than consistent higher base flows. But these pulses need to be designed such that there is the establishment and persistence of littoral vegetation and the spawning and recruitment of small bodies native fish during warm, low flow periods.

To assess the incremental environmental outcomes associated with the different scenarios, the scientific panel assessed scenarios against the outcomes for Scenario 6. Scenario 6 is similar to the base case; it is equivalent to unrestricted transfer of water to the Murray River and is consistent with the operation of the lower Goulburn River in 2017-18 and 2018-19. This is summarised in **Table** 7.

Table 7: Scientific panel scenarios relative performance compared to the base case

RIS option comparison	Panel scenarios compared	Level of improvement			Overall
		Channel condition	Vegetation	Native Fish	
Option 1 vs base case	1 v 6	High	High	Significant	**High**
	2 v 6	High	High	Significant	**High**

	3 v 6	Significant	High	Significant	**Significant**
Option 3 vs base case	4 v 6	Moderate	Moderate	Moderate	**Moderate**
	5 v 6	Low	Significant*	Low	**Low**

Note – Rankings are ascending from low, moderate, significant, high (in that order). A high ranking corresponds to substantial improvement relative to the outcomes of Scenario 6.

* Low in the short-term

Source: Environmental risk and opportunities assessment for the Lower Goulburn River, a report prepared by the Scientific Panel , 7 July 2020

The panel was also asked to comment on expected environmental outcomes for the lower Goulburn River on the operating rules underpinning Option 2 and Option 4 in this RIS, drawing on the scenario assessment completed by the panel.

The panel were clear that Option 2 provided an inferior outcome to Option 1 but a superior outcome to other scenarios.

Noting that there was significant uncertainty, the panel advised that Option 2 would avoid the kind of damage to the river caused in 2017-18 and 2018-19. The risk of erosion would be substantially reduced, and it is probable that the river would slowly heal, given adequate sediment inputs from tributaries.

The current geomorphic complexity would be retained. Linear bands of flood tolerant species along the littoral zone are likely to be more prevalent but would be limited to a narrow band in the upper littoral zone. Vegetation along the lower elevations of the banks would be maintained or increased. The current habitat and flow-regulated conditions for small-bodied and large-bodied species for low-flow months would be maintained.

Value of impacts on environmental outcomes / ecosystem health

Based on experience in the Murray, and the best available knowledge about the differences between the Murray and Goulburn Rivers, the costs to rehabilitate the impacts of erosion would exceed $160m and would not address the broader range of environmental concerns. Such works would be in a national park with culturally sensitive areas, and erosion control measures would irreparably change the natural habitat and look of the river — resulting in environmental, recreational, social and cultural implications.

Another approach to valuing the environmental outcomes, is to use a measure of the community's willingness to pay for environmental outcomes. A study undertaken in 2008 assessed the willingness to pay for improved environmental health along Victorian Rivers.[61] Choice modelling was undertaken in 2008 to establish the community's willingness to pay for improved environmental outcomes along the Goulburn River; it involved in-catchment, Melbourne, and Victorian out-of-catchment respondents. The environmental outcome relevant for this RIS includes improved littoral vegetation. The willingness to pay results are summarised in the table below.[62] This study remains the most robust and valid study on the willingness to pay for environmental outcomes along the Goulburn River to date.

Table 8: Willingness to pay for environmental outcomes

Outcome	Description of valuation	Goulburn (in catchment respondents)	Goulburn (out of catchment respondents)	Goulburn (Melbourne respondents)
Vegetation	Household willingness to pay for 1% in river's length with healthy native vegetation on both banks (once off payment)	$4.79	$6.25	$7.44

Note – values escalated to $2020 prices. Source: Bennett, J., Dumsday, R., Howell, G., Lloyd, C., Sturgess, N. and Van Raalte, L., 2008. The economic value of improved environmental health in Victorian rivers. Australasian Journal of Environmental Management, 15(3), pp.138-148

[61] Bennett, J., Dumsday, R., Howell, G., Lloyd, C., Sturgess, N. and Van Raalte, L., 2008. *The economic value of improved environmental health in Victorian rivers*. Australasian Journal of Environmental Management, 15(3), pp.138-148.

[62] Other environmental outcomes were either not relevant or had strong overlap with the vegetation benefits (e.g. where improvements to fish outcomes has strong interactions with vegetation improvements)

It is somewhat challenging to link the environmental improvements assessed for the willingness to pay study with the outcomes from the scientific panel. For the purpose of this assessment, we assume that in the base case the damage recognised by the willingness to pay has already occurred to 225 km of the Lower Goulburn River. Under the project options, we assume that it takes 15 years for the recovery, based on the findings from the scientific panel, and this recovery occurs linearly across this period.

We also note that the willingness to pay is only applied to 20% of Victorian households to account for a 20% response rate in the study. Household numbers and household growth rates for in catchment (SA3 – Greater Shepparton), regional out of catchment and Greater Melbourne are estimated from ABS census data and forecasts.[63]

The incremental benefits associated with the options are summarised below. We recognise these willingness to pay estimations will likely understate the current willingness to pay as the study was taken at a time where the relative environmental condition of the Lower Goulburn was higher. We also note that the base case would likely continue to degrade the environmental values of the Goulburn River, which would make the incremental benefit of the options higher.

Another approach to value the environmental outcomes is to use the avoided remediation costs. As stated above, the cost to rehabilitate the erosion impacts of IVT delivery for would exceed $160m and would not address the broader range of environmental concerns. The different options are expected to avoid these remediation costs over time by reducing the IVT deliveries over the peak summer period to within acceptable limits.

Given the wide range of benefit estimates, we use the central estimate (lower bound of expected rehabilitation costs) to demonstrate the potential magnitude of environmental benefits of options (avoided costs).

For Option 1 we suggest using the lower bound remediation avoided cost value of $600 million.

While for Options 2 and 4 these benefits would be deferred somewhat due to the slower recovery of the river (being a net present value of $430 million if recovery takes 5 years longer), recognising that it is unclear as to whether further remediation work may be needed under these options.[64]

For Option 3, there are lower expected environmental benefits (as compared to the base case) given the overall high environmental risk rating.

Impacts on lower Murray environmental values

Water held for the environment in the Goulburn System can be delivered to support environmental outcomes in the lower Murray when it is shepherded from the Goulburn in accordance with the return flow credit provisions in the Victorian Environmental Water Holder's (VEWH's) bulk entitlements. This can support environmental values including Ramsar-listed wetlands such as Gunbower Forest, Hattah Lakes, the Lower Lakes, the Coorong, and the Murray Mouth). In 2019-20, the return flow provisions were used to deliver 320 GL of Goulburn water to the South Australian border during winter and spring.

In accordance with the Basin Plan pre-requisite policy measures (PPMs), the VEWH's bulk entitlements allow for environmental water to be delivered instream through the Goulburn River on top of operational water (which includes Goulburn IVT deliveries), and for the delivery to be shepherded through to the Murray whenever there are no material impact to other entitlements. In practice, this has usually meant that environmental water holders can deliver Goulburn water to the Murray when there is spare delivery capacity, even when trade is restricted. As part of the Capacity and Delivery Risks Project, Victoria, along with NSW and South Australia, are currently investigating how to better define environmental water holders' rights to delivery to clarify how environmental water should be treated when capacity limits are reached. This work will take into account advice from the ACCC published in September 2020 about the treatment of environmental water moving between trading zones under Basin Plan water trading rules.

While recent changes in the southern connected Murray-Darling Basin have resulted in the Goulburn delivery capacity being more frequently reached, the proposed Options 1 to 4 will reduce the amount of Goulburn IVT delivered each year. This is expected to reduce the frequency of time that trade deliveries near capacity limits, to compete with environmental water deliveries, throughout the year.

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63 Australian Bureau of Statistics, 2019, *Household and Family Projections, Australia, 2016 to 2014*, https://www.abs.gov.au/ausstats/abs@.nsf/7d12b0f6763c78caca257061001cc588/c843aa6306feefd7ca257e0c000e9a3f!OpenDocument#:~:text=Capital%20city%20and%20rest%20of%20state%2Fterritory%20households&text=Fastest%20growth%3A%20Melbourne%20is%20projected,%25%20and%205%25%20by%202041.

64 As it is uncertain when these costs are incurred, we assume that remediation costs are spent in year 1 and are therefore not discounted.

Environmental water holders have expressed some concern that the new rules may shift the delivery of Goulburn IVT out of summer into spring. This is not considered to be material because the amount of Goulburn IVT that can be delivered in spring under the proposed options is not likely to be significantly different from past practice. Under the base case, there is no limit on how much water could be called in winter or spring. Spring deliveries of Goulburn IVT have averaged 30-40 GL, and in 2018-19 135 GL was delivered between August and November. Under Options 1-4 the volume of water that can be delivered in spring is expected to be well below the volumes observed in 2018-19 because the volumes called will be limited by how much demand would be generated in summer and the delivery limits in those months.

Impacts on recreational values

The Victorian Fisheries Authority (VFA)'s submission[65] neatly sums up the views of many individuals and groups that responded to DELWP's consultation on proposed changes to the Goulburn to Murray trading rule:

> *The lower Goulburn River is among the most popular inland recreational fisheries in Victoria. Anglers are attracted to this water to fish for Murray cod and golden perch. The river is also highly valued as a camping location with a peak of fishing and camping activity when the Murray cod season re-opens after spawning, i.e. on the first weekend of December. At this time of the year, recreational fishers value being able to camp on sand banks when low water levels are low. Low and slow summer flows provide safer conditions for families to enjoy dispersed camping. High summer flows are dangerous for young families.*
>
> *Murray cod feeding activity is heavily influenced by river flows and fishing is more difficult and less productive when the river is running high flows. When high flows coincide with the start of the Murray cod fishing season (first weekend in December), it significantly detracts from the fishing and camping experience.*

With regard to the economic contribution from Murray cod fishing, the Victorian Fisheries Authority said:

> *Murray cod are the most popular freshwater angling species in Victoria. In 2010 an Ernst and Young survey estimate Murray cod:*
>
> 1. *Are targeted by 44% of recreational fishers*
> 2. *Account for $166 million in annual direct fishing expenditure*
> 3. *Account for 374 jobs.*
>
> *Anglers fishing for Murray cod spend on average $250 for each trip. [A tackle shop in Shepparton] estimates 50% of their total annual fishing tackle sales are directly attributed to tackle sales to those targeting Murray cod, much of which takes place in the lower Goulburn River. The peak times for this fishing expenditure include: Murray cod opening, Easter, and during the Christmas holiday period.*

The Victorian Fisheries Authority has expressed its view that IVT flow regimes should be responsive to fish spawning ecology and life history processes, and that IVT flows should not undermine long-term and seasonal environmental watering investment and benefits. VFA has further expressed that low flows are needed in order to help the lower Goulburn to recover and to remediate damage already caused – to not only maintain the current state of environmental and recreational values but to improve upon them. Where the science is uncertain, the VFA recommends that a precautionary approach be taken when delivering IVT flows.

The VFA notes that a range of recreational and socio-economic values and benefits rely on the health of the river, including:

- economic benefits, including economic contribution to Victoria and regional communities and job creation
- flow on social and community benefits associated with fishing and nature-based activities, including social capital and connectivity and the opportunity to connect with community and nature/place
- mental health, wellbeing and safety
- cultural, ceremonial, natural heritage and landscape values.

The VFA points out that sandbars, which have been inundated by high IVT flows during the high use period over spring-summer, are a historical and socially significant feature of the Lower Goulburn. They are important for access for a range of recreational uses and values, including fishing, camping, boating, swimming, kayaking and bird watching. In addition, the sandbars have an amenity aspect as a natural, heritage feature of the river.

[65] VFA 2020 submission to DELWP – available at https://engage.vic.gov.au/download_file/34738/3373

The VFA also notes that high baseflows in summer pose a number of issues, with increased risk to access, safe navigation and use of the lower Goulburn River, including:

- banks being inundated and eroded, creating issues for land-based fishing opportunities and quality of experiences;
- sandbars being no longer accessible for land-based fishers to use to cast and target fish (for land-based fishers, fishing from sandbars is known to support quality fishing as fish aggregate around these sites), and to support quality, enjoyable land-based fishing opportunities that have historically been enjoyed and form an intrinsic part of the fishing culture of the lower Goulburn. Sandbars are also used as launching spots for smaller craft used for fishing, including canoes and kayaks;
- sandbars being no longer accessible to support camping opportunities with amenity negatively impacted, and potentially making it more dangerous for swimming, in particular, for young families with children;
- significant launching/retrieval and navigation difficulties for boat-based fishers arising from a high, fast-flowing river; and
- high flows submerging known and mapped in-stream woody habitat, debris and other obstacles, causing increased risk to safe use and navigation of the river.

Native Fish Australia is concerned with the high flows of cold water from the bottom of Lake Eildon and the negative effect it has on native fish spawning. Murray cod in particular tend to spawn once the average water temperature reaches 18Cº. Trout cod and Macquarie perch are more specialised for slightly colder climates and can spawn when water temperatures reach 16Cº, however even in late spring and summer times the water flowing from the bottom of Lake Eildon can be below 14Cº which they believe, and research from the Arthur Rylah Institute corroborates, will suppress the spawning of these threatened native fish species.

Native Fish Australia also notes that unseasonably cold water, as well as affecting the spawning of native fish, also affects their juvenile offspring. High flows of cold water in the later spring and early summer months suppress the life cycle of phytoplankton and zooplankton, which the young of year fish feed on at that time. Suitable conditions for optimum planktonic production are slow flowing warmer waters that are conducive to rapid growth in juvenile native fish, leading to increased survivorship and recruitment.

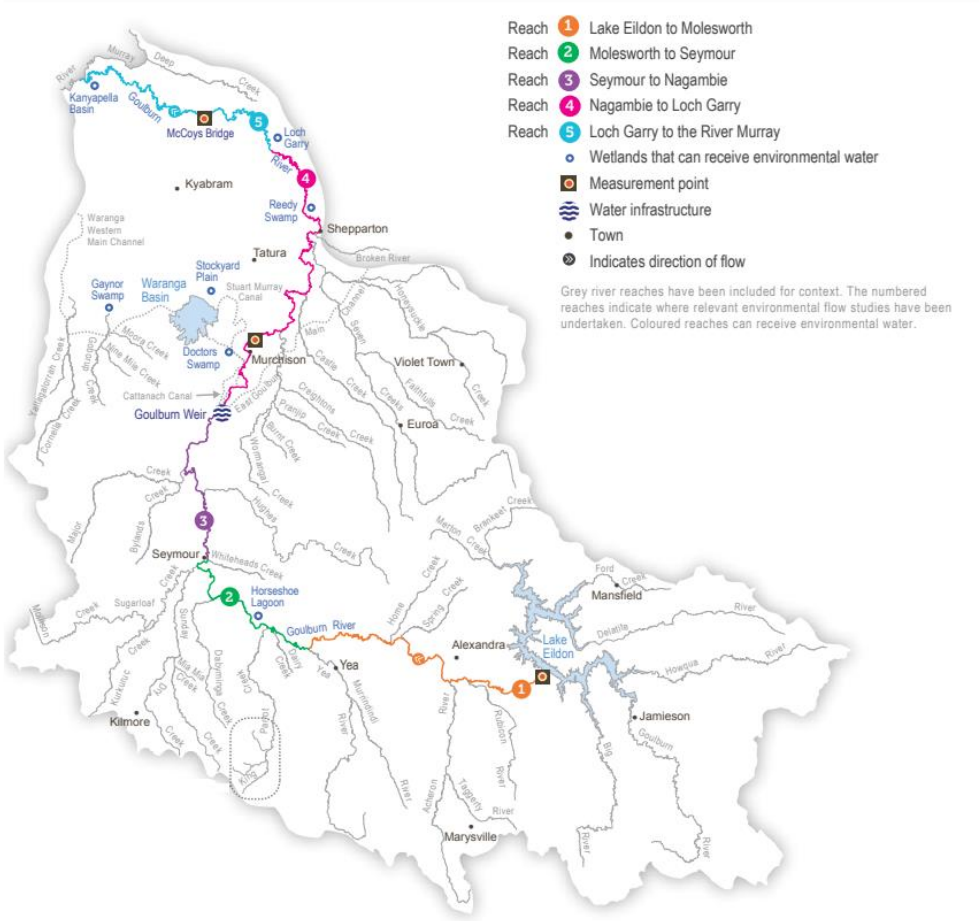
These cold water pollution concerns that have been raised are applicable to the Goulburn River downstream of Lake Eildon to Seymour. However, they are not an issue in the Goulburn River downstream of the Goulburn Weir (the lower Goulburn River) which is the focus of this RIS. Cold water released from Lake Eildon increases in temperature as it flows downstream. By the time the water passes through the Goulburn Weir (a wide shallow waterbody) its temperature has returned to natural levels. More information on this issue is below in **Box 3: Cold water in the lower Goulburn.**

A summary of feedback heard from public consultation held in early 2020, along with input provided by the Victorian Fisheries Authority indicates that recreational fishers are likely to be supportive of the lowest summer flow options (e.g. Option 1, if not lower). Ideally pulses in Option 2 (or Option 3) would also be timed to avoid the first weekends in December (the opening of the Murray cod season) as well as the Christmas, New Year, and early January period to provide for safe, dispersed camping, and attractive fishing, during peak recreational periods.

Box 3: Cold water in the lower Goulburn

Based on the Mid Goulburn River FLOWS study 2014[66], unseasonably cold water is not an issue associated with the lower reaches of the Goulburn system (see figure below for Goulburn system reaches). Further upstream, near trout fisheries, colder summer and autumn temperatures (particularly around Lake Eildon) favour trout, while large bodied native fish species such as Murray cod, Trout Cod and Macquarie perch typically avoid these areas. In Reach 1, which is outside the scope of this RIS, cold water releases in summer and autumn from Eildon Dam, particularly when storage levels are high, were identified as an issue in the Mid Goulburn River FLOWS study (2014). However, this was not identified as a key issue for the Lower Goulburn (Reaches 4 and 5) in the FLOWS study 2014, or by the scientific panel evaluating environmental risks on the lower Goulburn.

Figure 7: Goulburn system reaches



Source: VEWH Northern Region Seasonal Watering Plan 2020-21[67]

Impacts on trade opportunities

The opportunities for water allocation trade from the Goulburn to the Victorian Murray will differ between options, depending on the trade rule and the operating rule. Trading opportunities will also differ from season to season depending on the prevailing seasonal conditions, and the opening balance of the Goulburn IVT account.

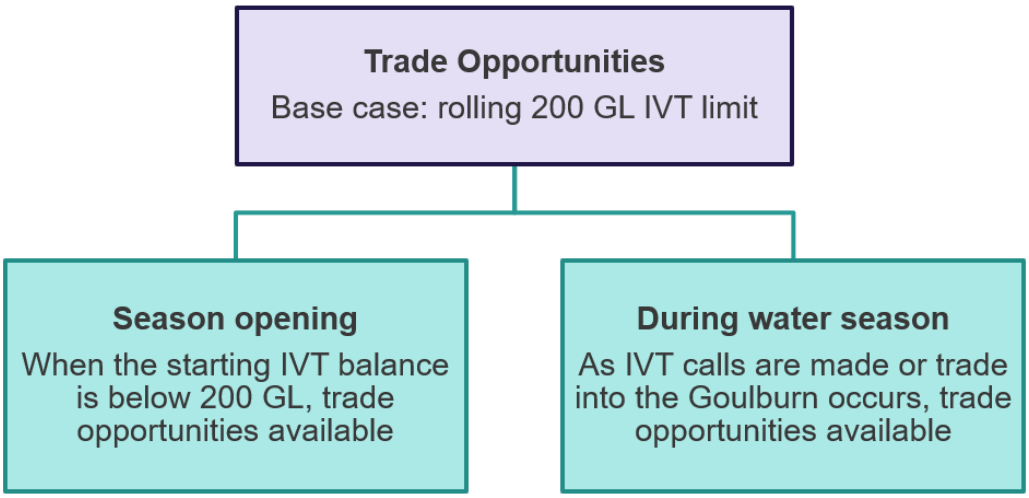
The base case involves the current 200 GL rolling cap on the Goulburn IVT. At the start of the year, trade opportunities exist if the opening balance of the IVT account is less than 200 GL. If the 200 GL rolling limit on the balance of the IVT account is reached, further trade opportunities will only arise throughout the season if delivery of water from the Goulburn IVT account to the Murray draws the account below this 200 GL rolling

[66] https://www.vewh.vic.gov.au/__data/assets/pdf_file/0003/357546/Mid-Goulburn-FLOWS-study-final-report-051214.pdf

[67] https://www.vewh.vic.gov.au/__data/assets/pdf_file/0017/531053/25951-VEWH-SWP-Section-05-Northern-FA-WEB.pdf

limit. Trade out may continue to occur towards the end of the season, such that the water year can end with a significant balance in the Goulburn IVT account. This is summarised in **Figure** 8.

Figure 8: **Base case trade opportunities**



Source: Frontier Economics

Options 1, 2 and 3 involve a two-part water trading rule that consists of:

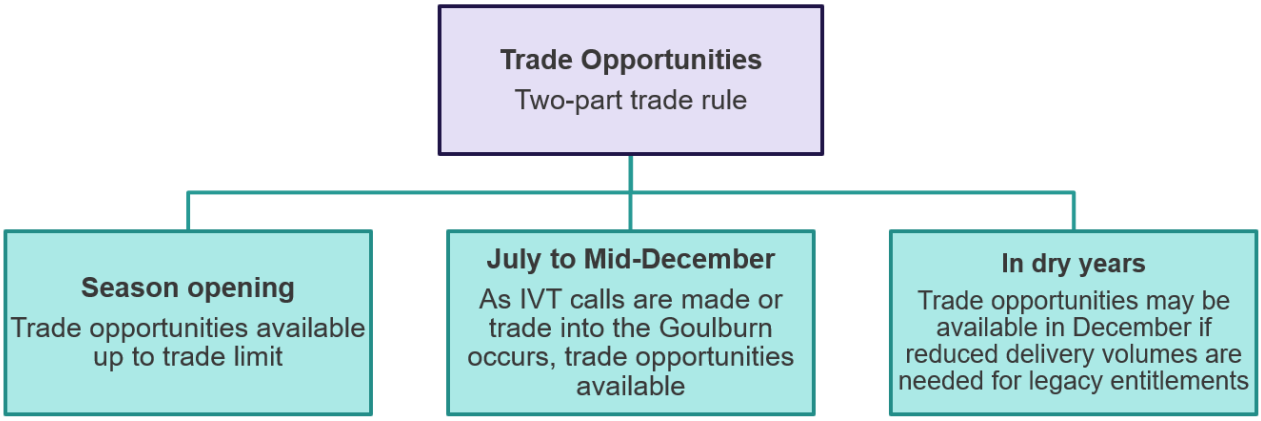
- Part 1: Up until mid-December a **rolling winter-spring limit** applies – this allows for trade opportunity to open up when water from the IVT account is delivered in winter and spring months, taking advantage of when seasonal conditions allow river operators to deliver more water early in the irrigation season without damaging the environment, or creating additional risks to water users downstream. This part will operate like the current trade rule with trade stopped when the IVT balance exceeds the designated limit.
- Part 2: From mid-December, a **fixed summer-autumn limit** applies – this prevents making additional trade opportunity available for which water cannot be delivered. This allows the Goulburn IVT account to be drawn down towards the end of the season.

The volume of water that can be delivered under the operating regime during summer and autumn is the basis for determining both the rolling winter-spring limit and whether any additional trade opportunity can be made available under the fixed summer-autumn limit.

Trade opportunities under options 1, 2 and 3 exist at the season opening up to the rolling winter-spring limit, after taking into account any undelivered water in the Goulburn IVT account from the previous year and the volume quarantined for legacy volumes. If the limit is reached During the period from July to mid-December, once the limit is reached, further trade opportunities will continue to arise whenever delivery of water from the Goulburn IVT account draws the account below the rolling winter-spring limit. Additional trade opportunity may also become available in mid-December, if the seasonal determination for Goulburn high-reliability water shares indicates allocations are likely to be less than 100% by February. The fixed limit on further net trade from mid-December, means that the Goulburn IVT balance would be drawn down towards zero as the water year ends.[68] This is summarised in **Figure 9**.

[68] The IVT balance would end the water year above 0 GL if the allocations to legacy volumes exceed the November estimate.

Figure 9**: Options 1,2 and 3 trade opportunities**



Source: Frontier Economics

Box 4: IVT cap such that there is no expected increased delivery risk

The IVT cap is set to reflect the volume that can be delivered in line with expected demand such that trade does not result in an increase in expected delivery risk. The potential for delivery risk is examined closely in section 0.

This means that the IVT cap is set to be the volume that is expected to be delivered from the Goulburn to Murray resource from the period December to June.

For example, under Option 1, it is expected that of the volume that can be delivered from the Goulburn to Murray (including legacy volumes, allocation trades and tagged delivery) in the peak summer period after mid-December will be 126 GL. This suggests an IVT cap of 126 GL for option 1.

Option 4 involves a seasonal tagging trade rule. This involves an annual cap on trade based on the operational limit. Tagged water use during July-October does not count towards this trade cap, whereas tagged water use and allocation trade are treated equally from December onwards, with both subject to the annual trade cap. This is summarised in **Figure** 10.

Figure 10: **Option 4 trade opportunities**

Source: Frontier Economics

Value of trade opportunities

The value of trade opportunities depends on the relative value of water between the Goulburn and Murray. Trade is generally observed from Goulburn to the Murray, as indicated by the IVT balance being frequently at or near the limit in recent years, suggesting there is benefit from this direction of trade.

This is currently the case because almonds, a high value crop that now accounts for more water use than any other horticultural crop in the lower Murray, are preferentially grown in the Mallee region. The semi-arid environment there, and the sandy well-drained soils, help to maintain nut quality.

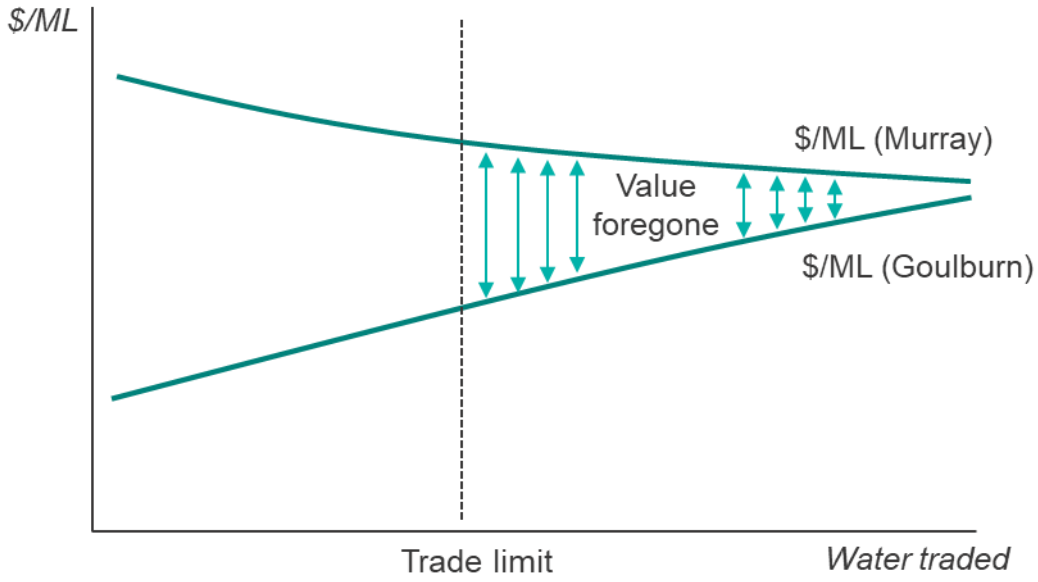
When the price of water allocations in the Murray exceeds the price in the Goulburn, it suggests the marginal value of water use is higher in the Murray compared to the Goulburn. Water trade can be used to reallocate the water resources to the higher value use, whether that be for irrigation, environment or other uses. As more trade of water occurs, the marginal value of any additional water traded is expected to diminish as water becomes more available in the Murray and scarcer in the Goulburn.

With no trade constraints, trade would be expected to occur up to the point where the marginal value of water in the Goulburn is equal to the marginal value of water in the Murray. At this point there is no further benefit in trade between the two zones. Water allocation prices reflect this underlying marginal value of this water in the market. Therefore, when the water allocation prices between the Goulburn and Murray are equal, it can be assumed that the marginal value of water is equal between the two zones and that there are not further benefits from trade.

If a trade limit is imposed, it prevents the potential efficient (ignoring externality impacts) reallocation of water resources via trade between the two zones. This is expected to create price differentials between the Murray and Goulburn zones as the marginal value of water in the Murray exceeds that in the Goulburn.

The costs associated with this limit is the foregone efficiency loss from water trade, which can be measured as the difference between the water allocation price differentials between the Murray and Goulburn. This is summarised in **Figure** 11.

Figure 11: Illustrative example of value foregone due to reduced trade opportunities



Source: Frontier Economics

The ACCC note in their interim water market inquiry report that these price differentials are currently occurring under the current arrangements between the Goulburn (zone 1A) and the average price across the Southern Connected system. For example, prices in 2017–18 and the first half of 2019–20 for the Goulburn were approximately 80-85% that of the average for the whole Southern Connected Basin, aligning with periods where trade into the Murray was limited by the IVT account balance.[69]

[69] ACCC, 2020, *Murray–Darling Basin water markets inquiry Interim report*, p 129. Available from https://www.accc.gov.au/system/files/Murray-Darling%20Basin%20inquiry%20-%20interim%20report.pdf (accessed 10/09/2020)

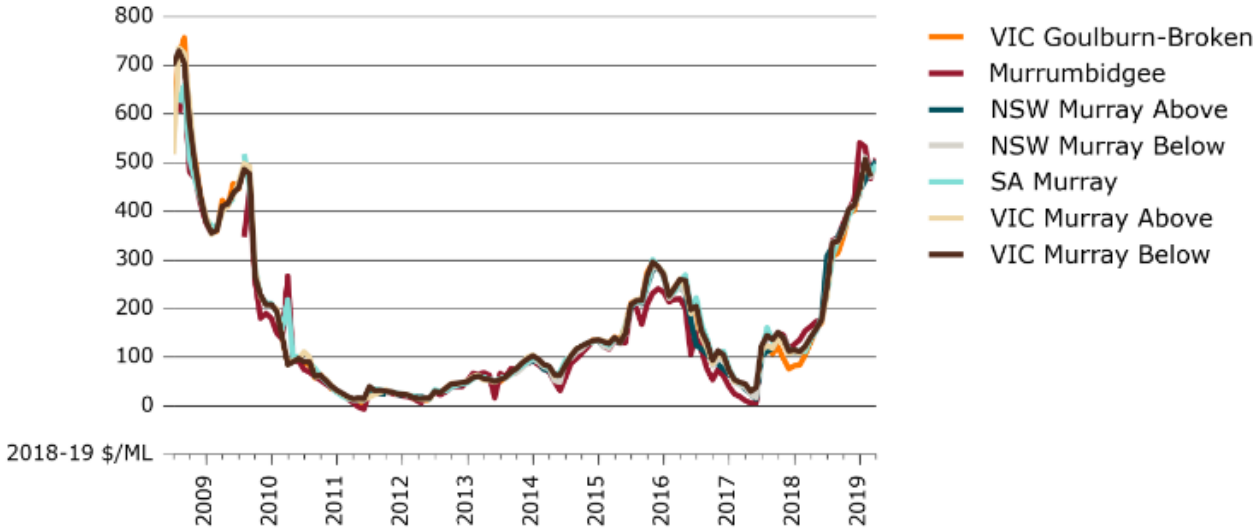
Options that place operational limits will constrain the available trade from the Goulburn to the Murray. To estimate the cost of this foregone trade opportunity using the framework detailed above, it requires an understanding of the expected prices in the Goulburn and Murray at different levels of trade opportunity.

At the lower end, a price differential of $20/ML is assumed to prevail if trade is limited as per current arrangements. This aligns with the current price differentials observed between the Goulburn and Murray as described in the ACCC interim water market inquiry. As an upper bound, this price differential is increased to $50/ML to represent where resources are scarcer.

If trade is further restricted, then the price differential would be expected to increase. The potential difference in prices depends on a range of factors, including seasonal factors and whether trade into the Victorian Murray below Barmah from the Murray above Barmah or from the Murrumbidgee is available. For example, ABARES[70] (2020) show that prices in the Goulburn, Murrumbidgee and Victorian Murray above Barmah have been regularly below the price in the Victorian Murray below Barmah, and the Murrumbidgee has also been recently observed at higher prices (**Figure 12**).

The price difference that would occur if Goulburn to Murray trade was highly restricted is unobservable from trade information. In order to provide a broad estimate of the value of the changed trade opportunity, it has been assumed that the price differential may be four times larger if trade were to be completely restricted Goulburn to Murray (beyond existing legacy volumes). This involves using a lower bound $80/ML price difference and an upper bound $200/ML. Using these values are considered to provide an upper limit on the value of trade opportunities, given that in many years water allocation prices themselves are less than $200/ML.

Figure 12**: Surface water allocation prices, selected southern MDB regions, 2008-09 to 2018-19**



Source: ABARES 2020, p.31.

It is assumed that the price differential declines linearly between the higher and lower price differentials as trade opportunity increases. The difference between the price in the Murray and Goulburn for each unit of water trade foregone relative to the base case represents the cost of trade opportunity for each option.

This difference is expected to occur every year for a time period of 20 years, with the costs discounted at 7%. The results of this analysis are summarised in Table 9.

Table 9: Value of trade opportunity foregone

Option	Trade opportunity* (ML) (in addition to legacy volumes)	Value of trade (per year)	Value of trade foregone (relative to the base case)	NPV of value of trade foregone (7% over 20 years)

[70] Goesch, T, Legg, P & Donoghoe, M 2020, Murray-Darling Basin water markets: trends and drivers 2002-03 to 2018-19, ABARES research report, Canberra, February.

Base case	~235 GL/year	$11.1-29.4m	0	0
Option 1	~66 GL/year	$4.6-11.8m	$6.4-17.6m	$73-199m
Option 2	~130 GL/year	$7.8-20.6m	$3.2-8.8m	$37-99m
Option 3	~191 GL/year	$10.0-26.6m	$1.1-2.8m	$12-32m
Option 4	~100 GL/year + Unlimited (estimated 0 – 150[1] GL/year) tagging	$1.8-20.6m	$3.2-8.8m	$37-99m
No trade	0	0	$11.1-29.4m	$125-333m

*Note – *Trade opportunity is inclusive of deliveries to grandfathered tags.*

[1] tagging opportunity is based on Victorian demand patterns in the lower Murray over spring. As tagged use is unlimited over this period, this volume is variable and could be more, especially if considering interstate demand.

There are also other qualitative impacts from the change in likelihood and/or circumstance of the Goulburn–Murray IVT trade limit being binding due to the options. These impacts include:

- Impacts on market confidence for all users where trade constraints limit resource use efficiency
- Impact on use of tagged trading (which without the current interim tagged allocation regulation would be a bypass to the Goulburn–Murray trade limit)

Impacts on river operations and shortfall risks

The Goulburn River is an important part of river operations in the connected southern MDB. IVT accounts from the Murrumbidgee and the Goulburn provide MDBA river operators with flexibility in the ways in which they are able to meet demands on the Murray below the Barmah Choke.

It is important to note, however, that the Goulburn IVT account is just one of many options for providing river operators with flexibility. Even when the Menindee Lakes are unable to augment South Australia's Entitlement flows, the Goulburn provides less than ten percent of the maximum monthly supply flows — when used in line with an approach to reducing shortfall risks. In the table below, the Goulburn (and other Victorian tributaries to the Murray) is ascribed as providing 40 GL of the total estimated 415 GL maximum monthly supplies.

Collaboration with the MDBA has shown that aiming for Goulburn to Murray IVT deliveries of a maximum of 40 gigalitres a month or less over summer and autumn of 2020-21 (to stop further environmental damage to the Goulburn River) is possible without creating a forecast shortfall. This is reflected in the *River Murray Annual Operating Outlook for 2020–21* which, assuming up to 40 GL a month from the Goulburn IVT, finds there is no indication that a shortfall will occur in the coming year.[71]

Table 10: Sourcing water for the mid-Murray

Sources	Estimated[72] maximum monthly supply capacity	Daily flow
Units	GL/m	ML/d
Lake Victoria draw down (375 GL for Dec to April inclusive, say 75 GL/m)[1]	75	2,500
Victorian Mid Murray Storages draw down[2]	30	1,400
Yarrawonga via the Barmah Choke	270	9,000
Vic tributaries – Goulburn (principally) and Broken, Campaspe and Loddon	40	1,333
NSW tributaries via Murray Irrigation Limited and the Edwards[3]	60	2,000

[71] https://www.mdba.gov.au/publications/mdba-reports/river-murray-system-annual-operating-plan

[72] Analysis by RMCG, based on information provided DELWP

NSW Murrumbidgee[4]	40	1,333
Menindee Lakes (Assumption for the purposes of this report)	0	0
Estimated River losses[5]	-100	-3,333
Total	415	14,233

[1] Actual supply capacity from Lake Victoria varies considerably depending on when the storage levels peak and if full capacity is reached. For the purpose of this analysis, we have assumed Lake Victoria has an assumed active storage capacity of 500 GL (total storage = 675 GL, 100 GL dead storage, but operators aim to keep levels above 180 GL to support delivery of SA entitlement and end of season targets) and net evaporation is 122 GL (1m over 12,200 ha). Consequently, the maximum December- April supply capacity is estimated to be 375 GL (i.e. average of 75 GL/month or 2,500 ML/day). Noting the Lake Victoria outlet capacity can be as high as 10,000 ML/day when the storage is full.

[2] Releases from Kow Swamp up to 900 ML/day can be made to supply lower Murray demands. Planned outlet rehabilitation works may enable releases from Lake Boga of up to an 1,000 ML/day, however in the past releases have been limited to 500 ML/day. The storages each have a combined active storage capacity of approximately 40 GL, however with outlet constraints its likely only 30 GL could be released within one month. Note that as the storages can only be refilled with more flow from the Murray, this 40 GL is usually only available once per irrigation season.

[3] Edward escape capacity is 2,400 ML, however the net volume that can be delivered via MIL depends on demands in the system, including keeping flows at Stevens Weir below 2,700 ML/day. Operators advise it is more reasonable to assume that net transfers via MIL are capped at about 60 GL per month (or 2,000 ML/day)

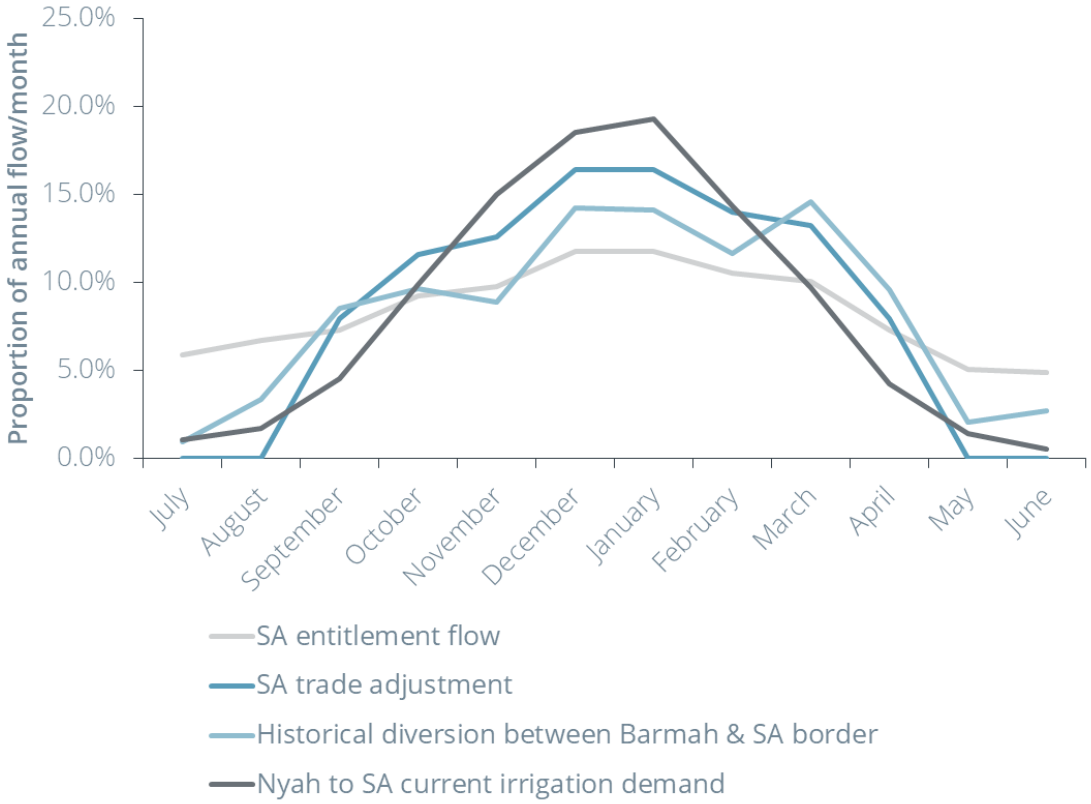
[4] In the past Murrumbidgee IVT deliveries exceeding 50 GL in one month have been made. In 2019/20 deliveries were capped at around 30 GL per month due to infrastructure works, we have assumed that under normal operating conditions up to 40 GL per month may be delivered, although it is not yet known what ecological tolerances the Murrumbidgee has to delivery of summer flows. Note access to Murrumbidgee IVT may be constrained by appetite to trade out of the Murrumbidgee.

[5] Actual losses can be highly variable and are difficult to quantify. MDBA is currently undertaking work to better understand potential losses. The loss volumes referenced here are a very rough estimate of losses between Yarrawonga and the SA border in a hot, dry, summer month. There is considerable uncertainty in this figure due to loss accounting occurring at reach scale from Hume to SA border in the Murray accounting and operations planning.

The challenge for river operation to meet demands downstream of the Barmah Choke, is to meet the time profile (shape) of demands that are based on crop demands and also affected by rainfall, heatwaves and other seasonal factors.

Collaboration between DELWP and river operations and trade personnel at MDBA identified that there are a number of different flow/demand shapes that are relevant to the option analysis, as compared in the chart below.

Figure 13: Flow/demand shapes relevant to the analysis



Source: MDBA.

In delivering volumes from the Goulburn to the Murray, the following was expected/assumed:

Snowy river recovery components of legacy volumes would be delivered as follows: 50% in line with SA entitlement flow and 50% in line with historical diversions between Barmah and SA border

The component of legacy volumes relating to exchange rate trades to SA would be delivered in line with the SA trade adjustment

The component of legacy volumes relating to exchange rate trades to the Victorian Murray would be delivered in line with historical diversions between Barmah and SA border

Any additional trade volumes (from water allocation trade and tagged delivery) would be delivered in line current irrigation demand in the Nyah to SA border region.

This enabled the estimation of the average trade opportunity that would be possible within the operational rule of each option. This calculation allows the demand shape to exceed the operational rule (in a given month or over a given period) and this is subject to further analysis of potential increased shortfall risks. For example, a conservative approach is to only allow January demand to exceed by 10 GL as this is a volume that can be supplied from GMW infrastructure. An alternative assumption that may allow more trade is if larger deviations are permitted in January while ensuring the cumulative difference over each of December-February and November-March is constrained to zero — given that variations such as this may be able to be managed by drawdown of mid Murray storages and Lake Victoria.

If there is a shortfall, it can have significant economic consequences.

Assessment of base case

Impact on Aboriginal cultural values

Through submissions and direct consultation with the Traditional Owners of the land – the people of the Taungurung and Yorta Yorta Nations – they have noted that unseasonal high flows such as those in the base case will continue to cause irreversible damage to important cultural heritage sites including burials, middens, hearths, scar trees and artefacts. There is also concern that high flows may negatively affect flora and fauna used by Traditional Owners as food, fibre and medicine in the landscape, and therefore considered to have high cultural value.

Impact on environmental values

Base case flows would see a return to the environmental damage caused by long periods of unseasonal high summer flows down the lower Goulburn River. Unseasonal high summer flows, such as those experienced in 2017-18 and 2018-19, would continue to accelerate environmental damage in the lower Goulburn River.

The panel considered that consistently high base flows of around 2,700 ML/day would result in a highly incised channel with steep banks and extensive and severe erosion. Vegetation would be severely impacted with possible declines in both small and large bodied fish. The panel also noted that 15 years of damage from base flows of around 2,700 ML/day could take up to 50 years to repair.

Impact on recreational values

Submissions from recreation users provided a clear position that the lower Goulburn River was not being sufficiently protected from unseasonal high flows. The importance of lower flows in summer and autumn to protect river health, fish species and the ability of the waterway to support recreation by the community would likely be significantly undermined by the higher base flows in the base case.

Impact on inter-valley trade opportunities

In addition to legacy volumes, observed activity has seen in the order of 235 GL of new annual trade in some recent years.

Impact on river operations and delivery shortfall risks

Under the base case, the Goulburn IVT can be used to optimise Murray resources (including as a river operations tool to mitigate other delivery risks).

Summary

Element of assessment	Base case
Aboriginal cultural values	Cultural heritage sites not protected
Environmental values	High Risk to channel condition High Risk to vegetation High Risk to small bodied native fish Significant Risk to large bodied native fish **Overall: High Risk**
Recreational values	Poor outcomes
Inter-valley trade opportunities	In addition to legacy volumes, ~235 GL/year
River operations and delivery shortfall risks	Goulburn IVT used to optimise Murray resources (including as a river operations tool to mitigate other delivery risks)

Assessment of option 1

Impact on Aboriginal cultural values

Option 1 considers a flow regime that broadly aligns with the recommendations outlined in the submissions from the Traditional Owners. The flows would result in improved ecological and biodiversity outcomes of the river, and they would reduce the risk of cutting and collapsing of banks. Option 1 would therefore provide protection of cultural heritage sites currently not protected under the base case.

Impact on environmental values

Option 1 is based around the preferred environmental flow regime assessed by the scientific panel. The panel considered that the river could look like a better version of its current self in 15 years. Damage caused in 2017-18 and 2018-19 would slowly heal, and there would likely be recovery of the linear bands of flood tolerant species along the littoral zone and lower elevations of the bank. This could potentially be more extensive than observed pre 2016-17.

There would be some year to year variation in the extent and cover of vegetation, but recovery would be more rapid relative to scenarios with larger flow volumes. Pre 2016-17 food resources, habitat and refuges that support food webs would be maintained supporting current populations of small-bodied and large-bodied fish. Overall, the scientific panel considered it likely that there would be a high level of improvement to environmental outcomes relative to the base case.

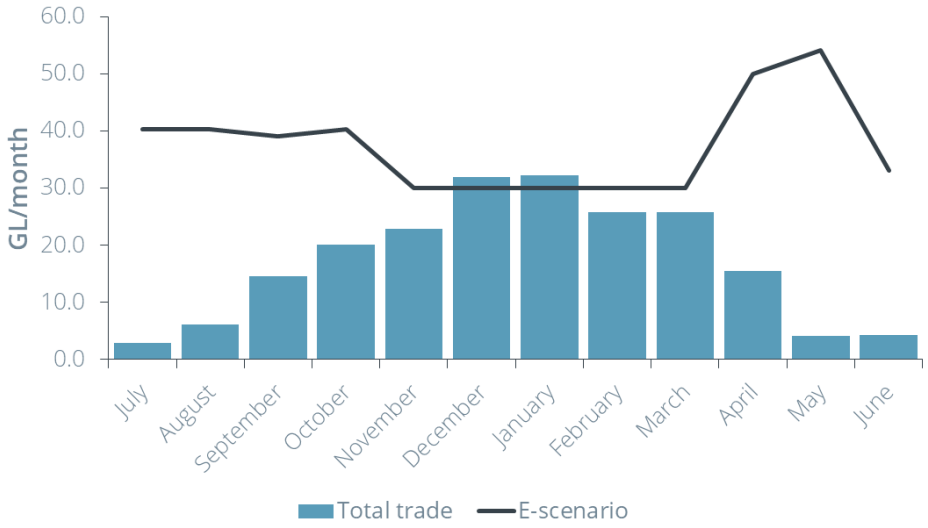
Impact on recreational values

Lower flows in summer and autumn would help to protect river health, fish species and the ability of the waterway to support recreation by the community. The improved environmental outcomes would likely see the recreational values of the river maintained or improved relative to the higher base flows in the base case.

Impact on inter-valley trade opportunities

In addition to legacy volumes, the trade opportunity is estimated to be in the order of 66.4 GL/year.

This is based on the delivery of a total of 206.4 GL from the Goulburn to Murray in a typical year, in the delivery pattern shown in the figure below.



Source: Frontier Economics

In the case that Goulburn allocations are below 100%, then additional trade opportunity would be available — as presented in the table below.

Expected February allocation	100%	80%	60%	40%	20%
Trade opportunity (GL)	66.4	86.4	106.4	126.4	146.4

However, it should be noted that less trade opportunity would be available if the volume delivered in the winter-spring period is less than the median demand shape — such as due to a very wet spring. For example, the delivery pattern assumes 80 GL of water from the Goulburn IVT account is delivered in the period July to December. It is this delivery that creates trade opportunity under the initial part of the two-part trade rule.

Impact on river operations and delivery shortfall risks

The above trade opportunity is estimated based on an expected shape of delivery traded. This means that the IVT would be used to meet traded demand, with no increased delivery risk from trade.

Summary

Element of assessment	Option 1
Aboriginal cultural values	Cultural heritage sites protected
Environmental values	Low risk to channel condition Low risk to vegetation Low risk to small bodied native fish Low risk to large bodied native fish **Overall: Low risk**
Recreational values	Maintained and improved outcomes
Inter-valley trade opportunities	In addition to legacy volumes, ~66 GL/year.

Assessment of option 2

Impact on Aboriginal cultural values

Option 2 is similar to Option 1, and it considers a flow regime that broadly aligns with the recommendations outlined in the submissions from the Traditional Owners. The flows would result in improved ecological and biodiversity outcomes of the river, and it would reduce the risk of cutting and collapsing of banks. Option 2 would therefore be expected to provide protection of cultural heritage sites currently not protected under the base case.

Impact on environmental values

The panel note that Option 2 has inferior environmental outcomes to Option 1, but it does have relatively better outcomes compared to the base case and options with higher average flow rates. The panel advised that the option would avoid the kind of damage to the river caused in 2017-18 and 2018-19. The risks of erosion would be substantially reduced, and it is probable that the river would slowly heal, given adequate sediment inputs from tributaries.

Vegetation along the lower elevations of the banks would be maintained or increased, and the current habitat and flow-regulated conditions for small-bodied and large-bodied species for low-flow months would be maintained.

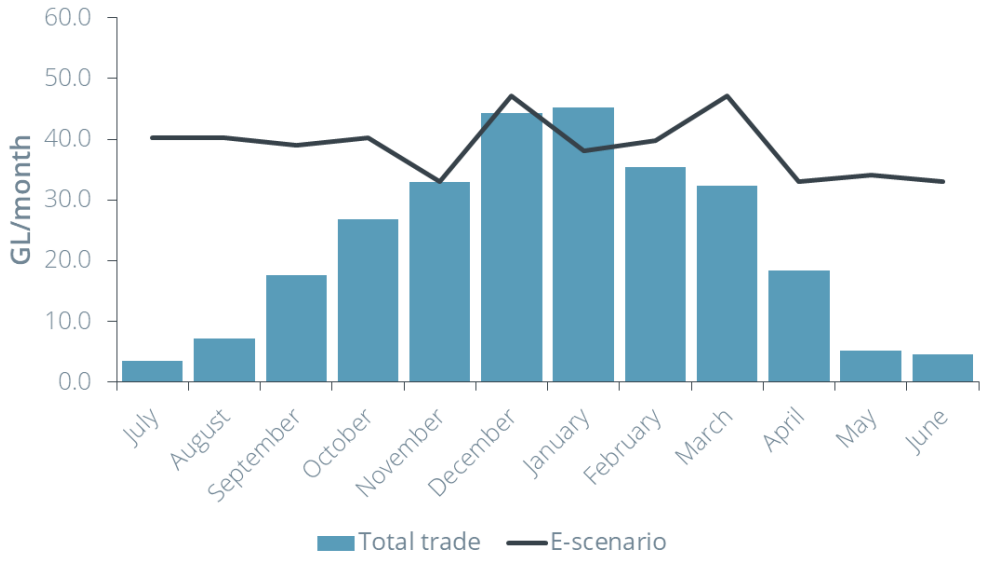
Overall, the panel did not assess this option as one of their scenarios, but they suggest the outcomes would fall somewhere in between Scenario 1 and Scenario 3. This would result in significant to high improvements to environmental outcomes relative to the base case over 15 years.

Impact on recreational values

Similar to Option 1, improved environmental outcomes would likely see the recreational values of the river maintained or improved relative to the higher base flows in the base case.

Impact on inter-valley trade opportunities

In addition to legacy volumes, the trade opportunity is estimated to be in the order of 130 GL/year.



Source: Frontier Economics

Impact on river operations and delivery shortfall risks

The above trade opportunity is estimated based on an expected shape of delivery traded. This means that the IVT would be used to meet traded demand, with no increased delivery risk from trade.

Summary

Element of assessment	Option 2

Aboriginal cultural values	Cultural heritage sites protected
Environmental values	Low risk to channel condition Low risk to vegetation Low risk to small bodied native fish Low risk to large bodied native fish **Overall: Low risk**
Recreational values	Maintained and improved outcomes
Inter-valley trade opportunities	In addition to legacy volumes, ~130 GL/year.
River operations and delivery shortfall risks	IVT used to meet traded demand - no increased delivery risk from trade

Assessment of option 3

Impact on Aboriginal cultural values

The higher average flow rates under Option 3 are considered higher than what is recommended in the submissions from Traditional Owners, and would place a higher risk to cultural heritage sites compared to Options 1, 2 and 4. The scientific panel notes that there is a high risks of eroded channel conditions due to the higher base flows, which will threaten and therefore not protect cultural heritage sites including burials, middens, hearths, scar trees and artefacts.

Impact on environmental values

The panel considered that in 15 years the river would be in a worse condition than Options 1 and 2. This is because the monthly 3,000 ML per day flow pulses would have adverse effects on lower bank and littoral vegetation and on small bodied fish.

The regular pulses would result in there being minimal vegetation along the littoral zone below the 1,300 ML/day river height. Overall, the vegetation community would have reduced resilience because the species diversity and abundance would have declined. The reduced littoral and lower bank vegetation would also reduce habitat and refuges for small bodied fish and macroinvertebrates and there may be a decline in small bodied native fish.

The panel makes it clear that Option 3 would cause significant environmental harm due to the regular environmental pulses, and that the risk rating was comparable to the base case.

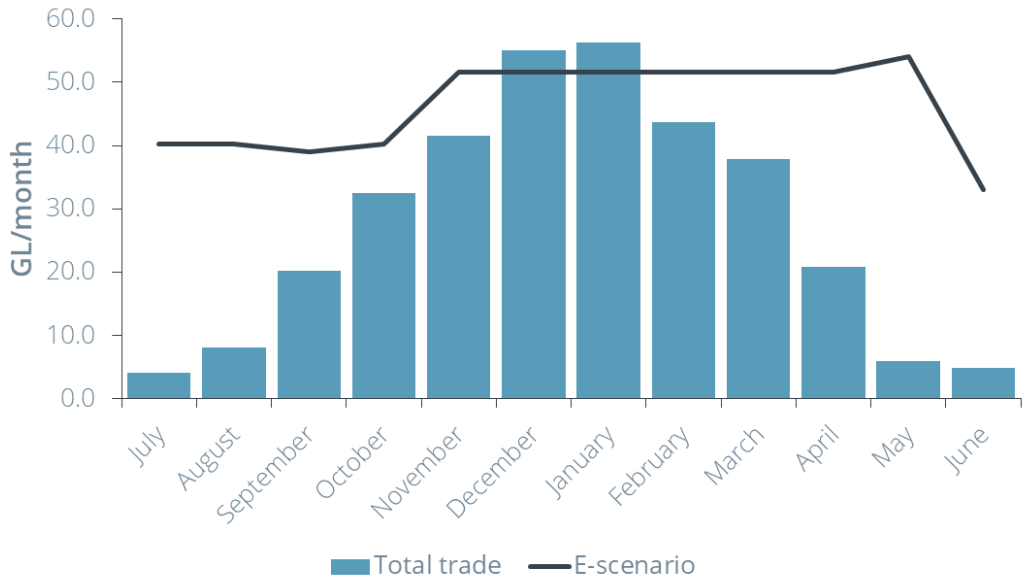
Impact on recreational values

Recreational values would likely continue to be impacted due to the river health. Recreation may also be impacted by the timing of the monthly pulses. Ideally any pulses would be timed to avoid the first weekends in December as well as the Christmas, New Year, and early January period to provide for safe, dispersed camping, and attractive fishing, during peak recreational periods. The regularity of the pulses may limit recreational outcomes in the summer period.

Impact on inter-valley trade opportunities

In addition to legacy volumes, the trade opportunity is estimated to be in the order of 191 GL per year, in addition to legacy volumes.

This is based on the delivery of a total of 331.0GL from the Goulburn to Murray in a typical year, in the delivery pattern shown in the figure below.



Source: Frontier Economics

In the case that Goulburn allocations are below 100%, then additional trade opportunity would be available — as presented in the table below.

Expected February allocation	100%	80%	60%	40%	20%
Trade opportunity (GL)	191.0	211.0	231.0	251.0	271.0

Again, as with the previous options, less trade opportunity would be available if callout in the July-November period is less than the median demand shape — such as due to a wet Spring or due to river operational decisions. For example, the delivery pattern assumes 106.6GL of IVT call out in the period July to November. It is this call out that creates trade opportunity under the initial part of the two-part trade rule.

Impact on river operations and delivery shortfall risks

The above trade opportunity is estimated based on an expected shape of demand for the water traded. This means that the IVT would be used to meet traded demand, with no increased delivery risk from trade.

Summary

Element of assessment	Option 3
Aboriginal cultural values	Cultural heritage sites not protected
Environmental values	Significant to high risk to channel condition High risk to vegetation Significant risk to small bodied native fish Low risk to large bodied native fish **Overall: High risk**
Recreational values	Poor outcomes due to environmental harm and regular pulses
Inter-valley trade opportunities	In addition to legacy volumes, ~180 GL/year.
River operations and delivery shortfall risks	IVT used to meet traded demand - no increased delivery risk from trade

Assessment of option 4

Impact on Aboriginal cultural values

Option 4, similar to Options 1 and 2, is a flow regime that broadly aligns with the recommendations outlined in the submissions from the Traditional Owners. The flows would result in improved ecological and biodiversity outcomes of the river, and they would reduce the risk of cutting and collapsing of banks. Option 2 would therefore be expected to provide protection of cultural heritage sites currently not protected under the base case.

Impact on environmental values

The environmental outcomes for Option 4 are the same as Option 2. The panel advised that the option would avoid the kind of damage to the river caused in 2017-18 and 2018-19. The risks of erosion would be substantially reduced, and it is probable that the river would slowly heal, given adequate sediment inputs from tributaries.

Vegetation along the lower elevations of the banks would be maintained or increased, and the current habitat and flow-regulated conditions for small-bodied and large-bodied species for low-flow months would be maintained.

Overall, the panel did not assess this option as one of their scenarios, but they suggest the outcomes would fall somewhere in between Scenario 1 and Scenario 3. This would result in significant to high improvements to environmental outcomes relative to the base case over 15 years.

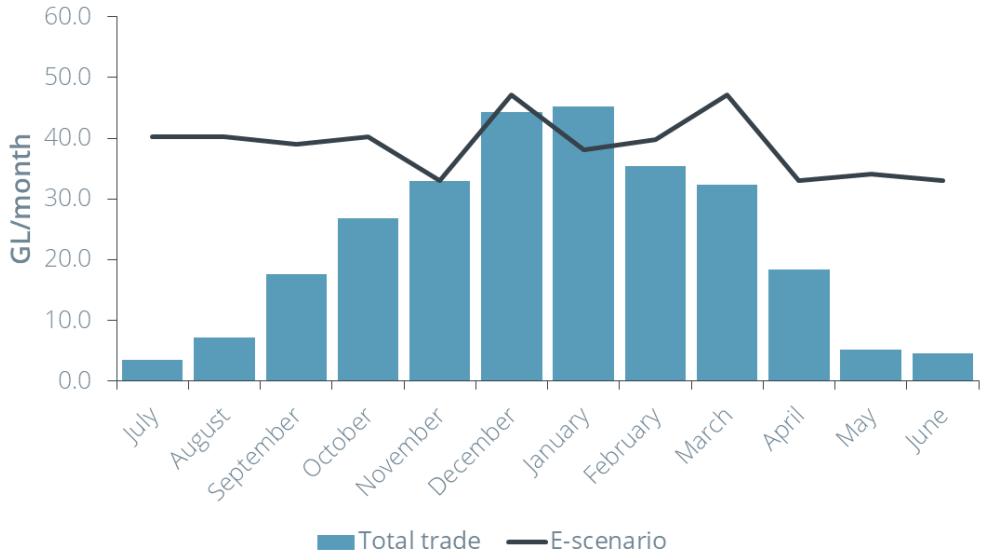
Impact on recreational values

Similar to Option 2, improved environmental outcomes would likely see the recreational values of the river be maintained or improved relative to the higher base flows in the base case.

Impact on inter-valley trade opportunities

In addition to legacy volumes, the trade opportunity is estimated to be in the order of 100 GL per year of allocation trade, plus unlimited spring tagged use.

This is based on the delivery of a total of 240.0GL from the Goulburn to Murray in a typical year, in the delivery pattern shown in the figure below, but would also mean the delivery of unlimited tagged use. This is estimated to be 0 – 150 GL based on Victorian demand patterns in the lower Murray over spring but would be highly variable and could be much higher, especially if interstate demand is considered. This would mean a total IVT delivery of 390 GL.



Source: Frontier Economics

In the case that Goulburn allocations are below 100%, then additional trade opportunity would be available — as presented in the table below.

Expected February allocation	100%	80%	60%	40%	20%
Trade opportunity (GL)	133.5	153.5	173.5	193.5	213.5

Less trade opportunity would be available if callout in the July-November period is less than the median demand shape — such as due to a wet Spring or due to river operational decisions. For example, the delivery pattern assumes 88.8GL of IVT call out in the period July to November.

Impact on river operations and delivery shortfall risks

Compared to the other options, an additional challenge for understanding the impact of option 4 on river operations is the potential for water users in the Murray to substitute water sourced from tagged Goulburn allocations for water use normally supported from Murray allocations. The potential interaction is that tagged use delivery is unrestricted in the spring, and water allocation trade, although restricted, allows water to be used at any time in the water year. The potential impact is set out in Box 5 below. The resultant risk is that if significant strategic use of the alternative sources occurs, then there will be an increase in delivery shortfall risks.

Box 5: Interactions between unrestricted tagged use and water allocation trade

The analysis of water trade opportunity when tagged use and water allocation trade are similarly restricted, is based on the delivery of these traded volumes in line with the expected shape of demand (see section 0).

If tagged use is unrestricted in the spring, while water allocation trade is restricted then alignment with this 'shape of demand' would not be feasible. This is because Option 4 would provide the opportunity for a Murray water user to use water from a Goulburn water account (under tagged use delivery) early in the season, while deferring water use from their Murray account (use of allocations to a Murray entitlements, or from previous water allocation trade from the Goulburn) to later in the season.

The consequence of this is that a policy on assessing trade opportunity would have to be highly conservative to take into account this opportunity for source substitution and the concentration of the use of Murray allocations into the peak demand period. At the extreme, if all water users in the Murray below Barmah region deferred their use of Murray water allocations to peak summer months (while relying on Goulburn tagged use delivery in the spring under Option 4) then delivery shortfall risks could be significantly increased.

- **Summary**

Element of assessment	Option 4
Aboriginal cultural values	Cultural heritage sites protected
Environmental values	Low risk to channel condition Low risk to vegetation Low risk to small bodied native fish Low risk to large bodied native fish **Overall: Low risk**
Recreational values	Maintained and improved outcomes
Inter-valley trade opportunities	In addition to legacy volumes, ~around 100 GL/year + unlimited tagging in spring
River operations and delivery shortfall risks	Large strategic use of alternative sources (tagged use and allocation trade) would increase delivery shortfall risks as a result of that trade

Comparison between options

The table below summarises the option assessments across the different impacts.

Table 11: Comparison between options

Element of assessment	Base case	Option 1	Option 2	Option 3	Option 4
Aboriginal cultural values	Cultural heritage sites not protected	Cultural heritage sites protected	Cultural heritage sites protected	Cultural heritage sites not protected	Cultural heritage sites protected
Environmental values	**Overall: High Risk**	**Overall: Low Risk** Low Risk of further damage	**Overall: Low Risk** Low Risk of further damage,	**Overall: High risk** Risk of further damage with	**Overall: Low Risk** Low Risk of further damage,

	Significant environmental degradation (Requiring at least ~$162 million erosion remediation cost while not addressing other environmental issues)	and good prospects for improvement ~$162 million avoided erosion costs compared to base case	enabling some improvement ~$130-162 million avoided erosion costs compared to base case	regular monthly flow pulses causing significant environmental harm. ~$15-80 million avoided erosion costs compared to base case	enabling some improvement ~$130-162 million avoided erosion costs compared to base case
Recreational values	Poor outcomes	Maintained and improved outcomes	Maintained and improved outcomes	Poor outcomes	Maintained and improved outcomes
Inter-valley trade opportunities	In addition to legacy volumes, ~235 GL/year (Estimated NPV $125-333m)	In addition to legacy volumes, ~66 GL/year (Estimated NPV $73-199m less than base case)	In addition to legacy volumes, ~130 GL/year (Estimated NPV $37-99m less than base case)	In addition to legacy volumes, ~180 GL/year (Estimated NPV $12-32m less than base case)	In addition to legacy volumes, ~130 GL/year (Estimated NPV $37-99m less than base case)
River operations and delivery shortfall risks	Goulburn IVT used to optimise Murray resources (including as a river operations tool to mitigate other delivery risks)	IVT used to meet traded demand - no increased delivery risk from trade	IVT used to meet traded demand - no increased delivery risk from trade	IVT used to meet traded demand - no increased delivery risk from trade	Could increase delivery risks with tagging demand substituting for Murray water allocation use.

Aboriginal cultural values have not been monetised as it is more appropriate to consider these risks qualitatively. Under the base case the risks to these values are expected to be extremely high and the cultural sites unprotected, whilst the other options are expected to protect cultural values. Option 3 provides less protection in the short term due to the current poor condition of the river.

The large-scale changes associated with erosion remediation for the base case and Option 3 may address erosion issues but would not address the broader range of environmental concerns. The increased risk of further damage to the river lead to a view that they are not feasible. Further, these erosion remediation works would be in a national park with culturally sensitive areas, and erosion control measures would irreparably change the natural habitat and look of the river — resulting in environmental, recreational, social and cultural implications. A conservative estimate of willingness to pay for environmental outcomes — representing the estimated community willingness to pay for improved vegetation outcomes along the lower Goulburn — is in the order of $94 million (following Bennett et al 2008[73]).

Under Options 1,2 and 4 there are expected benefits from avoided costs to rehabilitate the erosion impacts. These are discussed in **Appendix C**.

Moving from the base case to Option 3 would not result in significant improvements to environmental outcomes — both the base case and Option 3 had an overall environmental risk rating of High. However, relative to the base case, there may be limited environmental benefits, most notably to large bodied native fish. The scientific panel also noted that if more variation could be built into pulses then it may be possible to rate the overall risk associated with Option 3 as Significant (rather than High).

Recreational values have also not been monetised given they likely overlap with the willingness to pay estimates for the environmental values. Nonetheless, it is worth noting that, as discussed in the Appendix further below (Section 0), a 2010 survey by Ernst and Young attributed $166 million in annual direct fishing expenditure by anglers targeting Murray cod, much of which takes place in the lower Goulburn River. For example, a tackle shop in Shepparton estimates the 50% of their annual tackle sales are to people targeting

[73] Bennett, J., Dumsday, R., Howell, G., Lloyd, C., Sturgess, N. and Van Raalte, L., 2008. The economic value of improved environmental health in Victorian rivers. Australasian Journal of Environmental Management, 15(3), pp.138-148.

Murray cod. The high summer flows under the base case option have seen a decline in fishing in the opening of the cod season, in the first weekend of December, and in the Christmas holiday period.

The economic benefits of IVT opportunities increase with large volumes of potential trade. The net present value of these trade opportunities will depend on the relative scarcity of water allocations between the Goulburn and Murray systems, and will vary depending on such things as commodity prices and seasonal conditions. The net present value of the large volumes of trade allowed under the base case is expected to be in the order of $125-333m. The net present value of the other options declines with the associated trade opportunity — Option 3 $12-32m less than base case); Options 2 and 4 $37-99m less than base case); and Option 1 $73-199m less than base case).

The operational rules in Options 1 to 3 have been designed to make sure that the capped IVT volumes are delivered to match the demand patterns that they would generate. This is intended to minimise or avoid any impact on rights of other Murray entitlement holders resulting from the trade. Some variability between monthly deliveries and monthly demands is acceptable, provided there is sufficient buffering within the existing system to manage expected delivery or resource risks. The coordinated management of Lake Victoria, Menindee Lakes, Euston Weir, the Murrumbidgee IVT, the Victorian mid-Murray storages, the Edward River system, the Mulwala Canal and the Goulburn IVT collectively provides that buffering in all but the most extreme situations.

It is important to note that under the base case option, there would be years when allocation trade to the Murray would boost Murray resource and delivery security. However, given the environmental damage this created in the lower Goulburn in 2017-18 and 2018-19, continuing to support this boost for the Murray at the expense of the health of the lower Goulburn River would be inconsistent with the *Water Act 2007* Basin water market and trading objectives[74].

Option assessment findings

The impact assessment suggests the following:

- The **base case** has unacceptably high impacts to environmental values and not protect Aboriginal cultural values. Whilst this option delivers the most trade opportunity, the relative benefits of this trade opportunity cannot be traded-off against the costs to environmental and Aboriginal cultural values.
- **Option 3** also has unacceptably high impacts to environmental values that are at risk due to increased erosion, and similarly lack protection of Aboriginal cultural values.
- **Option 4 may have significant implementation issues and could increase delivery risk.** The Basin Plan water trading rules also require tagged use and allocation trade to be treated consistently. Victoria is advocating that in some cases allocation trade and tagged use could be managed differently based on the different risks presented, especially in cases where treating them the same would unnecessarily restrict trade. However, in this case risks are unacceptable.
- **Option 2 may be preferred to Option 1**. Both options protect cultural values, maintain or improve recreational outcomes and achieve significant improvements to environmental outcomes compared to the base case, but Option 2 provides greater trade opportunity for a small increase in environmental risks.
- **Option 2** therefore meets the requirements of a sustainable, working river, and is to be preferred overall because it meets the objectives more fully.

Sensitivity testing

The results of the analysis were tested for sensitivities to key assumptions, and it was found that the finding (of Option 2 being preferred) was robust.

The following sensitivities were tested:

- To seasonal condition – impact on trade opportunities: The estimated trade opportunities will vary with seasonal condition. The effect of the quarantine rule to ensure sufficient volume within the IVT limit for legacy allocations will provide additional trade opportunities in dry years when the allocation to Goulburn entitlements is not expected to reach 100%. In years when full allocations are announced, then no additional trade opportunities arise as a result in mid-December. For every 10% that allocations are predicted to be below 100% in February there would be an additional volume of 10 GL of trade possible. This result holds across all the options considered (except the base case) given the common use of

[74] Refer to clause 3(d) of Schedule 3 in the *Water Act 2007*.

quarantining to ensure there is available space in the IVT cap for delivery of legacy volumes. Therefore, conclusions are robust to changes in seasonal conditions.

- To discount rate: The calculated economic values will vary with the assumed discount rate. This does not alter the environmental impact and volumes of trade opportunities, and therefore conclusions are robust to changes in discount rate.
- To higher pulse flows if pumps are raised to allow high pulses during peak periods: The table below shows the increase volumes of trade opportunity that would be expected if larger pulses would be possible within the operational rules.

Table 12: Sensitivity testing of pulse magnitude

Option	Max 3 GL pulses	Max 6 GL pulses
Base case	Trade opportunity of ~200-250 GL/year	Trade opportunity of ~200-250 GL/year
Option 1	Trade opportunity of ~66 GL/year	Trade opportunity of ~66 GL/year (no change to trade if pumps are moved, since pulse in autumn)
Option 2	Trade opportunity of ~130 GL/year	Trade opportunity of up to ~220 GL/year
Option 3	Trade opportunity of ~190 GL/year	Trade opportunity of ~219-277 GL/year
Option 4	Trade opportunity of ~100 GL/year + unlimited tagging (estimate 0 - 150 GL/year)	Trade opportunity of ~200 GL/year + unlimited tagging (estimate 0 - 150 GL/year)

Note: The range provided is subject to further analysis of potential increased shortfall risks.

Appendix B: Infrastructure options that do not require legislative or regulatory change

Raising in-channel privately owned pumps in Lower Goulburn River

Many users take water from the lower Goulburn River for irrigation and domestic and stock needs via in-channel privately owned pumps.

As the lower Goulburn River is incised in parts, some of these pumps are located within the river channel. Locating the pumps within the river channel reduces pumping costs (and may have been the only practical solution at the time the pump was installed) but means the pump must be moved out of the channel to avoid being submerged and damaged when the river is running high. To enable their relocation, on steep banks pumps are mounted on sleds or rails while on shallower banks the pump can be moved by vehicle.

Goulburn-Murray Water (GMW) is required to provide advanced notification to river diverters when regulated flows are planned to be higher than 3,000 ML per day to allow pumps that are at risk of inundation to be moved. To date, notification is largely been by letter to all diverters and by phone call, text messages, emails depending on the diverters nominated preferred method of communication.

The requirement to avoid damaging private pumping infrastructure within the river channel places significant constraints on the operation of the Goulburn River.

For the purposes of this RIS, it means that a focus has been on operational rules based on environmental flow regimes that have pulses of no more than 3,000 ML per day maximum flow. This thereby constrains the volumes that can be called out of the Goulburn IVT and therefore the trade opportunity.

DELWP has undertaken concept planning to permanently relocate lower Goulburn River private pump infrastructure out of the river channel, which would greater flexibility in the operations of the lower Goulburn. This would allow increased flexibility for river operators to deliver higher operational flow rates (from 3,000 ML per day to 6,000 ML per day) with minimum notification.

Pump numbers and locations

The pumped infrastructure that is likely to be impacted by lifting the flow operating limits in the river is largely irrigation pumps as the stock and domestic pumps (1-2 ML per year) are typically located at the top of the river bank to avoid inundation during fluctuating river heights (in spring and summer), including flood events.

GMW has approximately 273 diversion customers licenced to divert water from the lower Goulburn River — across irrigation customers and stock and domestic customers.

GMW conducted a survey of lower Goulburn diversion customers in October 2018. Of the 130 direct responses received:

- 102 customers (78% of responses) indicated they are not impacted by flows up to 10,000 ML/day.
- 12 customers indicated their pumping operations are impacted by flows above 5,000 ML/day.
- 16 customers indicated their pumping is impacted when flows exceed 3,000 ML/day.

A total of 143 customers elected not to respond to the survey. GMW have advised that the non-respondents are likely to be domestic and stock customers or have licences that are currently not being used.

Potential costs

As part of this concept planning, it was assumed that 32 pumps would be affected by flows at around 3000-4500 ML per day, and a further 27 pumps by flows around 4500-6000 ML per day. After allowing a 20% contingency, this suggests a possible 71 pumps requiring relocation to allow higher operational flow rates (from 3,000ML per day to 6,000 ML per day) with minimum notification needed.

Distribution of these 71 pumps across pump types in order to cost the potential relocation was assumed to be:

- 6 pumps: Domestic & Under Bore Installation
- 4 pumps: Irrigation 2-5 ML/day Over Bank Installation
- 2 pumps: Irrigation 5-10 ML/day Over Bank Installation
- 20 pumps: Irrigation 2-5 ML/day Under Bore Installation

- 25 pumps: Irrigation 5-10 ML/day Under Bore Installation
- 14 pumps: Irrigation 10-15 ML/day Under Bore Installation

This suggested a Pump Construction Cost Total Estimate of nearly $10 million, and a total delivery budget estimated to be $27.2 Million (which includes design, approvals, construction and a 40% contingency).

Notwithstanding that the customers will receive new modernised pump sets, there is uncertainty about future operation and maintenance costs. This would need to be considered as part of any analysis, including for example costs arising from higher suction heads and the greater maintenance requirements of efficient modern pump sets and electricals. There may also be increased electricity costs but these may be offset by considering other options, e.g. solar. The Capitalised Operation and Maintenance Cost was estimated to be $2.6 million.

Environmental benefits of moving pumps

Advice from environmental experts shows that if flows over the summer period could be pulsed at rates greater than 3,000 ML/day – when the risk to the environment from constant high flows is greatest – the risk of damage to the environment from delivering traded water could be reduced.

This is because greater volumes of traded water could be delivered over the peak irrigation season by delivering a flow pattern that maintains low base-flows for extended periods with several short, high flow pulses.

The ability to deliver larger pulses delivers more water downstream with a reduced risk of erosion, less damage to native vegetation, and with less risk to native fish species.

Lower Broken Creek and Campaspe River bypass

The Lower Broken Creek and Campaspe River are already used to deliver as much water from the Goulburn IVT account as possible within current environmental thresholds, bypassing the lower Goulburn River. These systems are limited by their own environmental thresholds and IVT delivery relies on spare capacity in GMW channels to transfer IVT water from the Goulburn to these waterways.

In the last few years, 5 to 10 GL per month has been able to be delivered from the Goulburn IVT to the Murray via the Campaspe River and the Lower Broken Creek. These opportunities will continue to be utilised in the future to deliver water from the IVT account in a way that minimises environmental damage.

DELWP and the Goulburn-Broken CMA are working to ensure flows down those systems will not result in simply shifting the environmental damage from the Goulburn to other waterways.

Rochester bypass

This option considers utilising GMW's Rochester Channel No 14 (RO14) to increase the ability to transfer IVT water from the Goulburn to the Murray. This option would augment or supplement existing IVT flows.

The RO14 channel is a medium sized channel (400 ML/day capacity) within GMW's Rochester Irrigation Area. The channel is an offtake from the Waranga Western Main Channel (WWMC) and flows north for 39.5 km towards the River Murray, parallel to the Campaspe River.

The channel originally discharged to the River Murray via a drain downstream of Echuca. In 2016, the final 11.5 km of channel was decommissioned and replaced by a GMW owned pipeline. The pipeline runs in the same alignment as the original channel.

Utilising the existing RO14 channel footprint and existing reserves, this option involves the construction of a larger channel that could carry up to 400 ML/day from the WWMC to the River Murray. This option would also require:

- enlargement of the current channel to bring its capacity to 400 ML/day across its total length, which would include upgrading road crossings and regulators
- replacement of the existing pipeline and construction of a new channel to Point Rd adjacent to the River Murray
- construction an outfall channel and structure into the River Murray along Point Rd
- reinstatement of the inlet to the remaining length of pipeline

The estimated cost for delivery of the works is $83.4 million.

Furthermore, this infrastructure option would require removing recently installed pipeline works and reinstating a recently decommissioned channel.

This option is unlikely to be well-received by the local community.

Infrastructure options recommended for further investigation

Based on the above analysis, we recommend further investigation of moving in-channel privately owned pumps in the lower Goulburn. This option presents long-term opportunities to deliver more water within the bounds of the preferred operating rules and provides additional operational flexibility throughout the year.

This option will require negotiations with the pump-owners and will be subject to government funding.

Appendix C: Estimated costs of preventing further environmental damage

As discussed in section 4.1, the flow regime to deliver high IVT volumes in 2017-18 and 2018-19 contributed to significant bank erosion, vegetation loss and impacts on native fish.

In order to address this change, to allow for environmental outcomes in the lower Goulburn to recover, the ideal mechanism is to address the flow regime to allow gradual recovery of the natural systems. The scientific panel identified under some flow regimes that:

> *"the river could look like a better version of its current self in 15 years. Damage caused in 2017-18 and 2018-19 would slowly heal."*[75]

Rather than reducing flows, engineering options can be used to address some of these impacts — namely erosion impacts by building protective structures such as a groyne or revetment along riverbanks. This means that flow regime with greater overall volumes, may be maintained without causing further erosion.

One challenge in preparing this RIS is to estimate the cost of undertaking such works in order to compare them with the benefits of changing the flow regime to enable gradual environmental recovery on the banks of the lower Goulburn river that have been affected by the erosion caused by high IVT flows; direct estimates of these costs are not available. It is also important to note that such works would not restore channel condition or ecological diversity of the river – they would only offer an attempt at rehabilitation and protection from further erosion.

The remainder of this section considers the approximate cost of works to manage erosion impacts.

Evidence from Murray works

It is possible to draw on other studies that have estimated rehabilitation costs for similar damage in the Murray. For example, MDBA (2017[76]) includes case studies of rehabilitation on the Murray River. The MDBA report was prepared in the context of erosion due to boating activities, however it provides a basis for estimating costs to protect banks and mitigate erosion.

In the aggregate, the MDBA finds:

- During the last 17 years, more than $25 million has been spent to implement physical bank protection works and to monitor bank erosion along the Hume to Lake Mulwala reach of the Murray River.
- Average cost by solution type (reported in 2016 dollars):
    - Timber groyne $380,282 per km
    - Rock revetment $368,852 per km
    - Log revetment $304,054 per km

The MDBA report also details the works program that was implemented at a high boat traffic area at Corowa. At this site:

- In 2010, the works program constructed approximately 800 metres of bank protection works to address actively eroding riverbanks. The technique initially comprised log revetment and machine placed Common Reed (Phragmites spp.) rhizomes. This has become the preferred riverbank protection work mitigation technique. The technique is generally effective at addressing erosion caused by river regulation and has an estimated design life of 30 years.
- However, after only five years the log revetment had effectively failed and this is thought to be due to undermining due to vessel wash.
- To address this, in 2016 a further $670,000 was spent to repair the damaged riverbank protection works and to reinforce the riverbanks with rock beaching to protect against boat wash.

[75] Description of outcomes of Scenario 1 – 940 ML/day average with autumn fresh (RIS Option 1), p.17

[76] MDBA 2017, Bank erosion along the River Murray from the Hume Dam to Ovens junction, https://www.mdba.gov.au/sites/default/files/pubs/Bank-erosion-along-the-Murray-River.pdf

- The report also comments that "There are works with a value of $2.5 million dollars in the proposed boating restriction zone that are currently at risk of failure if boating trends continue."
- The 2016 element of this response converts to $837,500 per km ($2016)
- If the 'works with a value of $2.5 million dollars' is the total cost (in 2016 dollars) of the 2016 and prior works in the 800m section of river, then this would be $3,125,000 per km ($2016).

The report does not provide cost estimates of ongoing operation and maintenance.

The above information is presented in Table 13 and then indexed to 2020 dollars using the ABS CPI. This suggests that the range in costs of Murray works is in the order of $320,000–$3,292,000 per km (in 2020 dollars).

Table 13: Cost of erosion remediation: Murray works

Type	Number of works	Total length (km)	Value ($m based on 2016 cost replacement)	Cost (in $2016) $'000 /km	Cost (in $2020) $'000 /km
Timber groyne	95	14	5.4	380	401
Rock revetment	231	24	9.0	369	389
Log revetment	141	15	4.5	304	320
Corowa repair	1	0.8	0.7	838	882
Corowa total	1	0.8	2.5	3,125	3,292

Source: MDBA (2017), Table 1 and page 10; ABS 6401.0.

Applying these to the Goulburn context

GBCMA has observed that River Murray works (discussed in the MDBA 2017) are generally at sites with good access and banks less than 2m high. This means that they are at locations where there is machinery access at the top of the bank.

For the Goulburn river the majority of the banks are much steeper and higher (around 3-4m) which would make access difficult. The steepness and height of the banks of the Goulburn River mean that equivalent works would need to be undertaken from floating barges or with equipment physically in the river leading to significant cost increases.

GBCMA has suggested that:

- a contingency of at least 40% should be added to the unit costs for the Murray to accommodate these site differences at the Goulburn.
- there is the potential for costs on the Goulburn to be in the order of three times the cost of Murray River works.

Based on this, Table 14 provides a potential range of costs for addressing erosion in the lower Goulburn.

If these 'per km' estimates are applied to the 225 km of affected river the costs may be in the central estimate range of $278–596 million (in 2020 dollars), if the full length of the river required works similar to the repairs undertaken at the Corowa site in MDBA (2017). Whereas the range may be $101-216 million if the average log revetment type is appropriate, or up to $1.0-2.2 billion if the total works from the Corowa case study are required along the full length of affected river.

Given the MDBA (2017) observation that works would have an estimated life of 5-30 years, the sites would require continuing maintenance and this would further add to the costs.

Table 14: Cost of erosion remediation: Goulburn works (in $2020)

Type	Murray cost ($'000 /km)	Goulburn cost ($'000 /km)		Cost of 225 km of Goulburn ($m)	
		Low range Murray cost +40%	High range Murray cost x3	Low range Murray cost +40%	High range Murray cost x3
Timber groyne	401	561	1,202	126	270
Rock revetment	389	544	1,166	122	262
Log revetment	320	448	961	101	216
Corowa repair	882	1,235	2,647	278	596
Corowa total	3,292	4,609	9,876	1,037	2,222

Source: MDBA (2017), Table 1 and page 10; ABS 6401.0.

In addition to the financial cost consideration of works, works would be in a national park with culturally sensitive areas, with approvals being hard to obtain and works potentially leading to short-term damage to a very fragile ecosystem. Works could only be undertaken with river levels at 1,000 ML/day or less over summer so could not deliver IVT as well as do rehabilitation.

Summary

A central estimate of the costs to address erosion from high flows along the full 225 km of the lower Goulburn is the range of $278–596 million (in 2020 dollars), if the full length of the river required works similar to the repairs undertaken at the Corowa site in MDBA (2017). This range may be $101-216 million if the average log revetment type is appropriate, or up to $1.0-2.2 billion if the total works from the Corowa case study are required along the full length of affected river.

If these works were to be undertaken, the implementation would be challenged by occurring in a national park with culturally sensitive areas and low flows would need to be maintained during the construction period.

Overall, the scale and cost of rehabilitation works and the increased risk of further damage to the river lead to a view that they are not feasible.

Further, if completed, these works may address erosion issues but would not address the broader range of environmental concerns.

Appendix D: Grandfathered tags

A ‘tag’ enables water users with accounts in the Goulburn to have that water tagged for use in the Murray. Under the interim tagging regulations, which first came into effect in December 2019, tagged use was restricted in line with allocation trade.

An exception to this was if a tagged water access entitlement, i.e. a tagged water share, was established before 22 October 2010 (which corresponds to the release of Volume II of the Guide to the Proposed Basin Plan) — with such tags being referred to as ‘grandfathered’ tags.

In order to hold a grandfathered tag, water users needed to have filled out an application form and have that request approved by their water corporation before the 22 October 2010 threshold date. Water users following the same procedure on or after that date were to be subject to the restrictions.

Tagged water allocations made under a Victorian grandfathered water share cause the same type and magnitude of impacts to spill and delivery issues as tagged water allocations established after the grandfathering date. The volume of these grandfathered tags are also substantial – totalling about 12 GL of entitlement, which are held by about 20 water users.

Most of these tagged volumes (84%) are high reliability water shares (HRWS), totalling about 10 GL. Low reliability water shares (LRWS) total about 2 GL (Figure 14).

Most of the tagged volume (82%) is for use of zone 1A water in zone 7 — with 11% for use of zone 1B water in zone 7 and 7% for use of zone 1A water in zone 6B (Figure 14).

Of the grandfathered water users, a single water user holds 87% of the total tagged volume across HRWS and LRWS grandfathered tags (Figure 14).

Historically, the use of tags has been an effective mechanism for water users with accounts in the Goulburn to have that water used in the Murray. Prior to tagged use restrictions taking effect in December 2019, some of the grandfathered tags have historically traded in water and used about 30 times their tagged entitlement volume, in the years 2012-13, 2013-14 and 2014-15.

The exemption to the Goulburn-Murray trade rule for grandfathered tags is limited to any water allocation made available through seasonal determinations to the grandfathered tagged water share, along with any allocation carried over against the water share in accordance with the carryover rules that apply to all entitlements. Water allocation that is traded into or out of the account during the season is not exempt.

This means that, beginning from December 2019, there is a likely maximum volume that could be moved between systems by these grandfathered tags of about 22 GL:

- For HRWS, the volume is twice the tagged entitlement volume associated with the tag (assuming maximum use of carryover, 100% allocations to HRWS, and a low risk of spill declaration for spillable accounts)
- For LRWS, the volume is equal to the tagged entitlement volume (assuming maximum use of carryover and 0% allocations to LRWS).

In the 2020-21 water year up to mid-February 2021, at least four grandfathered tags have fully utilised this opportunity while trade has been closed.

This means that about 12 GL of grandfathered tagged entitlement can enable up to about 22 GL of water to move between systems, adding to the Goulburn IVT balance. When these grandfathered tags use water and the IVT balance is credited, it means that less allocation trade is made available under the Goulburn-Murray water trade rule — either within the water year in which it occurs, or in the following year because it adds to the end-of-year IVT balance that is taken into account when trade opportunities are calculated at the season opening.

If the preferred option (Option 2) is implemented, then water users with grandfathered tags would be expected to make the strategic decision to use non-grandfathered water allocations when trade is open and to use their grandfathered water allocations when trade is closed. The impacts of this include:

- If all of the potential grandfathered water was used in the first half of the year when the proposed two-part trade rule ‘rolling limit’ of 190 GL was in place, and trade was closed, this use could result in an IVT balance of about 212 GL, increasing the spill risk for all water users (noting the current rule in place has identified

200 GL as the maximum acceptable spill risk limit). This would also mean less trade opportunity to water users in the second half of the year when the 'fixed limit' is applied.

- If all the potential grandfathered water was used instead in the second half of the year when the proposed two-part trade rule 'fixed limit' was in place, and trade was closed, then the additional IVT volume above the cap would be increasing shortfall risk for Murray entitlement holders, as the 22 GL volume owed to the Murray may not be able to be delivered within operational thresholds. This undelivered volume carried over into the next water year would also mean that trade opportunity to water users in the first half of the following water year will be reduced, as the IVT balance would be higher.

The analysis of Option 2 found that the net present value of trade opportunity was $88-234m over the assessment period (being $37-99m less than the base case, which had benefits of $125-333m). Of this, $15-39m accrues to the water users with grandfathered tags, while $73-195m is available to all water users (with and without grandfathered tags). An assessment of the economic value available to these grandfathered tags when trade is closed that is not available to other water users is provided below in Table 15.

Table 15: Assessment of the distribution of trade benefits

Element of assessment	Base case	Option 1	Option 2	Option 3	Option 4
Inter-valley trade opportunity# benefit available to grandfathered tags due to ability to use when trade is closed	No advantage as all tagged water users were unrestricted	Estimated NPV $17–44m	Estimated NPV $15–39m	Estimated NPV $13–34m	Estimated NPV $15–39m
Inter-valley trade opportunity# benefit available to all water users when trade is open	Estimated NPV $125-333m	Estimated NPV $35–90m	Estimated NPV $73–195m	Estimated NPV $100–267m	Estimated NPV $73–195m
Total inter-valley trade opportunities	Estimated NPV $125-333m	Estimated NPV $52-134m ($73-199m less than base case)	Estimated NPV $88-234m ($37-99m less than base case)	Estimated NPV $113-301m ($12-32m less than base case)	Estimated NPV $88-234m ($37-99m less than base case)

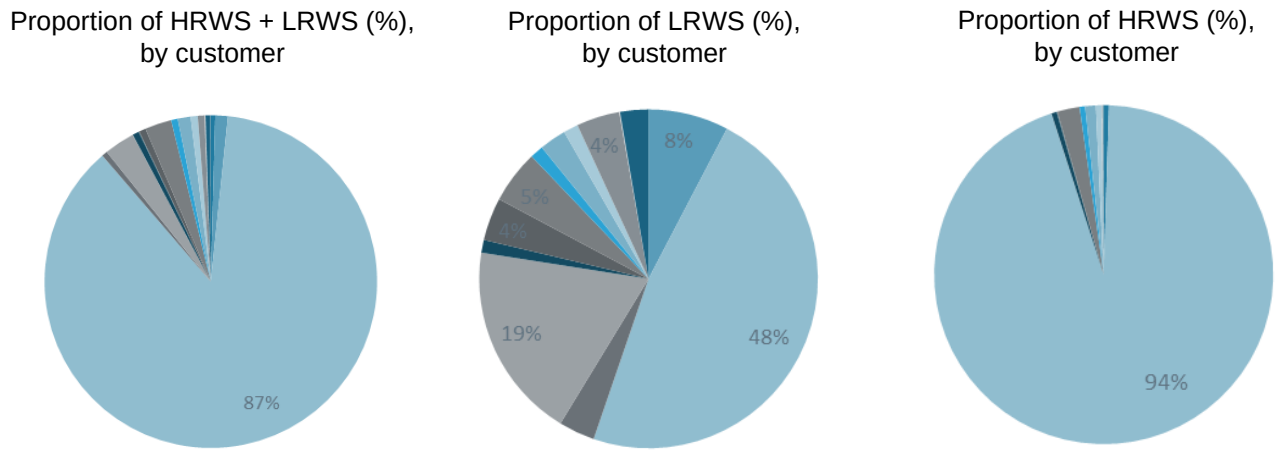
NPV = Net present value based on water allocation prices.

If restrictions were placed on all such grandfathered tags in Victoria, or similarly if all grandfathered water users undertook transactions that resulted in restrictions being applied to the tag (such as change in ownership) – such that these tags are treated the same way as other tags (those established on or after 22 October 2010) – then it would have the following effects:

- About 20 customers (those with tags established on or after 22 October 2010) would no longer be exempt from the Goulburn–Murray water trade rule. This would mean they could not use about 12 GL of grandfathered tagged entitlement to move up to about 22 GL of water between systems, and benefit from the water allocation price differentials that exist when Goulburn–Murray trade is constrained. The expected impact would be greatest for the single customer holding about 10 GL of grandfathered tagged entitlement which could have been used to move up to about 20 GL of water between systems.
- The volume of water (up to about 22 GL) that would have been moved via grandfathered tags, would instead be available for Goulburn–Murray allocation trade or tagged use by all water users.
- All water users (using allocation trade, tags established before 22 October 2010 and those with tags established on or after 22 October 2010) would be subject to the same trade rule for Goulburn–Murray water trade.

- Spill risk would be reduced in the first half of the water year and managed within acceptable thresholds, and the risk of shortfall for Murray entitlement holders would likely reduced in the second half of the year compared to if there were no such restrictions on grandfathered tags.

Figure 14**:** Proportion of grandfathered tag volumes, by customer



Source: Victorian Water Register