
Appendix U

Operations plan

Yanco Creek System operations plan

Yanco Creek Modernisation Project

October 2024

Last Updated – 20 October 2024

WORKING DRAFT


for project development and

delivery



Drafting Note – This document remains under development in consultation with WaterNSW and hence remains subject to change.

Drafting Note – This document template needs to be updated to a current DCCEE template.



Acknowledgement of Country

The Department of Climate Change, Energy, the Environment and Water acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

Published by NSW Department of Climate Change, Energy, the Environment and Water

dpie.nsw.gov.au

Yanco Creek System operations plan

First published: October 2024 (working draft only)

Department reference number: [PUB21/762](#)

More information

dpie.nsw.gov.au/yanco-creek-modernisation-project

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TMP-MC-R-LC-V1.2

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About this plan

The Yanco Creek System Operations Plan (plan) has been developed as part of the Yanco Creek Modernisation Project. This project formed part of the larger NSW Sustainable Diversion Limit Adjustment Mechanism (SDLAM) Program funded by the Australian Government.

The plan details how the Yanco Creek System will be operated into the future by river operators for local communities and other stakeholders following the completion of infrastructure and other investments that were made as part of the Yanco Creek Modernisation Project.

The project was developed with local community and broader stakeholder support and encompassed a range of initiatives including:

- maintaining and improving flows along the Yanco/ Billabong/ Colombo/ Forest Creeks
- smarter use of available water
- modernisation of ageing infrastructure (includes replacement of some private infrastructure with public infrastructure)
- improved opportunities for cultural flows and outcomes for First Nations communities
- better environmental watering outcomes for key river ecosystems
- increased fish passage and instream connectivity
- assisting to meet NSW's commitments under the *Murray-Darling Basin Plan 2012 (Basin Plan 2012)*.

This plan also details a series of WaterNSW Operating Conditions (marked in red text) that WaterNSW must comply with as a requirement of work approvals issued to WaterNSW under the Water Management Act 2000.



Yanco Creek @ upstream McCaugheys Block Bank

What has changed?

The Yanco Creek Modernisation Project resulted in a series of new infrastructure investments and operational changes across the Yanco Creek System. A high-level summary of the changes directly related to the Yanco Creek Modernisation Project include:

- 18 new infrastructure assets
 - Two large automated and remoted controlled re-regulation weirs located in the Billabong Creek
 - fish passage via vertical slot fishways
 - raised full supply levels
 - Limits to daily regulator pool level rates of rise and fall
 - Minimum operating levels
 - Seasonal regulator pool level targets
 - Flow measurement
 - improved operational flexibility from new re-regulation capacity that assists rivers operator to deliver the right amount of water to the right place at the right time for customers and the environment
 - increased capacity to deliver environmental water from Billabong Creek into Forest Creek at Forest Creek Offtake
 - includes the following additional minor works
 - Forest Creek Block
 - Hartwood Access Culvert
 - Wanganella Flood Bypass Channel

- Seven small automated and remote-controlled regulators that provide flow measurement and safe downstream fish passage that also enable the efficient delivery of targeted environmental water when required:
 - Cheverells Creek Offtake
 - Controls the flow of water from Colombo Creek into Cheverells Creek that flows into Yanco Creek
 - Wilsons Anabranh Offtake
 - Controls the flow of water from Muntoora Anabranh into Wilsons Anabranh that flows back into Yanco Creek
 - Forest Creek Return Regulator
 - Significantly reduces unplanned flows in the Forest Creek downstream of Warriston Weir by diverting these unplanned flows via Piccaninny Creek back to Billabong Creek where this water can be reused for consumptive and/or environmental purposes.
 - Four small automated and remote-controlled regulators in the Wanganella Swamp area that significantly improve environmental water delivery efficiency and environmental outcomes.
 - Estuary Creek Offtake
 - Northern Regulator
 - Southern Regulator
 - McCrabbs Regulator
 - Two new privately owned access culverts located downstream of Wanganella Swamp that address significant previous environmental water delivery constraints
- XX ha of new water inundation easements that provide the legal right to deliver water (mostly environmental water) on private property and Crown Land including:
 - 100ML/day in the Piccaninny Creek downstream of Forest Creek Return Regulator
 - 50ML/day design flow plus 50ML/day buffer
 - 300ML/day in the Forest Creek System downstream of Warriston Weir to McCrabbs Regulator
 - 250ML/day design flow plus 50ML/day buffer

- 200ML/day in Estuary Creek downstream of Estuary Creek Regulator
 - 150ML/day design flow plus 50 ML/day buffer
- 50ML/day in Clarkes Creek downstream of the Cobb Highway,
 - 25ML/day plus 25ML/day buffer
- 200ML/day in the Forest Creek System downstream of McCrabbs Regulator to the Avenel / Zara property boundary
 - 150ML/day design flow plus 50 ML/day buffer
- Water inundation easements with variable buffers within the Wanganella Swamp area based on the following design full supply levels
 - Upstream of the Northern and Southern regulators located adjacent to the Cobb Highway – 86.30m
 - Upstream of McCrabbs Regulators located about 4km downstream of the Cobb Highway – 85.50m
 - Clarkes Creek upstream of the privately owned access culvert – 85.80m
- Shared water delivery efficiency gains generated from the Yanco Creek Modernisation Project between the Commonwealth Environmental Water Holder and the Yanco Creek System. Within the Yanco Creek System that majority but all of these new environmental flow provisions start to take effect during a water year when general security water allocations are equal to or less than 15%. A summary of the new Yanco Creek System environmental flow provisions includes:
 - A range of environmental baseflows on a reach by reach basis.
 - This includes new restrictions to the delivery of water out of Coleambally Catchment Drain, DC800 and Finley Escape until new environmental baseflow targets have been met upstream of these escapes.
 - Native fish environmental flows to assist improve native fish breeding outcomes between 14 September and 16 November.
 - Additional environmental flows in the form of a 14 day 200ML/day small fresh in the Billabong Creek @ Darlot (410134) anytime between 1 February and 31 March.

About the Yanco Creek System

The Yanco Creek System links two of Australia's largest rivers — the Murrumbidgee and Murray — through over 800 km of interconnected waterways including:

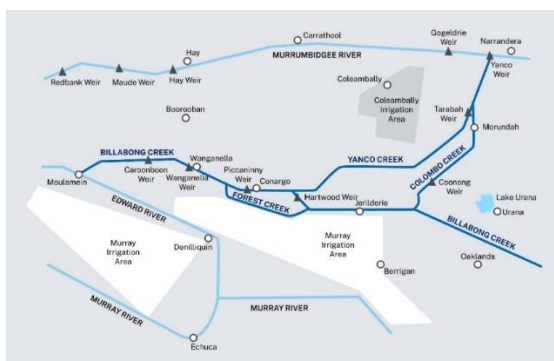
- Yanco Creek
- Colombo Creek
- Billabong Creek
- Forest Creek.

These local waterways support many important uses and values including:

- domestic, stock and irrigation water supply for over 180 farms
- town water supply to Morundah, Urana, Oaklands, Jerilderie, Conargo and Wanganella
- First Nations culture and heritage, including opportunities for First Nations people to continue spiritual, cultural and traditional Connection-to-Country
- recreation, such as fishing, water skiing and photography
- historical significance associated with pastoralism and irrigation development
- biodiversity conservation, encompassing important wetlands and populations of threatened species.

The system starts in the traditional lands of the Wiradjuri people and flows through Bangerang, Barapa Barapa (also known as Perepa Perepa) and Wamba Wamba (also known as Wemba Wemba) traditional country. 'Yanggu' is Wiradjuri for 'song of running water', perhaps reflecting that before dams and irrigation, Yanco Creek only connected with the Murrumbidgee River during floods. As the name suggests, Billabong Creek was also regularly reduced to isolated waterholes.

Due to river regulation, these waterways are now permanently flowing creeks (the Billabong Creek is only regulated below the junction with the Colombo Creek) with sections of still and fast flowing water and deep and shallow water. Many native plants and animals are now well adapted to the new water regime.



Yanco Creek System schematic diagram

Drafting Note: Consider adding Warriston Weir to this figure

Operating principles

- Genuine partnership with local communities and other key stakeholders that assist to inform infrastructure investments and operating rules/guidelines to deliver targeted outcomes.
- The Yanco Creek System is operated by WaterNSW (a state-owned corporation) in accordance with legal requirements that include but are not limited to the following.
 - *Water Management Act 2000*
 - Water Sharing Plan for the Murrumbidgee Regulated River Water Source
 - WaterNSW's works approvals State Significant Infrastructure (SSI) planning approvals
- Improved operational efficiency by delivering the right amount of water to the right place at the right time for both consumptive and environmental purposes. This includes:
 - reducing unplanned surpluses and shortfalls that have been facilitated by new infrastructure and operating rules;
 - improving water order flexibility by increasing the percentage of approved water order amendments (i.e. the ability for customers to change the time and/or rate that a water order is delivered); and
 - using water savings from improved operational efficiencies to deliver improved environmental outcomes through new environmental flow provisions.
- Optimise regulator pool operations to provide benefits in terms of improved fish passage and fish habitat plus limit the risk of adverse (i.e. harmful and/or unfavourable) outcomes such as over watering of native vegetation.
- Ensure equitable sharing of supplementary water between water access licence holders across the Murrumbidgee Valley in-line with the Murrumbidgee water sharing plan.
- Maintain new and existing environmental baseflow provisions on a reach-by-reach basis.
- Adaptive management by adopting the lessons learnt from trialling new approaches and historic operational events to progressively improve outcomes.
 - This also includes adapting to seasonal conditions and variability.
- Yanco Creek System operations following the implementation of the Yanco Creek Modernisation Project will not create an additional net demand on held environmental water (HEW) for the purpose of:
 - substituting other forms of water previously contributing to the environmental water requirements (EWRs) of the system; and/or
 - mitigating adverse environmental impacts from the project.
- This plan does not reduce the flexibility of environmental water managers in deciding where, when and how much environmental water to deliver.
- Refer to the exemptions section of this plan for events or periods when the WaterNSW Operating Conditions in this plan do not apply.
- Reasonable mitigation of adverse third-party impacts to the greatest practical extent possible.

Objectives

The objectives of this plan are to:

- keep the Yanco Creek System flowing (e.g. maintain environmental baseflows)
- clearly define the operating parameters WaterNSW is required to operate within as a requirement of WaterNSW's works approvals, State Significant Infrastructure (SSI) planning approvals and the Murrumbidgee water sharing plan. This includes:
 - 40WA405734
 - **Drafting Note – List work approval and SSI numbers here. Licensing Team to advise of relevant work approval numbers.**
- reduce the need for additional water market purchases for the environment from productive water users across NSW, Victoria and South Australia to meet legislative Sustainable Diversion Limits defined in the *Basin Plan 2012*.
 - The Yanco Creek Modernisation Project contributes to achieving this by delivering improved environmental outcomes with less held environmental water (HEW) entitlements within the Murrumbidgee Valley.
- balance social, environmental, economic and cultural outcomes in consultation with local communities and key stakeholders
- maintain the reliability of existing water entitlements (e.g. general security allocations)
- ensure flexibility to assist river operators to appropriately respond to a broad range of circumstances and operational objectives that vary with time and water resource availability
- continue to maintain the alignment of system operations with other planning and legislative documents, including but not limited to the:
 - *Basin Plan 2012*
 - *Water Management Act 2000*
 - *Murrumbidgee Water Sharing Plan for the Murrumbidgee Regulated Water Source 2016*
 - Murrumbidgee Long Term Water Plan
- define annual WaterNSW reporting requirements associated with this plan
- document clear governance arrangements outlining who is authorised to amend this plan and the procedures required to do so.



Billabong Creek @ upstream Hartwood Weir

Governance arrangements

Drafting Note – This chapter of the draft plan has been updated based on advice from the Licensing Team.

Plan Commencement

This plan commences from <1 July 2027>.

Drafting Note – This corresponds to the first full water year following the construction of all new Yanco Creek Modernisation Project assets.

Roles and Responsibilities

The Water Group within the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is responsible for:

- managing NSW's surface water and groundwater resources (this includes issuing water access licences and approvals for certain water users and purposes).
- developing and overseeing the state's water-related laws and policies as well as ensures NSW's water resources are secure and sustainable by establishing regional and metropolitan water strategies and water sharing plans;
- supervising NSW's local water utilities – making sure the water and wastewater services they provide to their communities are safe, secure and sustainable; and
- leading collaboration and negotiations with the Commonwealth and other states and agencies (including the Murray-Darling Basin Authority) on water-related issues

WaterNSW is a state owned corporation that is responsible for:

- supplying around 65 percent of all water used in NSW;
- operating the largest surface and groundwater monitoring network in the southern hemisphere and delivering essential water supply infrastructure across the state; and
- issuing water access licences and approvals for rural landholders and industries as well as certain developments.

WaterNSW Operating Condition – Plan Requirements

1. WaterNSW must maintain a Yanco Creek System Operations Plan (This Plan) that has been approved by the Minister. This approval will be in the form of a date specific version of the Yanco Creek System Operations Plan that is Conditioned on the Water Supply Work approval for the works in this plan.
2. A copy of the approved Yanco Creek System Operations must be published by WaterNSW on its website.

Plan Reviews

Drafting Note – The roles and responsibilities regarding Plan Reviews including who should be the lead agency remains under discussion between DCCEEW and WaterNSW.

1. <<Agency>> must complete a comprehensive review the Yanco Creek System Operations Plan by 30 September 2030 and then within every five years after that.

Drafting Note – This is three months after the IPART water pricing determination period due to commence from 1 July 2030. This means no <<Agency>> costs for the review need to be considered as part of the 1 July 2025 to 30 June 2030 IPART water pricing determination.

2. A report documenting the outcomes of each plan review must be provided by <<Agency>> to the Minister. This report must:
 - a. Demonstrate that <<Agency>> has appropriately consulted with all key stakeholders. This may include but not be limited to relevant:
 - i. regulatory authorities (e.g. Fisheries)
 - ii. other NSW and Commonwealth government departments
 - iii. local government authorities
 - iv. private irrigation companies (e.g. escape operators)
 - v. local communities and landholders
 - vi. Aboriginal groups and/or organisations
 - b. Detail stakeholder feedback including copies of all written submissions from stakeholders to <<Agency>> as part of this consultation process.

- c. recommended actions from the review.
 - i. As outlined below this may or may not include recommended changes to the plan submitted to the department as a formal application to amend WaterNSW's work approval conditions.

Working Draft

WaterNSW Operating Condition – Operations Plan Amendments

1. Proposed changes to this plan must be:
 - a. applied for by WaterNSW in the form of a formal application to the department to amend conditions on the relevant WaterNSW work approval; and is then
 - b. approved by the Minister.
2. Applications by WaterNSW to change this plan must:
 - a. Clearly detail all proposed amendments compared to the current approved plan (e.g. tracked changes);
 - b. demonstrate an appropriate level of key stakeholder consultation that is proportional to the significance of the requested changes;
 - c. detail how key stakeholder feedback has been considered and how this advice has influenced WaterNSW's requested proposed amendments to the plan;
 - d. detail the rationale for the proposed amendments; and
 - e. detail expected outcomes (positive and/or negative) that the requested changes will have from a social, environment, economic and cultural perspective.

Proposed Murrumbidgee Water Sharing Plan Amendments

This plan includes a series of new environmental flow provisions. It is proposed that the environmental baseflow requirements in this plan (refer to Environmental Provisions for further details) for the following locations be included in an amended version of the Murrumbidgee water sharing plan.

- Yanco Creek @ Offtake (410007)
- Billabong Creek @ Jerilderie (410016)

In addition, it is proposed to amend the minimum flow requirements in the Murrumbidgee water sharing plan to include a daily seven-day rolling average flow provision for Billabong Creek @ Darlot (410134) to align with several other environmental baseflow requirements across the Yanco Creek System that are detailed in this plan (refer to Environmental Provisions for further details).

WaterNSW Operating Condition - Annual reporting requirements

Each year WaterNSW must provide the Minister with an Annual Compliance Report as per WaterNSW's Murrumbidgee works approval conditions.

WaterNSW must include the following details related to the Yanco Creek System in it's Annual Compliance Report for the Murrumbidgee Valley.

1. An annual water balance table for the Yanco Creek System which must as a minimum include the each of the items detailed in the following table.

Description	Average Volume (GL/yr)
Yanco Creek @ Offtake (410007) Inflows	
Billabong Creek @ Walbundrie (410091) Inflows	
Coleambally Catchment Drain	
DC800 Inflows	
Finley Escape Inflows	
TOTAL INFLOWS	
Unaccounted Differences (includes seepage & evapotranspiration)	
Extractions upstream of Billabong Creek @ Darlot (410134)	
TOTAL SYSTEM USE	
Billabong Creek @ Darlot (410134)	
Forest Creek @ Warriston Weir (410148)	
TOTAL OUTFLOWS	
Extractions downstream of Billabong Creek @ Darlot (410134)	

2. Periods of time that Forest Creek Offtake regulation gates were fully opened as a result of the average daily flow in the Billabong Creek @ Downstream Hartwood Regulator being equal to or greater than 1,200 ML/day (refer to Forest Creek Offtake for further details).
 - a. Any environmental reasons and periods of time the Forest Creek Offtake regulation gates were not fully open during periods of time that Billabong Creek @ Downstream Hartwood Regulator were equal to or greater than 1,200 ML/day including how the modified operation of the regulation gates resulted in no additional unregulated flows passing downstream of Forest Creek @ Warriston Weir (410148) compared to the standard operating conditions.
3. Periods of time that the regulator gate at Wilsons Anabranche Offtake was open (refer to Wilsons Anabranche Offtake for further details).
 - a. For the five month period 1 April to 31 August, any reasons and periods of time the Wilsons Anabranche Offtake regulator gate was not fully open.
4. Details of any WaterNSW Operating Conditions that were not met as a result of any exemptions detailed in this plan (refer to Exemptions for details). This must include details about:
 - a. the nature and reason for each exemption event;
 - b. which WaterNSW Operating Conditions in this plan were not met as a result of each exemption event; and
 - c. the periods of time each WaterNSW Operating Condition in this plan were not met as a result of an exemption.
5. The annual volume of inter-valley trade (IVT) adjustments for Finley Escape calculated based on the following equation [refer to Finley Escape (a.k.a. Billabong Escape) inter-valley trade (IVT) adjustment for further details].
 - a. $\text{Daily IVT Adjustment} = \text{Min}[\text{Finley Escape Water Order}^\#, \text{Finley Escape Actual Flow}^\#, \text{Max}[0, \text{Min}(\text{Finley Escape Water Order}^\#, \text{Finley Escape Actual Flow}^\#) + \text{Billabong Creek @ Darlot Minimum Flow Requirement} - \text{Billabong Creek @ Darlot Actual Flow}]]$
Assumed ten-day travel time adjustment from Finley Escape to Billabong Creek @ Darlot (410134).

WaterNSW must publish all of above annual reporting requirements that specifically relate to the Yanco Creek System on WaterNSW's website.

- The published annual reporting requirements detailed above may be an extract of the relevant sections of the full Annual Compliance Report.

Drafting Note – The requirement to publish the above Yanco Creek System reporting requirements directly addresses key stakeholder advice regarding the need for transparency regarding the operation of the Yanco Creek System while avoiding the need to publish all other information from the Annual Compliance Report that WaterNSW may consider to include sensitive information.

WaterNSW must publish all electronic data (e.g. hydrometric station and regulator data) for stream flow, height and water quality data for all sites within the Yanco Creek System on its website.

- This includes the upstream water levels at both Hartwood and Wanganella regulators.

Drafting Note – This would likely be published on WaterNSW’s existing WaterInsights website similar to a number of sites across the Yanco Creek System that already published by WaterNSW on this website.

Working Draft

River operations overview

System wide approach to operating the Yanco Creek System

Operation of the Yanco Creek System by WaterNSW forms part of the larger operation of the Murrumbidgee Valley. This in turn links and interacts with the operation of the Murray Valley by Murray Darling Basin Authority.

Operation of the Murrumbidgee Valley includes the major storages known as Blowering and Burrinjuck dams.

Operating the Yanco Creek System is complex and requires considerable flexibility. It involves balancing potentially competing objectives, considering a wide range of variables and numerous possible courses of action. Accordingly, in addition to detailing WaterNSW Operating Conditions that WaterNSW must comply with, this plan also provides guidelines and provisions for exercising operator judgement within an adaptive management approach.

Seasonal operations may vary

Due to its broad scale hydrological setting and pattern of water usage, the day-to-day operation of the system has historically taken place under either one of two different operating or flow conditions:

- regulated flow conditions (a.k.a. demand driven)
- unregulated (a.k.a. inflow driven)

These two flow conditions require different operational approaches, priorities, activities and focus.

On-going changes to water management policy across the Murray Darling Basin that includes planned/managed environmental watering events occurring during unregulated flow periods is increasingly blurring the distinction between the two. These changes are creating periods of blended operating conditions where there is a combination of the two occurring at the same time.

Anticipating actions and decisions

River operations are highly variable as conditions and water demands differ between and within water years. At times conditions change quickly. River operators need to anticipate future outcomes and determine the best course of action when there are numerous options available. This includes the need for operators to understand relevant risks and have the ability to respond in the best way possible.

System wide operating guidelines

Operating the system is an exercise in judgement, involving consideration of numerous opportunities, risks, uncertainties and options. Many of the operating procedures require interpretation by river operators. In addition to detailing specific WaterNSW Operating Conditions that WaterNSW must comply with, the following additional guidelines are intended to provide the foundation for these operations, while maintaining the flexibility to effectively respond to changing operating conditions and system drivers. Travel times throughout the system vary but indicatively it takes water about 25 days to travel from the top end of the system at Yanco Creek @ Offtake (410007) to the bottom end of the system where the Billabong Creek flows into the Edward River at Moulamein. Systems with long travel times like the Yanco Creek System are challenging to operate due to the need for operators to make decisions weeks in advance of water arriving at the intended delivery point. Providing operators with an appropriate level of operational flexibility is important to enable operators to best respond to changing conditions.

The following general guidelines apply to the whole Yanco Creek System.

Meet water orders to the extent possible

This applies during regulated (a.k.a. demand driven) operating conditions. It requires water orders for consumptive and environmental water use along the system to be met as far as reasonably possible giving due consideration to long travel times and the potential impact of changing conditions.

A fundamental operating requirement is to ensure that, as far as reasonably possible, both current and forecast flows across the system will ensure that all approved water orders can be met.

To meet water orders to the greatest extent possible but still operate the system as efficiently as possible, operators must:

- regularly review forecast weather and inflows and assess a range of possible scenarios to understand how they might affect overall system water use in the form of extractions, evapotranspiration and seepage (sometimes referred to as transmission losses)
- regularly review forecast demands and related information including advice from stakeholders and assess a range of scenarios to understand the most likely volume and timing of demands over the coming weeks
- allow for water delivery travel time and plan for the worst-case scenario during peak demand periods, and anticipate periods of hot and dry weather
 - For example, system inflows may be increased beyond what would normally be considered 'sufficient and efficient' to allow for assumed higher losses and diversions resulting from very hot and dry weather.
- undertake ongoing reassessment of forecasts and risks to inform operational decisions.
 - This applies to both the short and long term.
 - Long term assessments include a periodic review of water ordering accuracy.
 - Short term assessments include adjusting water orders in real time when necessary.
 - This includes operators making judgements about what the use of water will be into the future which may deviate from actual water orders (e.g. when weather conditions change faster than changes to water orders).

Water order accuracy

Monitoring water ordering accuracy and educating customers to provide more accurate water orders (including variations to the timing and/or magnitude of initial water orders) will assist river operators operate the system more efficiently.

This should also include an assessment of the overall water ordering process to ensure that it is as efficient as possible to minimise unnecessary water deliveries.

Environmental Flow Provisions

Water delivery efficiency gains created from the Yanco Creek Modernisation Project were shared between the Yanco Creek System and the Commonwealth Environmental Water Holder. This included the establishment of a series of new environmental flow provisions for the Yanco Creek System. These include:

- Environmental baseflows
- Native fish environmental flows
- Additional environmental provisions

The highest priority for local communities identified by the Yanco Stakeholder Advisory Group during the development of the Yanco Creek Modernisation Project was the protection of baseflows on a reach-by-reach basis. As a consequence, this plan includes a number of environmental baseflow provisions and restricts the use of Murray Irrigation Limited and Coleambally Irrigation Co-operative Limited escapes until some these key environmental baseflow conditions have been met.

Release from downstream storages first and store water as far upstream as possible

This supports the most efficient system operations to help maximise overall water availability and reliability. Water held in the upper storages is the most secure and valuable for supplying the system. To help retain water in these upstream storages, operators should make use of water stored further downstream to supply demands whenever possible (i.e. use downstream stored water in the first instance). This can be achieved by:

- releasing only just enough water to meet requirements downstream after consideration of factors such as demands, tributary inflows, transmission losses (e.g. evapotranspiration and seepage) and weather conditions that will affect creek flows; and
- regularly reviewing and updating weather and inflow forecasts to help identify opportunities to use the various inflows to supply demands.

Use of Finley Escape in the first instance

WaterNSW has commercial-in-confidence agreements with both Murray Irrigation Limited and Coleambally Irrigation Co-operative Limited for the delivery of water from these irrigation districts into the mid sections of the Yanco and Billabong Creeks.

This plan recommends that the first 50ML/day of escape deliveries to assist in meeting water supply demands downstream of Billabong Creek @ Puckawidgee (410017) to be delivered from Finley Escape in preference over DC800 and/or Coleambally Catchment Drain. This strategy improves operational efficiency by optimising the use of inter-valley trade rules associated with the use of Finley Escape.

Drawdown targets for Hartwood and Wanganella regulators

The Yanco Creek Modernisation Project included the construction of two new fully automated and remote-controlled regulators known as Hartwood and Wanganella regulators.

Each of these regulators has a limited ability to re-regulate flows in the Billabong Creek by raising and lowering the volume of water stored upstream of each regulator. This flexibility improves the ability for operators to deliver the right amount of water to the right place at the right time.

A major part of the operating strategy for these two regulators is planning to drawdown the volume of water stored upstream of each regulator during dry conditions (i.e. regulated flow conditions). This creates airspace that can be used to capture inflows from a future surplus flow event.

This plan details varying regulator pool drawdown target levels for different times of the year. This includes a lower pool target level for the May to October period compared to the November to April period.

As each of these new regulators can raise the water level above typical median water levels upstream of the previous fixed crest weirs, this plan includes guidelines about how to significantly limit the period of time that these regulators are held at or near full supply level. This is to avoid adverse environmental outcomes such as “drowning out” existing native vegetation in the upper levels of the regulator pool. Even redgum trees that typically thrive during natural flood events will die if inundated for prolonged periods of time.

Filling the pools at each of these regulators to fully supply level at the end of rather than the start of a surplus flow event significantly helps to limit the period that each regulator is held at full supply level. Further reductions to the number of days each regulator is held at fully supply level can be achieved by starting to drawdown the water level as soon as another surplus flow event is known to be in transit.

This operating strategy means that improved environmental outcomes are provided without compromising water delivery efficiency or reliability.

Monitor and take account of current hydrological conditions, climate outlooks and weather and streamflow forecasts

This supports the most efficient system operations. It is essential that operators understand current and forecast conditions as a key input to their decision making.

They should monitor and take account of hydrological, climate, weather and streamflow forecasts by:

- reviewing a range of climate, weather and streamflow conditions on a regular basis, starting with Bureau of Meteorology information but also considering other sources of information; and
- allowing for the range of uncertainty inherent in forecasts and be prepared for the wide range of conditions that may occur, and for when conditions change in unexpected ways.

Efficient Day to day operations

Improved meteorological and streamflow forecasts and understanding how conditions are trending are vital in helping operators determine the most efficient and effective way to operate the system.

For example, it can help in determining if:

- inflows and storage releases can be reduced to account for expected flows downstream, and/or expected decreases in demands and river transmission losses
- water releases should be increased to adjust for anticipated high river losses from warm and dry weather
- environmental benefits or other opportunities can be targeted, or short-term planning can be refined by reviewing and updating assumptions and forecasts for tributary flows, rates of recession and/or river loss trends.

Operational planning

Regular planning and analysis of longer period scenarios is an important aspect of system operations. The Yanco Creek System sits within Murrumbidgee Valley operations and includes coordination with Murray Darling Basin Authority (MDBA) about Murray Valley operations. A key element of longer period planning and analysis is covering a set of dry to wet scenarios prepared for each water year. These reveal a range of possible outcomes and their potential to occur during the water year ahead. Planned operations are then progressively updated as the year unfolds.

Flood operations

Under high unregulated (inflow driven) flow conditions, operators need to pay very close attention to current conditions, climate outlooks and meteorological forecasts to understand how a flood event may progress.

Operators also need to understand what is happening on the ground with flooding noting that local operational adjustments may be required.

Supplementary access operations

Supplementary water, formerly known as off-allocation water, is effectively surplus flow that cannot be captured, or 're-regulated', into storages. When storm events result in flows that cannot be captured (regulated) in storage structures such as dams or weirs for future use, and the water is not needed to meet current demands or commitments, then it is considered surplus to requirements. Regulated rivers become unregulated for a period of time.

As soon as these conditions are identified for a particular river or creek, a period of Supplementary Access is announced and details of the river reaches and time periods for supplementary access are published.

Within the Murrumbidgee Valley, WaterNSW makes recommendations to the Department for the approval of supplementary access periods prior to WaterNSW making a public announcement about the details. It is important that river operators ensure (subject to the approval of the Department) that unregulated flows during supplementary access periods are equitably shared across all water access licence holders and competing environmental areas across the Murrumbidgee Valley (e.g. flow splits between the Murrumbidgee River and Yanco Creek at Yanco Weir).

Supplementary water access licence holders can only pump water against these licences during these announced periods. Other categories of licence holders can choose to pump water during these periods as usual.

Those holding general security water access licences within the Murrumbidgee Valley may, under some circumstances pump water 'without debit' during these periods. Refer to taking of uncontrolled flows in the Murrumbidgee water sharing plan for further details.

Supplementary flow events can occur in any regulated system at any time and therefore access is purely opportunistic. Supplementary events depend on the amount and location of rainfall and ensuing streamflow, and the catchment conditions at the time. They can be triggered overnight and last for a day or two, a month to six months or more, depending on the system and nature of the flow event.

WaterNSW must comply with its Murrumbidgee work approval conditions regarding Supplementary Water.

Drought operations

It is particularly important to pay close attention to forecasts and outlooks during periods of prolonged drought. Severe drought may result in unprecedented transmission losses. This helps ensure that the available water is most appropriately managed to meet demands such as carryover and, under extreme drought conditions, critical human water needs.

In droughts, especially severe droughts, transmission losses (e.g. evapotranspiration and seepage) can be extremely high and at times at unprecedented high levels. This needs to be considered as an as a possible operational outcome/occurrence.

Use historic data, information and system modelling to guide operations

This guideline supports the achievement of efficient river operations. Comprehensive long-term data sets are maintained by WaterNSW. The data is used within a range of computer models that can represent system behaviour. These models can be interrogated for information for several purposes including statistical details on past system behaviour, as well as for forecasting future behaviours and scenario development.

Good community relations

Instigating actions and responses in operations may require extensive consultation, discussion, and other engagement with stakeholders. This takes time and effort. Operators therefore need to make appropriate preparations to do this work.

Developing good working relationships with communities and stakeholders by being cooperative, understanding, open and available can provide operators with improved knowledge of community needs and local conditions; helping them to better identify potential issues and solutions.

Apply adaptive management and progressively improve operations

The Yanco Creek System is a complex, ever-changing system. In that context, the historical ways of operating may not always remain optimal or appropriate. It is therefore important to consider new ways of undertaking operations and ways to improve. This means there may be no clear 'correct' way of operating and new approaches may lead to unintended negative consequences.

Operators should seek to progressively improve operations using adaptive management. New and potentially improved operations practices may be progressively developed, with outcomes of alternative operations tested through systems modelling and/or trials as appropriate.

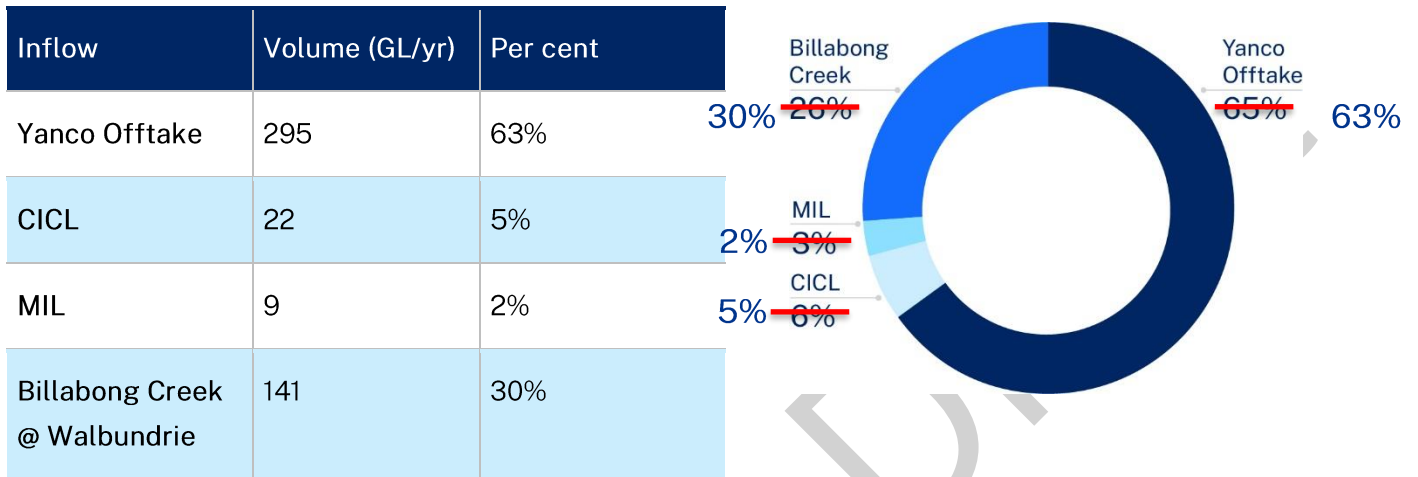
Coordinate with Murray Valley operations

Aim to effectively coordinate with Murray Darling Basin Authority's (MDBA) river operations within the Murray Valley. Inflows to the Murray Valley from tributary systems including Billabong Creek @ Darlot (410134) form a key component of total flows in the Murray Valley. They assist both flow reliability and overall Murray Valley operations flexibility, and they contribute water both upstream and downstream of the Barmah Choke.

MDBA coordinates its Murray Valley operations with tributary inflows, including Billabong Creek @ Darlot (410134) inflows to the Edward River, by taking account of and making purposeful use of tributary inflows where possible to help supply Murray Valley demands in preference to Murray Valley storage releases.

This includes the use and delivery of any Inter Valley Trade (IVT) water. At times this also includes Barmah Choke bypass flows along Billabong Creek via Finley Escape (a.k.a. Billabong Escape) that delivers water from the Murray Valley to the Murrumbidgee Valley and then back to the Murray Valley.

Yanco Creek System inflows

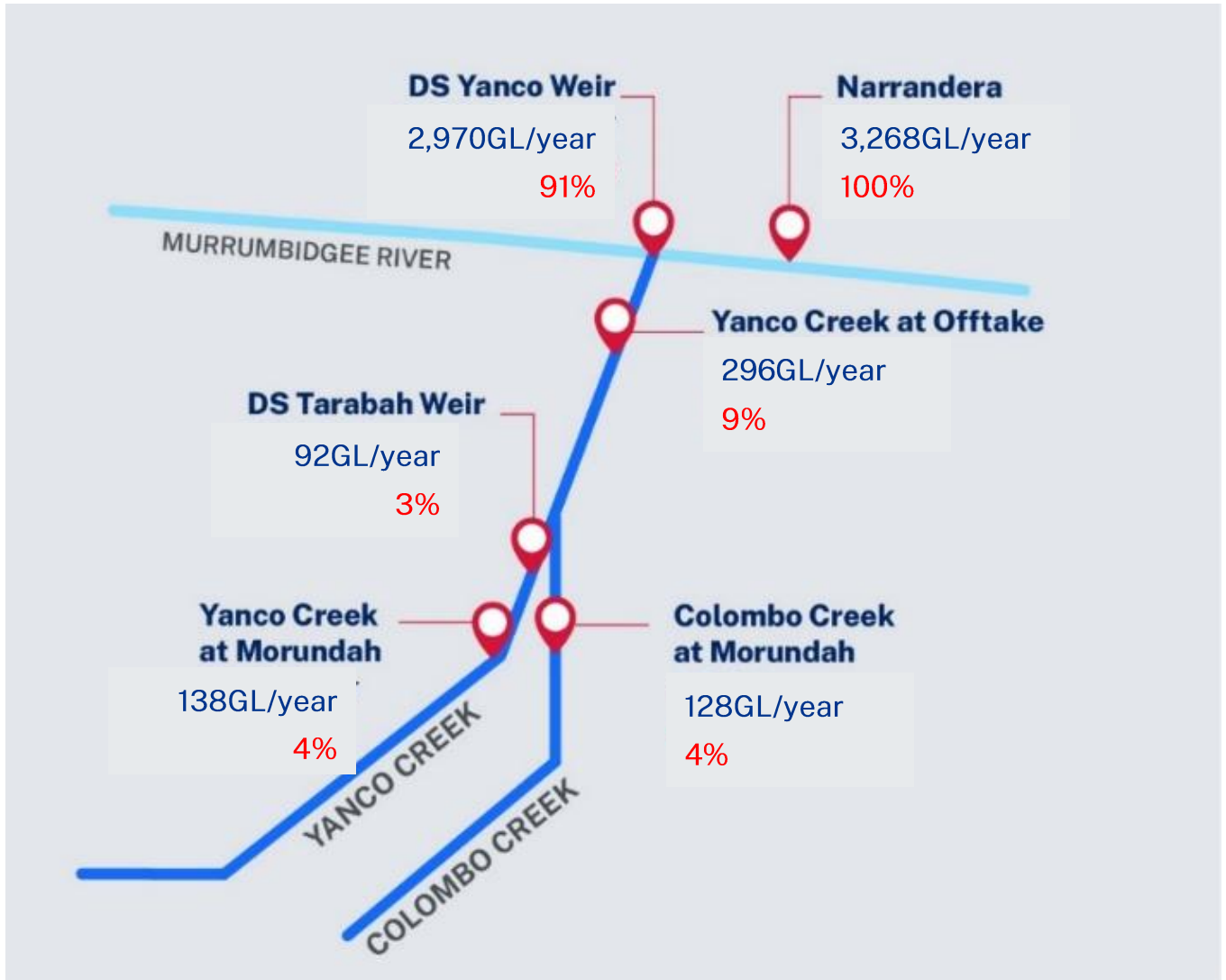


Modelled Yanco Creek System inflow data from 1 July 1895 to 30 June 2022

Inflows to the Billabong Creek upstream of the junction with Colombo Creek are unregulated. This means flows are purely dependant on the amount of rainfall runoff into Billabong Creek from the catchment area.

Understanding the flow regime near Yanco Creek @ Offtake (410007)

The following figure describes the long term modelled average flow regime in the upper reaches of the Yanco Creek System.



Modelled average flows downstream of Murrumbidgee River @ Narrandera from 1 July 1895 to 30 June 2022

The increase in volume between downstream (DS) Tarabah Weir and Yanco Creek @ Morundah is due to inflows from Woolshed Creek that flow into Yanco Creek downstream of Tarabah Weir.

Yanco Creek System water balance

The modelled figures in the table below are long term averages following implementation of the Yanco Creek System Operations Plan based on 1895 to 2022 climatic conditions.

Description	Average Volume (GL/yr)
Yanco Creek @ Offtake (410007) Inflows	295
Billabong Creek @ Walbundrie (410091) Inflows	141
Coleambally Catchment Drain + DC800 Inflows	22
Finley Escape Inflows	9
TOTAL INFLOWS	467
Unaccounted Differences (includes seepage & evapotranspiration)	155
Extractions Upstream of Billabong Creek @ Darlot (410134)	68
TOTAL SYSTEM USE	223
Billabong Creek @ Darlot (410134)	213
Forest Creek @ Warriston Weir (410148)	31
TOTAL OUTFLOWS	244
Extractions Downstream of Billabong Creek @ Darlot (410134)	XX

Yanco Creek System Environmental Water Requirements

EWR Type	EWR Code	Yanco Creek @ Offtake (410007)	Yanco Creek @ Morundah (410015)	Colombo Creek @ Morundah (410014)	Billabong Creek @ Jerilderie (410016)	Billabong Creek @ Darlot (410134)
Overbank Flow	OB-L1_S	100%	100%	100%		
	OB-L1_P	88%	92%	88%		
	OB-L1					96%
	OB-S2_b					
	OB-S2_a					
	OB-S2_S	88%		100%		
	OB-S2_P	70%		86%		
	OB-S2		90%			98%
Wetland Connection Flow	OB-S1					70%
	W-LF8	100%	100%	100%		100%
	W-LF7_b					
	W-LF7_a					
	W-LF7	89%	70%	73%		87%
	W-LF6_S	100%	100%	100%		100%
	W-LF6_P	100%	100%	100%		100%
	W-LF5					98%
Large Fresh	W-LF4_S					72%
	W-LF4_P					68%
	LF2	100%	100%	100%		100%
Small Fresh	LF1_S	100%	100%	100%		100%
	LF1_P	81%	81%	87%		85%
	SF2	100%	59%	97%		100%
Native Fish Nesting Support	SF1_S	87%	90%	93%		96%
	SF1_P	79%	82%	86%		94%
	NestS1_tcmc	40%	29%	60%		65%
Baseflow (Annual Metric)	NestS1_mc	52%	37%	65%		76%
	BF1_b	100%	97%	99%	99%	100%
Very Low Flow	BF1_a	100%	42%	100%	100%	100%
	VF1_b	100%	100%	99%	99%	100%
Cease to Flow	VF1_a	100%	100%	100%	100%	100%
	CF1	100%	100%	100%	100%	99%
Average		89%	83%	92%	100%	92%
Total Average						90%

Modelled Yanco Creek System Environmental Water Requirements (EWRs) from 1895 to 2022 with new infrastructure and operating rules from the Yanco Creek Modernisation Project

Compared to modelled Yanco Creek System operating conditions prior to the Yanco Creek Modernisation Project this represents:

- an average 5% improvement across eight Native Fish EWRs; and
- an average 4% improvement across ten environmental baseflow EWRs;
- an average 4% improvement across 12 small fresh EWRs; and
- an average 2% improvement across 90 Yanco Creek System EWRs.

Yanco Weir



Murrumbidgee River @ Yanco Fixed Crest Weir (left) and Yanco Weir (right)

General operating principles

- Primarily used to control the split in flows between Yanco Creek @ Offtake (410007) and the Murrumbidgee River @ downstream Yanco Weir (410036).
 - The Yanco Offtake Cutting is at a higher elevation than the Murrumbidgee River.
 - This means a weir pool is required to raise the water level in the Murrumbidgee River upstream of Yanco Weir to a height that enables water to flow by gravity into the Yanco Offtake Cutting.
- Equitable sharing of supplementary water access to all water access licence holders.
- Equitable sharing of unregulated flows between the Yanco Creek System and Murrumbidgee River downstream of Yanco Weir.
- The existing fish ladder at Yanco Weir is ineffective for native fish and is not normally operated.

Normal regulated flow operational limits

- The two regulation gates at Yanco Weir are generally operated in upstream control.
 - When an increase in target flows in Yanco Creek @ Offtake (410007) is needed, increase the upstream control target level corresponding to the Yanco Creek @ Offtake (410007) target flow.
 - When a reduction in target flows in the Yanco Creek @ Offtake (410007) is needed, lower the upstream control target level corresponding to the Yanco Creek @ Offtake (410007) target flow.
- Refer to flow constraints regarding limits to Yanco Creek @ Offtake (410007) flows under normal regulated conditions.
 - Environmental use in the form of evapotranspiration and seepage start to significantly increase above about 1,000ML/day.

Unregulated flow operations

- Ensure an equitable flow split of unregulated flows between the Murrumbidgee River @ Downstream Yanco Weir (410036) and Yanco Creek @ Offtake (410007). To help inform this decision long term average flow splits at Yanco Weir are as follows.
 - 9% of flow at Yanco @ Yanco Offtake (410007)
 - 91% of flow at Murrumbidgee River @ downstream Yanco Weir (410036)

Drafting Note – This is consistent with advice from WaterNSW regarding recent practice.

- Ensure equitable sharing of supplementary water access between water access licence holders. This may include an equal number of days of supplementary water access for the following reaches.
 - Murrumbidgee River @ downstream Berembed Weir (410023) to Murrumbidgee River @ Gogelderie Weir (410082)
 - Yanco Creek @ Offtake (410007) to Yanco Creek @ Morundah (410015)
 - Colombo Creek @ Offtake to Colombo Creek @ Morundah (410014).
- For large unregulated events, lift the regulator gates at Yanco Weir clear of the water.
 - Historically this has typically occurred when flows in the Murrumbidgee River @ downstream Yanco Weir (410036) rise above about 10,000ML/day.
 - When this occurs, the flow split between Yanco Offtake Cutting and the Murrumbidgee River is controlled by the natural landscape as opposed to the regulator gates at Yanco Weir.

Drafting Note – Figure of 10,000ML/day pending confirmation from WaterNSW.

Use of irrigation escapes in the Yanco Creek System

The construction of the supply and drainage networks within both the Coleambally Irrigation Co-operative Limited (CICL) and Murray Irrigation Limited (MIL) irrigation districts initially resulted in water occasionally flowing from some “escapes” and drainage channels into the Yanco Creek System. These irrigation escapes and drainage channels were originally built to drain excess water from local properties and/or irrigation supply channels after significant rainfall events across these irrigation districts.

Over time, both CICL and MIL have invested in new infrastructure and technology to improve the efficiency of their irrigation supply channel networks. These investments assisted with planned water deliveries being made from supply channel networks directly into the mid sections of the system.

The Yanco Creek System is operated by WaterNSW (a state-owned corporation). WaterNSW has commercial-in-confidence agreements with both CICL and MIL to make planned water deliveries from their irrigation supply networks (as opposed to the drainage network) into the mid sections of the Yanco and Billabong creeks. The magnitude and timing of these planned water deliveries occur at the direction of WaterNSW and assist with the delivery of water for irrigation, environmental and other regulated water supply needs.

These escapes include:

- CICL owned and operated escapes that deliver water into the Yanco Creek
 - Coleambally Catchment Drain (CCD)
 - Drainage Channel 800 (DC800)
- MIL owned and operated escapes that deliver water into the Billabong Creek
 - Finley Escape (a.k.a. Billabong Escape).

The use of these escapes mean water deliveries into the mid sections of the Yanco Creek System can be increased or decreased in much shorter timeframes and more efficiently than supplying water from Burrinjuck and Blowering Dams (located near the top end of the Murrumbidgee Valley).

For example:

- Water can typically be delivered into the Billabong Creek at Finley Escape (a.k.a. Billabong Escape) within four days or less. This is 15 days less than the typical 19 days it takes for water to travel from Burrinjuck and Blowering dams to the same location.
- Water can typically be delivered into the Yanco Creek at DC800 within seven days or less. This is eight days less than the typical 15 days it takes for water to travel from Burrinjuck and Blowering dams to the same location.

Coleambally Irrigation Co-operative Limited (CICL) escapes

Coleambally Catchment Drain (CCD)



Coleambally Catchment Drain @ outfall into Yanco Creek

General operating principles

- Owned and operated by Coleambally Irrigation Co-operative Limited (CICL) under a commercial-in-confidence agreement between WaterNSW (a state-owned corporation responsible for the operation the Yanco Creek System) and Coleambally Irrigation Co-operative Limited (a privately owned cooperative).
- Water orders are placed by WaterNSW with CICL in advance of water delivery requirements consistent with the terms of the agreement.
 - Delivery of these water orders are subject to CICL having sufficient spare channel capacity to deliver this water over and above their internal water delivery demands for customers.

Normal regulated flow operational limits

- **WaterNSW Operating Condition** – Unless approved by the Minister, WaterNSW must not order any water for delivery at Coleambally Catchment Drain until flows are forecast to be greater than or equal to the following (adjusted for creek flow travel time):
 - Yanco Creek @ Offtake (410007) – 250ML/day
 - Assumed three-day creek flow travel time from Yanco Creek @ Offtake (410007) to Coleambally Catchment Drain.
 - Yanco Creek @ Morundah (410015) – 130ML/day
 - Assumed one-day creek flow travel time from Yanco Creek @ Morundah (410015) to Coleambally Catchment Drain.
- WaterNSW is restricted to placing water orders up to a maximum of 300ML/day at Coleambally Catchment Drain.
 - This is a physical capacity as opposed to an operational limit imposed by CICL.
- Normally not available for water deliveries during the winter period.
 - Varies from year-to-year but typically not available from about 15 May to 15 August.

Unregulated flow operations

- CICL is permitted to release water out Coleambally Catchment Drain when there is no water order placed by WaterNSW consistent with the conditions of CICL's operating and environmental protection licences.
 - For example, for periods when channel flows are more than the internal CICL channel capacity following a rainfall event across CICL's area of operations.

Drainage Channel 800 (DC800)



Drainage Channel 800 (DC800) @ outfall into Yanco Creek

General operating principles

- Owned and operated by Coleambally Irrigation Co-operative Limited (CICL) under a commercial-in-confidence agreement between WaterNSW (a state-owned corporation responsible for the operation the Yanco Creek System) and Coleambally Irrigation Co-operative Limited (a privately owned cooperative).
- Water orders are placed by WaterNSW with CICL in advance of water delivery requirements consistent with the terms of the agreement.
 - Delivery of these water orders are subject to CICL having sufficient spare channel capacity to deliver this water over and above their internal water delivery demands for customers.

Normal regulated flow operational limits

- **WaterNSW Operating Condition** – Unless approved by the Minister, WaterNSW must not order any water for delivery at DC800 until flows are forecast to be more than or equal to the following (adjusted for creek flow travel time):
 - Yanco Creek @ Offtake (410007) – 250ML/day
 - Assumed eight-day creek flow travel time from Yanco Creek @ Offtake (410007) to DC800
 - Yanco Creek @ Morundah (410015) – 130ML/day
 - Assumed six-day creek flow travel time from Yanco Creek @ Morundah (410015) to DC800.

Drafting Note - 130ML/day aligns with the baseflow target in the Murrumbidgee Long Term Water Plan. The 100ML/day environmental baseflow provision detailed later in this plan was developed in consultation with Yanco Stakeholder Advisory Group noting that a 130ML/day environmental baseflow target could not be achieved at all times when general security allocations are equal to or greater than 15% without adverse third party impacts (e.g. water reliability).

- WaterNSW is restricted to placing water orders up to a maximum of 180ML/day at DC800.
 - This is a physical capacity as opposed to an operational limit imposed by CICL.
 - It is uncommon for WaterNSW to order more than 100ML/day at this location.
 - Water orders between 150 and 180ML/day are rarely accepted by CICL and then generally only accepted for a limited time only.
- Normally not available for water deliveries during the winter period.
 - Varies from year-to-year but typically not available from about 15 May to 15 August.

Unregulated flow operations

- CICL is permitted to release water out of DC800 when there is no water order placed by WaterNSW consistent with the conditions of CICL's operating and environmental protection licences.
 - For example, for periods when channel flows are more than the internal CICL channel capacity following a rainfall event across CICL's area of operations.

Murray Irrigation Limited (MIL) escapes

Finley Escape (a.k.a. Billabong Escape)



Finley Escape (a.k.a. Billabong Escape) @ outfall into Billabong Creek

General operating principles

- Owned and operated by Murray Irrigation Limited (MIL) under a commercial-in-confidence agreement between WaterNSW (a State-owned Corporation responsible for the operation the Yanco Creek System) and Murray Irrigation Limited (a privately owned company).
- Water orders are placed by WaterNSW with MIL in advance of water delivery requirements consistent with the terms of the agreement.
- Sometimes used to assist the Murray Darling Basin Authority (MDBA) to bypass Murray Valley water resources around the Murray River at the Barmah-Millewa Choke (a key water delivery constraint within the Murray Valley).
 - This water returns back to the Murray Valley when it flows out of the Billabong Creek into the Edward River at Moulamein.

Normal regulated flow operational limits

- **WaterNSW Operating Condition** – Unless approved by the Minister, WaterNSW will not order any water for delivery at Finley Escape until flows are forecast to be more than or equal to the following (adjusted for creek flow travel time):
 - Yanco Creek @ Offtake (410007) – 250ML/day
 - assumed twelve-day creek flow travel time from Yanco Creek @ Offtake (410007) to Finley Escape
 - Colombo Creek @ Morundah (410014) – 100ML/day
 - assumed ten-day creek flow travel time from Colombo Creek @ Morundah (410014) to Finley Escape
 - Billabong Creek @ Jerilderie (410016) – 70ML/day
 - assumed one day creek flow travel time from Billabong Creek @ Jerilderie (410016) to Finley Escape.
- WaterNSW is restricted to placing water orders up to a maximum of 250ML/day at Finley Escape (a.k.a. Billabong Escape).
 - The Finley Escape has a physical capacity of 300ML/day but WaterNSW is restricted to ordering a maximum of 250ML/day.
 - The remaining 50ML/day of capacity (300 – 250 = 50) is typically reserved in case it is required for MIL operations (particularly after a rainfall rejection event).
- Normally not available for water deliveries during the winter period.
 - Varies from year-to-year but typically not available from about 15 May to 15 August.

Unregulated flow operations

- MIL is permitted to release water out of Finley Escape when there is no water order placed by WaterNSW consistent with the conditions of MIL's operating and environmental protection licences.
 - For example, for periods when channel flows are more than internal MIL channel capacity following a rainfall event across MIL's area of operation.

Prioritisation of CICL and MIL escape flows

WaterNSW will prioritise the ordering of water from Coleambally Catchment Drain (CCD), Drainage Channel 800 (DC800) and Finley Escape (a.k.a. Billabong Escape) as follows.

1. No water orders will be placed out any escapes until all environmental baseflow targets upstream of each escape are forecast to be met (adjusted for travel time).
 - This includes during periods that Murrumbidgee Valley general security allocations are less than 15% when a number of other environmental flow provisions in this plan do not apply.
2. Subject to priority number 1 being met, there is no restriction on the amount of water ordered out an escape for assisting with the delivery of water orders between that escape and Billabong Creek @ Puckawidgee (410017).
3. Subject to priority number 1 being met, it is recommended that the first 50ML/day of water orders to assist in meeting water orders downstream of Billabong Creek @ Puckawidgee (410017) will be delivered from Finley Escape prior to ordering any water from Coleambally Catchment Drain (CCD) and/or Drainage Channel 800 (DC800).
 - No restriction applies to Coleambally Catchment Drain (CCD) and/or Drainage Channel 800 (DC800) water orders after Finley Escape orders are equal to or more than 50ML/day.
 - This strategy improves operational efficiency by optimising the use of inter-valley trade rules associated with the use of Finley Escape.

Finley Escape (a.k.a. Billabong Escape) inter-valley trade (IVT) adjustments

During periods when WaterNSW places a water order with Murray Irrigation Limited (MIL) to deliver water into Billabong Creek at Finley Escape (a.k.a. Billabong Escape), this results in water from the Murray Valley being delivered into the Murrumbidgee Valley. Some of this water flows back from the Murrumbidgee Valley into the Murray Valley via Billabong Creek @ Darlot (410134) however the balance of this water is consumed within the Yanco Creek System (i.e. Murray Valley water is consumed within the Murrumbidgee Valley).

As a result, it is necessary to calculate an inter-valley trade (IVT) adjustment to account for the volume of Murray Valley water resources used within the Murrumbidgee Valley to offset third party impacts. The IVT adjustment volume is calculated daily as follows:

WaterNSW Operating Condition – WaterNSW must calculate an intervalley trade adjustment from the Murray Valley to the Murrumbidgee Valley for water orders placed by WaterNSW to Murray Irrigation Limited for the delivery of water from Finley Escape into the Billabong Creek in accordance with the following formula.

Daily IVT Adjustment = Min[Finley Escape Water Order[#], Finley Escape Actual Flow[#], Max [0, Min(Finley Escape Water Order[#], Finley Escape Actual Flow[#]) + Billabong Creek @ Darlot Minimum Flow Requirement - Billabong Creek @ Darlot Actual Flow]]

Assumed ten-day travel time adjustment from Finley Escape to Billabong Creek @ Darlot (410134).

Note: Billabong Creek @ Darlot Minimum Flow Requirement is generally 50ML/day plus downstream water orders except during Darlot autumn small fresh environmental flow events when this increases to 200ML/day including downstream water orders.

Note: A positive IVT adjustment represents a need to deliver water from the Murrumbidgee Valley into the Murray Valley.

This equation means that the volume of water over and above the maximum of the Finley Escape Water Order or Finley Escape Actual Flow (i.e. water deliveries over and above the water order do not count) that does not arrive ten days later over and above the required target flow at Darlot (most commonly over and above 50ML/day plus downstream water orders) is added to the inter-valley trade (IVT) account.

Environmental provisions

WaterNSW Operating Condition - Environmental baseflow provisions

Except where otherwise indicated in this plan, the following environmental baseflow provisions apply during periods when Murrumbidgee general security allocations (officially known as Available Water Determinations) are equal to or greater than 15%.

Drafting Note – All references to the 15% general security allocation trigger in this document remain subject to change pending further modelling investigations.

- Yanco Creek @ Yanco Offtake (410007) – 250ML/day
Note: This requirement is proposed to be included in an amended version of the Murrumbidgee water sharing plan.
- Washpen Creek @ downstream Spillers Regulator – 10ML/day
Drafting Note – Planned new hydrometric station.
- Yanco Creek @ downstream Tarabah Weir (41000213) – 25ML/day
 - This environmental baseflow requirement applies at all times including periods when general security allocations are less than 15%.
- Yanco Creek @ Morundah (410015) – 100ML/day

Drafting Note – It was agreed with the Yanco Stakeholder Advisory Group to treat the Yanco and Colombo creeks equally and hence apply a 100ML/day baseflow target for each of these two creeks. This differs to the Murrumbidgee Long Term Water Plan that refers to a 130ML/day baseflow target for this location. This was also done in consultation with the Biodiversity Conservation and Science Group, Commonwealth Environmental Water Holder and the Planning Team.

- Yanco Creek @ Moonyanco – 50ML/day
Drafting Note – Planned new hydrometric station about 10km east of the junction between the Billabong and Yanco creeks.
- Cheverells Creek @ Offtake – 10ML/day
 - This environmental baseflow requirement does not apply during periods when there is insufficient water height in the Colombo Creek @ Morundah (410014) to deliver this flow rate by gravity into Cheverells Creek.

Drafting Note – The proposed new offtake structure will include flow measurement.

Unverified modelling estimates a flow rate of about 6ML/day when flows in Colombo Creek @ Morundah (410014) equals 100ML/day and a flow rate of about 10ML/day when flows in Colombo Creek @ Morundah (410014) equals about 130ML/day.

Colombo Creek @ Morundah (410014) – 100ML/day

Drafting Note – It was agreed with the Yanco Stakeholder Advisory Group to treat the Yanco and Colombo creeks equally and hence apply a 100ML/day baseflow target for each of these two creeks. This differs to the Murrumbidgee Long Term Water Plan that refers to a 70ML/day baseflow target for this location. This was also done in consultation with the Biodiversity Conservation and Science Group, Commonwealth Environmental Water Holder and the Planning Team.

- Billabong Creek @ Jerilderie (410016) – 70ML/day

Note: This environmental baseflow requirement is proposed to be included in an amended version of the Murrumbidgee water sharing plan.

- Billabong Creek @ Old Coree - 50ML/day

Drafting Note – Planned new hydrometric station about 2km east of Finley Escape.

- Billabong Creek @ downstream Hartwood Regulator (410168) – 25ML/day
 - This environmental baseflow requirement applies at all times including periods when general security allocations are less than 15%.
- Forest Creek @ Offtake (41010309) – 10ML/day
- Piccaninny Creek @ Wanganella Conargo Road No cease to flow events in Piccaninny Creek downstream of Wanganella Conargo Road.
 - This baseflow requirement applies at all times including periods when general security allocations are less than 15%.

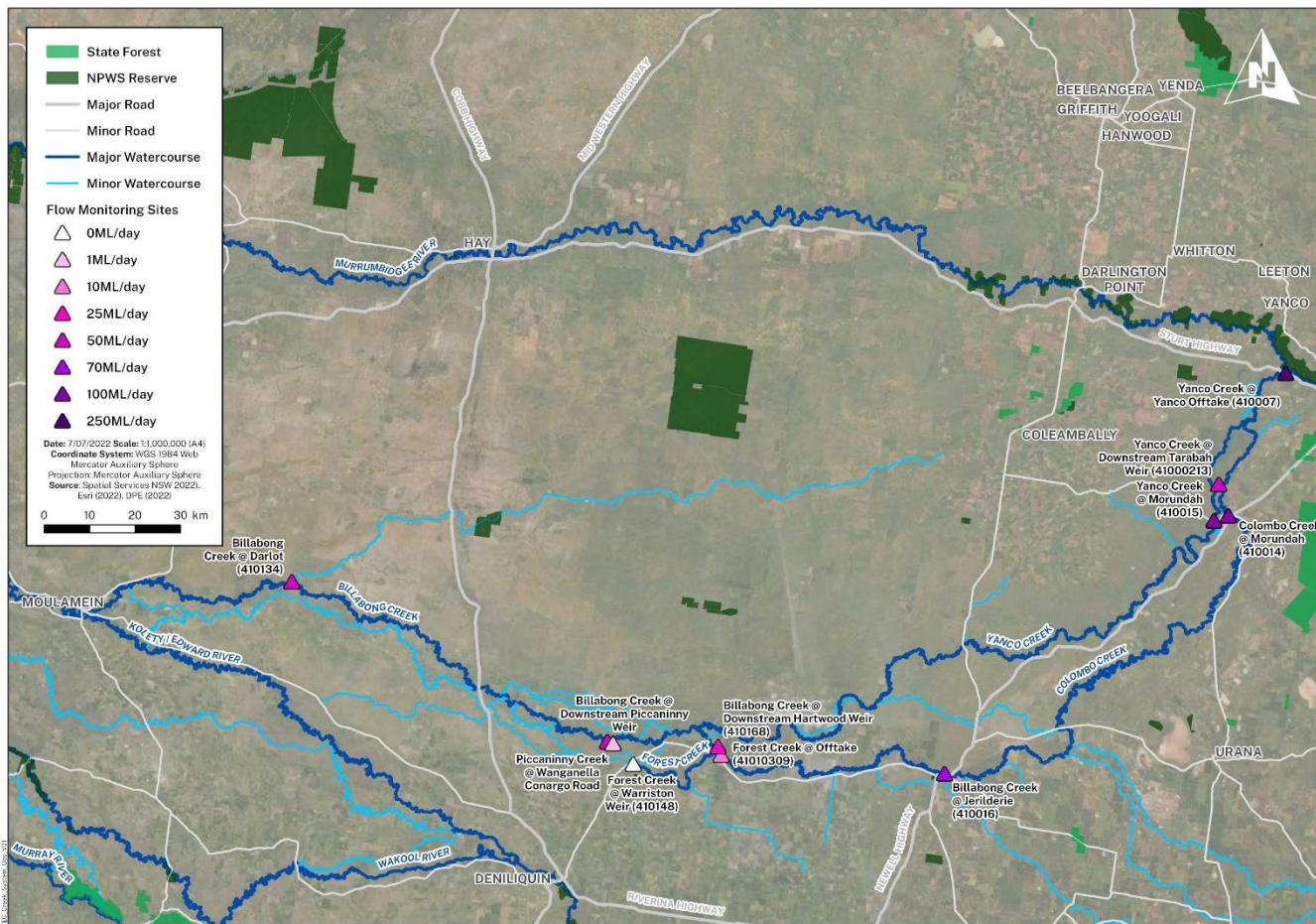
Drafting Note – It is not proposed to measure the flow at this location.

Drafting Note – Piccaninny Creek currently flows all year round so no new additional water is needed to meet this requirement.

Unless marked by a '#', WaterNSW will be deemed to meet its environmental baseflow water delivery obligations if the daily seven-day rolling average flow is equal to or more than each of the daily environmental baseflow requirements detailed above.

This rolling average provision has been provided in recognition there can be unexpected short-term fluctuations in creek flows that are beyond the control of operators.

It is noted that WaterNSW must also comply with any minimum flow requirements detailed in the Murrumbidgee Water Sharing Plan. It is currently proposed to amend the Murrumbidgee water sharing plan to apply the daily seven-day rolling average provision for environmental baseflow provisions detailed in this plan to minimum flow requirements for Billabong Creek @ Darlot (410134).



Yanco Creek System environmental baseflow requirements map

Drafting Note: Map needs to be updated to include environmental baseflow requirements at the proposed new hydrometric stations. Also need to delete 0ML/day target for Warriston Weir.

Native fish environmental flow provisions

The following native fish environmental flow provisions apply during periods when Murrumbidgee general security allocations (officially known as Available Water Determinations) are equal to or greater than 15%.

- Yanco Creek @ Yanco Offtake (410007)
 - Maximum daily rate of fall of 9% per day (by volume) while creek flows are equal to or between 250 and 1,000ML/day.
 - Applicable only during the period 14 September to 16 November inclusive.

- Billabong Creek @ Darlot (410134)
 - Maximum daily rate of fall of 9% per day (by volume) while creek flows are equal to or between 50 and 700ML/day.
 - Applicable only during the period 14 September to 16 November inclusive.

The above native fish environmental flow provisions do not apply in years when the flow rate at the start of the native fish environmental flow provision period is above the small fresh flow range (i.e. above the upper flow range at each of the locations detailed above).

- For example, if flows in Yanco Creek @ Offtake on 14 September are 1,010ML/day (i.e. above the upper small fresh range of 1,000ML/day) the native fish environmental flow provision would not apply in that year.

Drafting Note – For simplicity, a rate of fall of 9% per day (by volume) has been adopted at all sites. This is more conservative than the provisions in the Murrumbidgee Long Term Water Plan water for Yanco Creek @ Offtake (11%).

Drafting Note – These native fish environmental flow provisions have been drafted in consultation with Fisheries.

WaterNSW Operating Condition - Additional environmental provisions

The following additional environmental flow provisions apply during periods when Murrumbidgee general security allocations (officially known as Available Water Determinations) are equal to or greater than 15% on or before 1 March.

- Billabong Creek @ Darlot (410134) – 200ML/day (small fresh)
 - Applicable for a consecutive 14 day period anytime between 1 February and 31 March.
 - This flow rate target includes downstream water orders
 - This flow rate target can be met using any form of water including water for consumptive use, Barmah Choke bypass flows via Finley Escape and/or Inter Valley Trade (IVT) water.
 - WaterNSW must notify an officer within the Department that is responsible for Murrumbidgee environmental water management no less than 14 days in advance of this environmental flow provision commencing.

Drafting Note: This provides Biodiversity Conservation and Science (BCS) Group with an opportunity to order additional environmental water to the event (e.g. to make it larger and/or longer).

WaterNSW will be deemed to meet its water delivery obligations for additional environmental flow provisions if the flow rate during applicable periods is equal to or more than the required flow rates on each and every day (i.e. in this instance a seven-day rolling average similar to the environmental baseflow requirements does not apply).

Subject to demands within the lower reaches of the Murray Valley at the time, this additional environmental flow provision can be efficiently met from a Murrumbidgee water resource availability perspective by delivering any additional water required to meet the flow target on top of flows already in transit using Finley Escape. This minimises the volume of Murrumbidgee Valley water released to meet the requirement while offsetting adverse third-party impacts to Murray Valley water resources from the use of inter-valley trade adjustments associated with use of Finley Escape.

If permitted at the time, the delivery of inter-valley trade water in the Billabong Creek @ Darlot (410134) that is normally delivered in the Murrumbidgee River @ Balranald (410130) is another efficient way of meeting this environmental flow provision.

List of hydrometric station and flow measurement locations

The following is a list of key hydrometric stations and other flow measurement locations (e.g. regulators with flow measurement) within the Yanco Creek System where current data can be viewed on the WaterInsights website.

- Yanco Creek @ Offtake (410007)
- Washpen Creek @ downstream Spillers Regulator
- Cheverells Creek @ offtake
- Tarabah Weir (41000212)
- Yanco Creek @ downstream Tarabah Weir (41000213)
- Yanco Creek @ Morundah (410015)
- Coleambally Catchment Drain at outfall into Yanco Creek (410191)
- Drainage Canal 800 at outfall (410108)
- Yanco Creek @ Yanco Bridge (410169)
- Wilsons Anabranh @ offtake
- Yanco Creek @ Wiraki (41000209)
- Yanco Creek @ Moonyanco
- Colombo Creek @ Morundah (410014)
- Colombo Creek @ Coonong Weir (41000210)
- Billabong Creek @ Walbundrie (410091)
- Billabong Creek @ Cocketgedong (410012)
- Billabong Creek @ upstream of Innes Bridge (410170)
- Billabong Creek @ Jerilderie (410016)
- Billabong Creek @ Old Coree
- Billabong Creek @ downstream of Hartwood Regulator (410168)
- Billabong Creek @ Conargo (Puckawidgee) (410017)
- Billabong Creek @ Wanganella (41010810)
- Billabong Creek @ downstream of Wanganella Regulator
- Coleambally outfall drain near Bundy (410133)
- Billabong Creek @ Darlot (410134)
- Billabong Creek @ 10 Mile
- Forest Creek @ upstream of offtake (41010399)
- Forest Creek @ offtake (41010309)
- Forest Creek @ Warriston (410148)
- Estuary Creek @ offtake

- 8 Mile Creek @ Northern Regulator
- 8 Mile Creek @ Southern Regulator
- 8 Mile Creek @ McCrabbs Regulator

Drafting Note – Sites highlighted in yellow are new sites that are yet to be constructed under the Yanco Creek Modernisation Project and hence have not yet been added to WaterNSW’s WaterInsights website. These are all expected to be operational before the commencement of this plan.

Working Draft

Mollys Lagoon Regulator



Mollys Lagoon Regulator (located adjacent to Yanco Creek)

Drafting Note: Work potentially approved under 40WA405677. Need to investigate further and determine if 40WA405677 needs to be included on the approval list.

General operating principles

- Primarily used to measure and control the flow of environmental water from Yanco Creek to Mollys Lagoon.
- The regulator gate is normally in the fully closed position apart from during managed environmental flow events downstream of the regulator or during large unregulated events (e.g. floods) where WaterNSW deems it necessary to open the regulator to assist protect the structural integrity of the regulator.
- Managed environmental events downstream of Mollys Lagoon Regulator require agreement of the relevant downstream landholders to avoid unmitigated third-party impacts on private property.
 - This would typically be achieved by consultation between a departmental officer responsible for environmental water management in the Murrumbidgee Valley and relevant landholders.

Normal regulated flow operational limits

- As per general operating principles.

Unregulated flow operations

- As per general operating principles.
- The regulator may be opened during high flow events (e.g. flood events) if WaterNSW decides this is necessary to protect the structural integrity of the regulator.
- During the development of this plan, some local landholders downstream of the regulator informally indicated a willingness to consider participating in environmental flow trials downstream of Mollys Lagoon Regulator.
 - a. This could include setting the regulator gate at a lower level and accounting for any unregulated flows downstream of the regulator as environmental water use.
 - b. This approach could potentially improve the downstream flow regime while mitigating third party impacts by accounting for this water as environmental water use.
 - c. The outcomes of these flow trials could potentially be used to inform future changes to the operating rules for Mollys Lagoon Regulator subject to appropriate stakeholder consultation and support.

Spillers Regulator



Spillers Regulator (located adjacent to Yanco Creek)

Drafting Note – Better quality image required here.

General operating principles

- Used to maintain environmental baseflows and stock and domestic requirements in the creeks downstream of the regulator.
 - Water passing downstream of Spillers Regulator flows back into the Yanco Creek downstream of Tarabah Weir.

Normal regulated flow operational limits

- The undershot regulation gate should be positioned to ensure environmental baseflow requirements are always met.
 - There should be a continuous flow of water downstream of Spillers Regulator to where these flows return to the Yanco Creek downstream of Tarabah Weir.
- During managed environmental water events, flows downstream of Spillers Regulator will be operated in accordance with normal water access licence water ordering requirements by the environmental water access licence holder.

Unregulated flow operations

- The regulation gate should be lifted clear of the water during natural flow events (this does not necessarily apply to managed environmental events) during periods where the regulation gates in the Murrumbidgee River @ Yanco Weir are raised clear of the water.
 - This enables water to follow natural flow paths during high flow events to the greatest extent possible.

Tarabah Weir



Yanco Creek @ Tarabah Weir

Drafting Note – Better quality image required here.

General operating principles

- Used to control the split in flows between Yanco and Colombo Creeks.
- Distribution of flows downstream of the weir to be proportioned across each of the regulation gates to optimise native fish passage through the vertical slot fish ladder.
- Equitable sharing of supplementary water access to all water access licence holders.
- Equitable sharing of unregulated flows between the Yanco Creek and Colombo Creek.

Normal regulated flow operational limits

- Generally operated in downstream control.
 - Downstream flow target set to meet regulated flow requirements in the Yanco Creek downstream of Tarabah Weir.
- Environmental water use in the form of increased seepage and evapotranspiration starts to significantly increase when flows in the Colombo Creek @ Morundah (410014) increase above 600 ML/day.

Unregulated flow operations

- Ensure an equitable flow split of unregulated flows between the Yanco Creek and Colombo Creek.
 - This may include a 50:50 flow split between the Yanco and Colombo creeks so that both creeks are given equal priority.
 - A 50:50 flow split is broadly consistent with long term average flow splits between the two creeks.
- Ensure equitable sharing of supplementary water access between water access licence holders. This may include an equal number of days of supplementary water access for the following reaches.
 - Yanco Creek @ Morundah (410015) to Yanco Creek @ Yanco Bridge (410169)
 - Colombo Creek @ Morundah (410014) to Colombo Creek @ Coonong (41000210)
- Once the regulator gates at Tarabah Weir are fully opened during a large unregulated flow event the flow split between Yanco and Colombo creeks is controlled by the natural landscape as opposed to the regulator gates at Tarabah Weir.

Cheverells Creek Offtake



Cheverells Creek Offtake

Drafting Note – Insert image of new offtake after construction of new regulator as part of the Yanco Creek Modernisation Project.

General operating principles

- To be operated in a way so that the flow regime in an unnamed watercourse that is often referred to as Cheverells Creek is similar to the flow regime that existed prior to the new Cheverells Creek Offtake being constructed.
 - This includes flows into Cheverells Creek generally rising and falling as flows in the Colombo Creek @ Morundah (410014) rise and fall.
- Used to maintain environmental baseflows and stock and domestic requirements in Cheverells Creek.
- Water passing downstream of Cheverells Creek Offtake flows back into the Yanco Creek downstream of Yanco Creek @ Morundah (410015).
- Due to an existing Federation Council owned 600mm pipe road culvert in Cheverells Creek under Yamma Road (located about 80m downstream of the new Cheverells Creek Offtake), there will be no additional flooding risks or third party impact risks as a result of the existing Cheverells Creek Offtake being upgraded from a 600mm pipe culvert to a 1200mm x 1200mm box culvert with a regulation gate.
 - This means that the key flow constraint from Colombo Creek into Cheverells Creek will remain to be the existing 600mm pipe culvert under Yamma Road owned by Federation Council.

Normal regulated flow operational limits

- Generally the regulation gate opening will be maximised (i.e. almost fully open) without compromising the ability to measure flows into Cheverells Creek.
 - A minimum head loss is required across the regulation gate for flow measurement.
 - This means the flow regime into Cheverells Creek will be similar to the one prior to the construction of Cheverells Creek Offtake.

Drafting Note – As flows into Cheverells Creek start to increase, the primary flow constraint into Cheverells Creek will be the 600mm diameter concrete road culvert not far downstream of Cheverells Offtake located at Yamma Road.

- It is permitted to temporarily limit the flow rate into Cheverells Creek for a short period of time to assist river operators more accurately deliver the right amount of water to the right place at the right time for both consumptive and environmental water order requirements within the Yanco Creek System.
 - Flows into Cheverells Creek during these times are must still be equal to or greater than the environmental baseflow target of 10ML/day.

Drafting Note: The proposed new offtake structure will include flow measurement. Unverified modelling estimates a flow rate of about 6ML/day when flows in Colombo Creek @ Morundah (410014) equals 100ML/day and a flow rate of about 10ML/day when flows in Colombo Creek @ Morundah (410014) equals about 130ML/day.

- Based on experience gained from the operation of the new Cheverells Creek Offtake, it is permissible to limit flows into Cheverells Creek Offtake if unintended third-party impacts start to occur from out of bank flows in Cheverells Creek.
 - This means a new operational flow constraint for Cheverells Creek during normal regulated conditions may need to be established as new information becomes available.
- During managed environmental water events, flows downstream of Cheverells Creek Offtake should be operated in accordance with normal water access licence water ordering requirements by the environmental water access licence holder.
- No permanent inundation

Unregulated flow operations

- The regulation gate should be fully open during natural flow events (this does not necessarily apply to managed environmental events) when the regulation gates in the Murrumbidgee River @ Yanco Weir are raised clear of the water.
- This enables water to follow natural flow paths during high flow events to the greatest extent possible.

Wilson Anabranch Offtake



Wilson Anabranch @ Offtake from Yanco Creek

Drafting Note – Insert image of new structure following construction of new regulator as part of the Yanco Creek Modernisation Project.

General operating principles

- To be operated consistent with the rules developed as part of the Water for Rivers water savings project for this location.
- Environmental water orders can be lodged for outside of the normal operating periods detailed in the table below.
 - Normal delivery charges apply during these periods.

WaterNSW Operating Condition – WaterNSW must operate the Wilsons Anabranh Offtake in accordance with the following Wilsons Anabranh Offtake operating periods table.

Operational Trigger	Wilson’s Anabranh Offtake Regulation Gate
1 April to 31 August (5 months)	Open (fully as much as possible)#
1 September to 31 March (7 months)	Closed excluding supplementary access periods
WaterNSW announced supplementary water access periods (that require departmental approval) for the section of the Yanco Creek that includes Wilson Anabranh Offtake	Open (fully as much as possible)#
Environmental water orders	As per normal water access licence water ordering requirements by the licence holder.

Wilson Anabranh Offtake operating periods

While the intention is for the regulation gate to remain fully open to allow two-way fish passage through the regulator, this may not be possible at all times. Due to site constraints, there may be times when the regulation gate will not be fully open, including when accurate flow measurement is required for billing purposes and where fully opening the regulation gate results in adverse third-party impacts downstream (e.g. overtopping of private access culverts).

- This means a new operational flow constraint for Wilsons Anabranh during normal regulated conditions may need to be established as new information becomes available.

If WaterNSW is unable to fully open the regulation gate during this period, WaterNSW must document in its Annual Compliance Report the reasoning for the regulation gate not being fully open and the period of time this occurred for.

Normal regulated flow operational limits

As per general operating principles and normal water ordering requirements by environmental water access licence holders.

As the size of the new box culvert and regulator gate is larger than the previous pipe offtake that it replaced, consideration should be given to progressively opening the regulator gate up over a period of two or more days to allow more time for tailwater levels on the downstream side of the regulator to rise and reduce the rate of flow through the structure.

Drafting Note: If the structure is initially opened too quickly it is unclear what may occur at the downstream privately owned access culverts that have a smaller flow capacity.

When accurate flow measurement is not required for billing purposes, when possible fully open the regulator gate to enable two way native fish passage through the structure. At times this may not be possible if fully opening the regulator gate results in adverse third-party impacts downstream (e.g. overtopping of private access culverts).

Drafting Note: It is expected that there will typically be a high tailwater level on the downstream side of the structure that will enable upstream fish passage when the regulator gate is fully open.

Unregulated flow operations

As per general operating principles.

Working Draft

Hartwood Regulator

Drafting Note – The Licensing Team is currently reviewing the ability to apply WaterNSW Operating Conditions for a WaterNSW owned asset that is approved by a State Significant Infrastructure planning approval as opposed to a work approval.



Billabong Creek @ Hartwood Weir

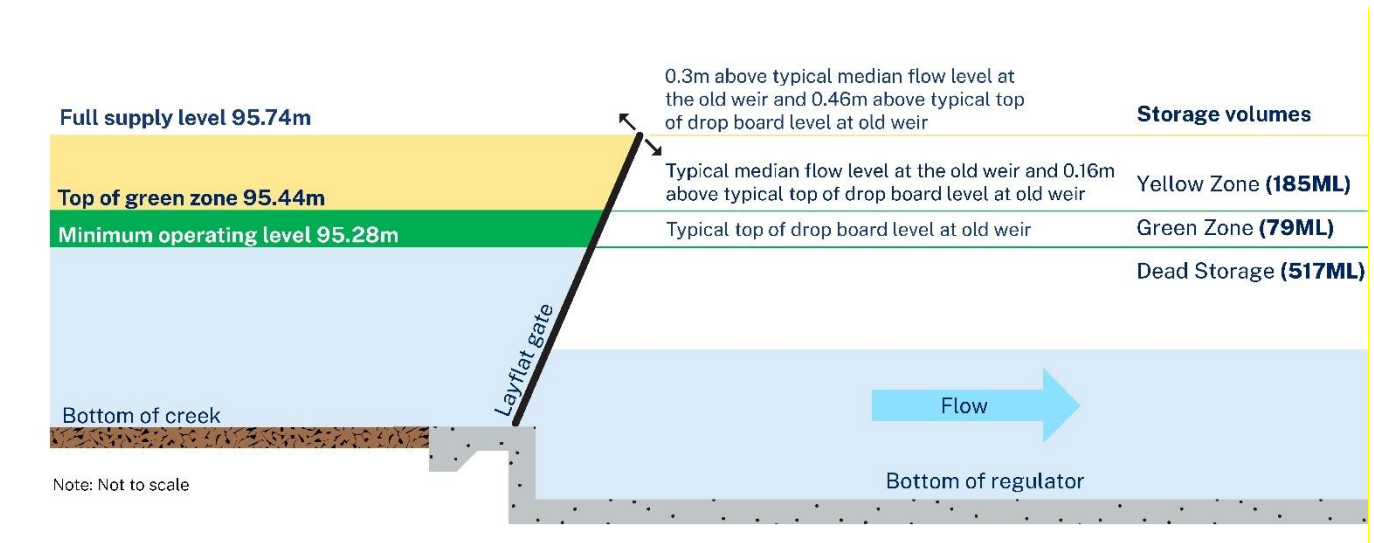
Drafting Note – Replace with image of new regulator after construction

General operating principles

- Primarily used to maintain a regulator pool height sufficiently high enough to deliver normal regulated flow requirements (including managed environmental flows) at Forest Creek @ Offtake (41010309).
- Used to create a pumping pool for seven irrigation pumps within the influence of the regulator pool and to provide re-regulation capacity of flows in the Billabong Creek.
 - Some stock and/or domestic pumps also extract water from within the influence of the regulator pool.
- Regulation gates to be fully open during moderate to large unregulated flow events at every possible opportunity to enable unrestricted fish passage opportunities.
- Equitable sharing of adverse outcomes across water access licence holders during unexpected supply shortfalls (i.e. when WaterNSW cannot deliver water order requests).
- Optimisation of regulator pool operations to minimise the risk of adverse environmental outcomes.
- Distribution of flows downstream of the regulator to be proportioned across each of the regulation gates to optimise native fish passage through the vertical slot fish ladder.

Drafting Note – A new additional privately owned irrigation pump was recently installed within the existing Hartwood Weir pool.

Regulator operating zones



Hartwood Regulator operating zones

WaterNSW Operating Condition – Unless approved by the Minister, WaterNSW must maintain the water level upstream of Hartwood Regulator equal to or above the minimum operating level of 95.28m.

Green zone

The regulator pool will most commonly be operated within the green zone.

Different regulator pool target levels within the green zone will apply at different times as detailed in regulator pool target levels.

Yellow zone

Regulator pool operations within the yellow zone must be optimised to limit the risk of adverse environmental outcomes (e.g. overwatering of native vegetation or impacts to native fish from slower moving water).

- For example, delay filling the regulator pool until near the end of an unregulated flow event to limit the number of days the water level is held within the yellow zone.
 - This approach optimises environmental outcomes without compromising operational delivery efficiency.
- If a second unregulated event occurs, consider temporarily drawing the regulator pool down back to the green zone and then refilling the regulator pool back to full supply level near the end of the second unregulated event.

Regulator pool target levels

The regulator pool target level refers to the level river operators are aiming to draw the regulator pool level down to under normal dry conditions. It is expected that wetter conditions and/or conservative operational decisions will mean actual regulator pool levels are often above the target level.

Time Period	Regulator Pool Target Level (AHD)	Difference from Full Supply Level (m)
1 November to 30 April	95.44m	-0.30m
1 May to 31 October	95.32m	-0.42m

Hartwood Regulator pool target levels

Normal regulated flow operational limits

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Regulator Pool Full Supply Level (m)	95.74	95.74	95.74	95.74	95.74	95.74	95.74	95.74	95.74	95.74	95.74	95.74
Top of Green Zone (m)	95.44	95.44	95.44	95.44	95.44	95.44	95.44	95.44	95.44	95.44	95.44	95.44
Regulator Pool Minimum Operating Level (m)	95.28	95.28	95.28	95.28	95.28	95.28	95.28	95.28	95.28	95.28	95.28	95.28
Regulator Pool Operating Range (m)	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Regulator Pool Maximum Daily Rate of Fall (m)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Regulator Pool Maximum Daily Rate of Rise (m)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30

Hartwood Regulator normal regulated flow operational limits

Maximum daily rates of rise and fall do not apply during large unregulated flow events that are beyond the operator's control. Unregulated flow operations

Unregulated flow operations occur following rainfall events resulting in higher than planned flows that cannot be controlled by river operators with available water regulation infrastructure.

- Water resource availability will be optimised consistent with the yellow zone operations detailed above.
- When flows downstream of Hartwood Regulator exceed normal regulated river flow requirements Hartwood Regulator will initially be placed in upstream control at any level within the green zone.
- When flows in the Billabong Creek @ downstream Hartwood Regulator (410168) are equal to or more than 1,200ML/day, the gates at Forest Creek Offtake must be fully opened (i.e. lifted clear of the water).
 - During this period, Hartwood Regulator will be placed on upstream control at 95.44m (top of the green zone) until such time downstream water levels increase to 95.44m.
 - When water levels downstream of Hartwood Regulator increase to 95.44m the regulator gates will be fully opened until downstream water levels fall again to 95.44m.
 - When water levels downstream of Hartwood Regulator fall below 95.44m, Hartwood Regulator will be placed in upstream control at 95.44m until flows are about to recede back to normal regulated operating conditions.
- When flows in the Billabong Creek @ downstream Hartwood Regulator (410168) fall below 1,200ML/day, subject to flexibility provisions (refer to Forest Creek Offtake for details) the gates at Forest Creek Offtake must be placed back in the water to meet regulated water delivery requirements and Hartwood Regulator will be operated in upstream control at any level within the green zone.
 - Delay filling Hartwood Regulator to full supply level until near the end of an unregulated or unplanned flow event without compromising total water resource availability.
 - Return to normal regulated flow conditions including adoption of regulator pool target levels.
- Regulator pool full supply levels do not apply when regulation gates are fully open during high flow events.

Note: The 1,200ML/day flow trigger downstream of Hartwood Regulator is consistent with plans established following the implementation of a previous Water for Rivers water savings project within the Forest Creek System downstream of Warriston Weir.

Wanganella Regulator

Drafting Note – The Licensing Team is currently reviewing the ability to apply WaterNSW Operating Conditions for a WaterNSW owned asset that is approved by a State Significant Infrastructure planning approval as opposed to a work approval.



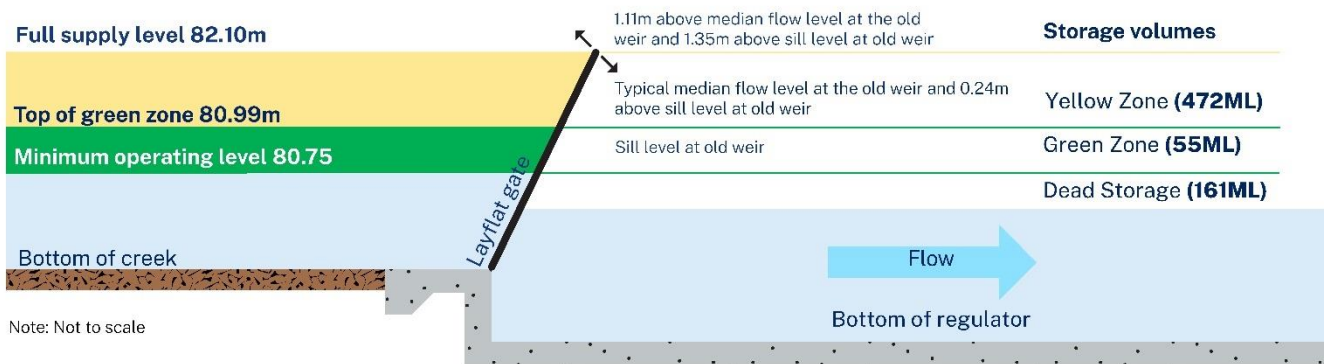
Billabong Creek @ Wanganella Weir

Drafting Note – Replace with image of new regulator after construction

General operating principles

- Primarily used to create a pumping pool for Wanganella’s town water supply, one irrigation pump and to provide re-regulation capacity of flows in the Billabong Creek.
 - Some stock and/or domestic pumps also extract water from within the influence of the regulator pool.
 - An additional irrigation pump benefits from the regulator pool when operated within upper parts of the yellow zone.
- Regulation gates to be fully open during moderate to large uncontrolled flow events at every possible opportunity to enable unrestricted fish passage opportunities.
- Equitable sharing of adverse outcomes across water access licence holders during unexpected supply shortfalls (i.e. when WaterNSW cannot deliver water order requests).
- Optimisation of regulator pool operations to minimise the risk of adverse environmental outcomes.
- Distribution of flows downstream of the regulator to be proportioned across each of the regulation gates to optimise native fish passage through the vertical slot fish ladder.

Regulator pool operating zones



Wanganella Regulator pool operating zones

WaterNSW Operating Condition – Unless approved by the Minister, WaterNSW must maintain the water level upstream of Wanganella Regulator equal to or above the minimum operating level of 80.75m.

Green zone

The regulator pool will most commonly be operated within the green zone.

Different regulator pool target levels within the green zone will apply at different times as detailed in regulator pool target levels.

Yellow zone

Regulator pool operations within the yellow zone must be optimised to limit the risk of adverse environmental outcomes (e.g. overwatering of native vegetation or impacts to native fish from slower moving water).

- For example, delay filling the regulator pool until near the end of an unregulated flow event to limit the number of days the water level is held within the yellow zone.
 - This approach optimises environmental outcomes without compromising operational delivery efficiency.
- If a second unregulated event occurs, consider temporarily drawing the regulator pool down back to the green zone and then refilling the regulator pool back to full supply level near the end of the second unregulated event.

Regulator pool target levels

The regulator pool target level refers to the level river operators are aiming to draw the regulator pool level down to under normal dry conditions. It is expected wetter conditions and/or conservative operational decisions will mean actual regulator pool levels are often above the target level.

Time Period	Regulator Pool Target Level (AHD)	Difference from Full Supply Level (m)
1 November to 30 April	80.99m	-1.11m
1 May to 31 October	80.82m	-1.28m

Wanganella Regulator pool target levels

Normal regulated flow operational limits

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Regulator Pool Full Supply Level (m)	82.10	82.10	82.10	82.10	82.10	82.10	82.10	82.10	82.10	82.10	82.10	82.10
Top of Green Zone (m)	80.99	80.99	80.99	80.99	80.99	80.99	80.99	80.99	80.99	80.99	80.99	80.99
Regulator Pool Minimum Operating Level (m)	80.75	80.75	80.75	80.75	80.75	80.75	80.75	80.75	80.75	80.75	80.75	80.75
Regulator Pool Operating Range (m)	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
Regulator Pool Maximum Daily Rate of Fall (m)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Regulator Pool Maximum Daily Rate of Rise (m)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30

Wanganella Regulator normal regulated flow operational limits

Maximum daily rates of rise and fall do not apply during large unregulated flow events that are beyond the operator's control.

Unregulated flow operations

Unregulated flow operations occur following rainfall events resulting in higher than planned flows that cannot be controlled by river operators with available water regulation infrastructure.

- Water resource availability will be optimised consistent with yellow zone operations detailed above.
- When flows downstream of Wanganella Regulator exceed normal regulated river flow requirements, Wanganella Regulator will initially be placed in upstream control at any level within the green zone.
- When water levels downstream of Wanganella Regulator increase to 80.82m, the regulator gates will be fully opened until downstream water levels fall again to 80.82m.
- When water levels downstream of Wanganella Regulator fall below 80.82m, Wanganella Regulator will be placed in upstream control at 80.82m until flows are about to recede back to normal regulated operating conditions.
- Delay filling Wanganella Regulator to full supply level until near the end of an unregulated or unplanned flow event without compromising total resource availability.
- Return to normal regulated flow conditions including adoption of regulator pool target levels.
- Regulator pool full supply levels do not apply when regulation gates are fully open during high flow events.

Forest Creek System infrastructure

Forest Creek Offtake



Forest Creek @ Offtake from Billabong Creek

Drafting Note – Better quality image required here.

General operating principles

- Primarily used to regulate flows into the Forest Creek System to meet normal regulated system demands (including managed environmental flow events).
 - Normally operated on downstream control.
- Generally gates fully open when flow in the Billabong Creek @ downstream Hartwood Regulator (410168) is equal to or more than 1,200ML/day subject to environmental advice (refer to unregulated flow conditions for details)

Normal operational limits

- Water deliveries that flow by gravity into Forest Creek downstream of Forest Offtake are normally constrained by a combination of the water height of the Billabong Creek upstream of Hartwood Regulator and the height of the drop boards in the Forest Creek @ Parrys Weir (a privately owned weir).
 - This delivery constraint was reduced as a result of the Full Supply Level for Hartwood Regulator being increased by about 300mm above the previous estimated median weir pool level for the old Hartwood Weir.

Unregulated flow operations

- **WaterNSW Operating Condition** – Unless approved by the Minister, Forest Creek Offtake regulation gates must be fully open when flow in the Billabong Creek downstream of Hartwood Regulator (410168) is more than or equal to 1,200ML/day.
 - During managed (human controlled) environmental flow events, this condition does not apply if a departmental officer responsible for environmental water management in the Murrumbidgee Valley makes a written request to the relevant WaterNSW river operator or manager to reduce part of all of this environmental water from flowing out of Billabong Creek and downstream of Forest Creek Offtake.
 - This condition does not apply during unregulated flow events if a departmental officer responsible for environmental water management in the Murrumbidgee Valley makes a written request to the relevant WaterNSW river operator or manager to reduce part or all of unregulated water from flowing out of Billabong Creek and downstream of Forest Creek Offtake if in the opinion of the department's environmental water manager it will result in undesirable environmental outcomes (e.g. a significant number of waterbirds abandoning their nests or chicks during a waterbird breeding event at Wanganella Swamp).
 - When making a written request to WaterNSW to vary the requirement for WaterNSW to fully open the Forest Creek Offtake gates during periods that flows in the Billabong Creek @ Downstream Hartwood Regulator (410168) are greater than equal to 1,200ML/day, the departmental officer responsible for environmental water management in the Murrumbidgee Valley must document and provide WaterNSW with the following information.
 - The rationale for the requested change and how the requested change will:
 - deliver equivalent or improved environmental outcomes; and/or
 - limit or avoid adverse environmental outcomes.

- How the requested change in operation of the Forest Creek System will result in no net increase to the total forecast flow in Forest Creek downstream of Warriston Weir as a result of the regulation gates at Forest Creek Offtake not being fully opened when flow in the Billabong Creek @ downstream Hartwood Regulator (410168) is greater than or equal to 1,200ML/day.
 - This prevents adverse third-party impacts to water reliability (e.g. general security allocations).
 - A reduction as opposed to an increase in the total forecast flow in the Forest Creek downstream of Warriston Weir is permitted.
 - This flexibility provision provides environmental water managers the ability to request WaterNSW to open the Forest Creek Offtake gates either fully or partially before and/or after flows in Billabong Creek @ Downstream Hartwood Regulator (410168) are equal to or greater than 1200ML/day on the condition that it can be demonstrated that no additional unregulated flows will pass downstream of Forest Creek @ Warriston Weir (410148) compared to the standard operating conditions.
- If WaterNSW does not fully open the regulation gates during periods of time that Billabong Creek @ Downstream Hartwood Regulator were equal to or greater than 1,200 ML/day for environmental reasons, WaterNSW must document in its Annual Compliance Report the reasoning for the regulation gates not being fully open, the period of time this occurred for and how the modified operation of the regulation gates resulted in no additional unregulated flows passing downstream of Forest Creek @ Warriston Weir (410148) under the standard operating conditions.

An example of when the above flexibility provision might be used is when environmental water managers want to avoid a sharp rise and/or fall in the rate of water flowing downstream of Warriston Weir to protect downstream waterbird nesting sites (e.g. Wanganella Swamp).

Forest Creek Return Regulator



Piccaninny Creek @ Forest Creek Return Regulator

Drafting Note – Replace with image of new offtake after construction

General operating principles

- Used to assist in preventing unplanned flows in the Forest Creek downstream of Warriston Weir during normal regulated periods.
 - The only time the flow target downstream Forest Creek @ Warriston Weir (410148) is not 0ML/day is during managed environmental flow events downstream of Warriston Weir.
 - Unplanned flows are diverted into Forest Creek Return Regulator rather than being permitted to flow in the Forest Creek downstream of Warriston Weir up to the design flow capacity of Forest Creek Return Regulator (50ML/day).

Normal operational limits

- Normal regulated flow capacity of 50ML/day.
 - This aligns with a 100ML/day water inundation easement in Piccaninny Creek from Forest Creek Return Regulator to Billabong Creek that includes a 50ML/day buffer above the 50ML/day design flow rate.
- As per general operating principles and normal water ordering requirements by environmental water access licence holders.
- During normal regulated operating periods when the flow target in Forest Creek @ Warriston Weir (410148) is 0ML/day place Forest Creek Return Regulator on upstream control at 92.12m (50mm below the concrete sill level at Warriston Weir).
- During normal regulated operating periods when there is a managed environmental watering event downstream Forest Creek @ Warriston Weir (410148):
 - Place Forest Creek Return Regulator in downstream control at a flow rate to meet the minimum flow requirement in Piccaninny Creek @ Wanganella Conargo Road in times where the objective is to maximise the amount of flow in Forest Creek @ Warriston Weir (410148)
 - Place Forest Creek Return Regulator in upstream control at a level to provide a stable target flow in Forest Creek @ Warriston Weir (410148) during periods advised in writing to WaterNSW by a departmental officer responsible for environmental water in the Murrumbidgee Valley.

Unregulated flow operations

- **WaterNSW Operating Condition - Initially, unless advised in writing to WaterNSW to do otherwise by a departmental officer responsible for environmental water management within the Murrumbidgee Valley, during moderate unregulated flow events in the Forest Creek resulting from the 1,200ML/day flow trigger in the Billabong Creek @ downstream Hartwood Regulator (410148), WaterNSW must place Forest Creek Return Regulator on downstream control to target environmental baseflow requirements in Piccaninny Creek at Wanganella – Conargo Road to maximise flows in the Forest Creek @ Warriston Weir (410148) (refer to environmental baseflow provisions for details).**
 - This is intended to maximise flows in the Forest Creek downstream of Warriston Weir during moderate unregulated flow events.
- Operated in downstream control at 50ML/day (the design flow rate of the structure) when unregulated flows in Forest Creek @ Warriston Weir (410148) increase above 500ML/day.
- Regulator gate to be fully opened when unregulated flows in Forest Creek @ Warriston Weir (410148) increase above 1,000ML/day.
 - This is prior to the spillway adjacent to the Forest Creek Returns Regulator commencing to flow (92.80m) and is equivalent to about a one in ten year flow event.

Warriston Weir



Forest Creek @ Warriston Weir

General operating principles

- Normal regulated flow target of 0ML/day downstream of the weir apart from during managed environmental events.
 - Significantly exceeding this flow target during large unregulated or unplanned flow events following significant rainfall events is beyond the control of operators.
- Normal regulated flow capacity during managed environmental flow events of 250ML/day.
- During periods when a departmental officer responsible for environmental water management in the Murrumbidgee Valley advises WaterNSW in writing it is appropriate to do so, aim to provide a stable constant flow downstream of the weir.
 - For example, unplanned flow variations increase the risk of unsuccessful water bird breeding outcomes at Wanganella Swamp.
 - This may include operating Forest Creek Return Regulator in upstream control up to its design capacity of 50ML/day.

Normal operational limits

250ML/day downstream of Warriston Weir during managed environmental flow events unless there is agreement with key stakeholders to deliver a higher environmental flow rate.

- This compares to a 300ML/day water inundation easement from Forest Creek @ Warriston Weir to 8 Mile Creek @ McCrabbs Regulator located at the downstream end of Wanganella Swamp that makes provision for a 50ML/day buffer above the 250ML/day design flow rate.

Unregulated flow operations

Consistent with outcomes of operating rules detailed above for Forest Creek Offtake and Forest Creek Return Regulator.

Wanganella Swamp

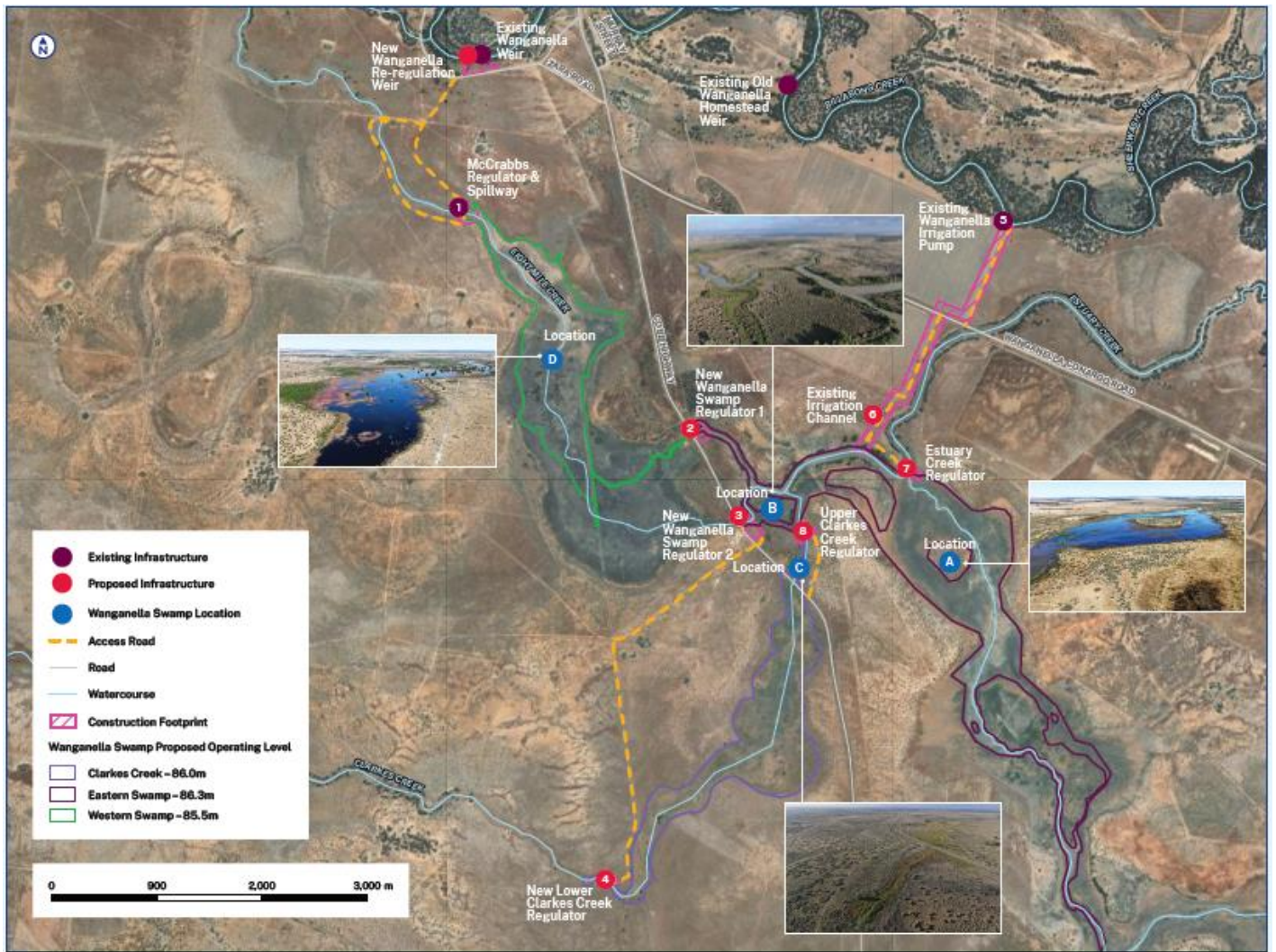


Wanganella Swamp (8 Mile Creek) @ upstream McCrabbs Regulator during the 2020/2021 managed environmental watering event.

General operating principles

- To provide targeted environmental outcomes consistent with objectives determined by environmental water managers.

Wanganella Swamp area map



Wanganella Swamp area map

Drafting Note – Replace with an updated version of this. This includes removing Upper Clarks Creek Regulator, Lower Clarks Creek Regulator and the construction area zone for the Existing Irrigation Channel that have all been removed from the scope of works

Estuary Creek Regulator



Estuary Creek Regulator

Drafting Note – Replace with image of upgraded regulator after construction.

General operating principles

- Provides targeted environmental outcomes consistent with objectives determined by environmental water managers.
- Used to deliver managed environmental flow events into Estuary Creek.
- Normal regulated flow capacity during managed environmental flow events of 150ML/day.
 - This aligns with a 200ML/day water inundation easement that includes a 50ML/day buffer above the 150ML/day design flow rate.
- Can be used in upstream control to assist stabilise water levels in the eastern area of Wanganella Swamp up to a full supply level of 86.30m.
 - Stable water levels assist to provide improved waterbird breeding outcomes.
- Regulation gate to be fully open during “natural” flow events.
 - The regulation gate may not need to be fully open during small to moderate natural flow events if a department officer responsible for environmental water management in the Murrumbidgee Vally has advised WaterNSW in writing to do otherwise and there is support from local stakeholders (e.g. relevant landholders).

Pumped water from Billabong Creek



Channel used to deliver water from Billabong Creek to Wanganella Swamp

General operating principles

- Provides targeted environmental outcomes consistent with objectives determined by from environmental water managers.
- Used to deliver targeted environmental water pumped from Billabong Creek to the eastern area of Wanganella Swamp upstream of the Cobb Highway via an irrigation channel.
- Flow capacity of about 25ML/day.
- Potentially used to increase flows into and downstream of Wanganella Swamp in addition to flows in the Forest Creek @ Warriston Weir (410148).
- During periods of low environmental water availability, can be used without inflows from Forest Creek @ Warriston Weir (410148) to more efficiently deliver limited environmental water to important environmental refuge areas within Wanganella Swamp.
- As the irrigation pump and channel are both privately owned, operation of this infrastructure requires agreement with the landholder on a case-by-case basis.
 - This will likely include the need for an agreed compensation package for the cost of operating and maintaining the privately owned pump and channel.

8 Mile Creek Northern Regulator



8 Mile Creek Northern Regulator

Drafting Note – Replace with image of 8 Mile Creek Northern Regulator to be located upstream of the existing box culvert shown in the above image after construction.

General operating principles

- Provides targeted environmental outcomes consistent with objectives determined by environmental water managers.
- Can be used in downstream control in conjunction with the 8 Mile Creek Southern Regulator to assist stabilise water levels in the western (downstream) area of Wanganella Swamp.
 - This would typically include operating Estuary Creek Regulator in upstream control at the same time to assist stabilise water levels in the eastern (upstream) area of the Wanganella Swamp and operating McCrabbs Regulator in upstream control to assist stabilise water levels in the lower areas of the western (downstream) area of Wanganella Swamp.
 - The fall in elevation of 8 Mile Creek from the Cobb Highway to McCrabbs Regulator is too much for McCrabbs Regulator operating in upstream control to assist stabilise water levels over the entire western area of Wanganella Swamp.
- Can be used in upstream control in conjunction with the 8 Mile Creek Southern Regulator, Upper Clarkes Creek Regulator and/or Estuary Creek Regulator to assist in stabilising water levels in the eastern (upstream) area of Wanganella Swamp up to a full supply level of 86.30m
 - Stable water levels assist to provide improved waterbird breeding outcomes.
- When used in conjunction with 8 Mile Creek Southern Regulator to raise the upstream water level up to a full supply level of 86.30m this enables environmental water to be more efficiently delivered by gravity into the Clarkes Creek area of swamp that is higher than the western and eastern areas of the Wanganella Swamp.

- Regulation gate fully open during “natural” flow events.
 - The embankment each side of the regulator gate is designed to overtop and “drown out” during moderate to large unregulated flow events downstream of Forest Creek @ Warriston Weir (410148).
- The full supply level of water in Clarke’s Creek upstream of a privately owned access culvert located about 5km downstream of the Cobb Highway is 85.80m
 - Permission to restrict managed environmental flows through this private access culvert and/or deliver water downstream of this culvert beyond the extent of current water inundation easements must be negotiated by a departmental officer with responsibility for environmental water management within the Murrumbidgee Valley with the landholder on a case-by-case basis.
 - This may include the need to obtain permission from the landholder to temporarily block the access culvert for the duration of a managed environmental flow event.
 - If needed a departmental officer responsible for Murrumbidgee environmental water management may need to consider the use of approved temporary works (e.g. sandbags) in Clarkes Creek at a location upstream of the private access culvert (e.g. the location of the existing dysfunctional offtake regulator).

8 Mile Creek Southern Regulator



8 Mile Creek Southern Regulator

Drafting Note – Replace with image of 8 Mile Creek Southern Regulator to be located upstream of the existing box culvert shown in the above image after construction.

General operating principles

- To provide targeted environmental outcomes consistent with objectives determined by environmental water managers.
- Can be used in downstream control in conjunction with the 8 Mile Creek Northern Regulator to assist stabilise water levels in the western (downstream) area of Wanganella Swamp.
 - This would typically include operating Estuary Creek Regulator in upstream control at the same time to assist stabilise water levels in the eastern (upstream) area of the Wanganella Swamp and operating McCrabbs Regulator in upstream control to assist stabilise water levels in the lower areas of the western (downstream) area of Wanganella Swamp.
 - The fall in elevation of 8 Mile Creek from the Cobb Highway to McCrabbs Regulator is too much for McCrabbs Regulator operating in upstream control to assist stabilise water levels over the entire western area of Wanganella Swamp.
- Can be used in upstream control in conjunction with the 8 Mile Creek Northern Regulator, Upper Clarkes Creek Regulator and/or Estuary Creek Regulator to assist in stabilising water levels in the eastern (upstream) area of Wanganella Swamp up to a full supply level of 86.30m
 - Stable water levels assist to provide improved waterbird breeding outcomes.
- When used in conjunction with 8 Mile Creek Northern Regulator to raise the upstream water level up to a full supply level of 86.30m this enables environmental water to be more efficiently delivered by gravity into the Clarkes Creek area of swamp that is higher than the western and eastern areas of the Wanganella Swamp.

- Regulation gate fully open during natural flow events.
 - The embankment each side of the regulator gate is designed to overtop and “drown out” during moderate to large unregulated flow events downstream of Forest Creek @ Warriston Weir (410148).
- The full supply level of water in Clarke’s Creek upstream of a privately owned access culvert located about 5km downstream of the Cobb Highway is 85.80m
 - Permission to restrict managed environmental flows through this private access culvert and/or deliver water downstream of this culvert beyond the extent of current water inundation easements must be negotiated by a departmental officer with responsibility for environmental water management within the Murrumbidgee Valley with the landholder on a case-by-case basis.
 - This may include the need to obtain permission from the landholder to temporarily block the access culvert for the duration of a managed environmental flow event.
 - If needed a departmental officer responsible for Murrumbidgee environmental water management may need to consider the use of approved temporary works (e.g. sandbags) in Clarkes Creek at a location upstream of the private access culvert (e.g. the location of the existing dysfunctional offtake regulator).

McCrabbs Regulator and Spillway



McCrabbs Regulator and Spillway

Drafting Note – Replace with image of McCrabb Regulator and Spillway after construction.

General operating principles

- To provide targeted environmental outcomes consistent with objectives determined by environmental water managers.
- Used in upstream control up to a full supply level of 85.50m
 - Drafting: The earlier planned provision to raise the water level to 85.70m during a managed environmental event was removed due to the higher sill level for the spillway at McCrabbs regulator resulting in adverse third party impacts during large flood events.
 - The reduction in elevation from the Cobb Highway to McCrabbs Regulator is too much for McCrabbs Regulator operating in upstream control to assist stabilise water levels over the entire western area of Wanganella Swamp.
 - Water levels in the western area of Wanganella Swamp can be stabilised by operating 8 Mile Creek Northern Regulator and/or 8 Mile Creek Southern Regulator in downstream control and McCrabbs Regulator in upstream control.
 - Stable water levels assist to provide improved waterbird breeding outcomes.
- Normal regulated flow capacity during managed environmental flow events of 150ML/day.
 - This aligns with a 200ML/day water inundation easement from 8 Mile Creek @ McCrabbs Regulator to Forest Creek Anabranh @ the Avenel / Zara property boundary that includes a 50ML/day buffer above the 150ML/day design flow rate.
 - The delivery of managed environmental water downstream of McCrabbs Regulator beyond the end of water inundation easements acquired as part of the Yanco Creek Modernisation Project must be negotiated by a departmental officer with responsibility for environmental water management within the Murrumbidgee Valley with downstream landholders on a case-by-case basis.

- Regulation gate fully open during natural flow events.
 - This regulator is designed so water starts to flow over the adjacent spillway during moderate to large natural flow events.
- Unless advised otherwise in writing from a department officer responsible for environmental water management in the Murrumbidgee Valley operate the regulation gate in upstream control at 85.50m at the end of a natural flow event.

Working Draft

WaterNSW Operating Condition - Exemptions

The WaterNSW Operating Conditions in this plan do not apply:

- when the Minister enacts statutory powers under the *Water Management Act 2000* and the *Local Government Act 1993* to manage water resources during extreme events to secure water for critical water needs defined by the NSW Extreme Events Policy. This includes but is not limited to:
 - the power to impose a temporary water restriction order to restrict access to water if it is in the public interest to cope with a water shortage, threat to public health or to manage water for environmental purposes – this is usually delegated to the department
 - the power to impose a temporary water restriction order to restrict access to water if it is necessary to do so to maintain or protect aquifer water levels, water pressure, water quality or groundwater dependent ecosystems and prevent land subsidence– this is usually delegated to the department
 - the power to suspend all or part of a water sharing plan, which has the effect of altering the rules of priority for the making of available water determinations and/or the making of individual water allocations – this requires the concurrence of the Minister for the Environment
- during periods of unexpected infrastructure outages (e.g. power failure and/or asset failure)
- when the Minister has approved a temporary variation to any of the WaterNSW Operating Conditions in this plan to provide an improved ecological outcome.
 - This would typically require the Minister to be required with a risk assessment demonstrating no unreasonable or unmitigated third party impacts.
- when the Minister has approved a temporary variation to any of the WaterNSW Operating Conditions in this plan for the duration of a temporary flow trial to assess potential opportunities for future improvements to social, environmental, economic and/or cultural outcomes.
 - This is consistent with the operating principle detailed in this plan about adaptive management by adopting the lessons learnt from trialling new approaches and historic operational events to progressively improve outcomes.

Other operational considerations

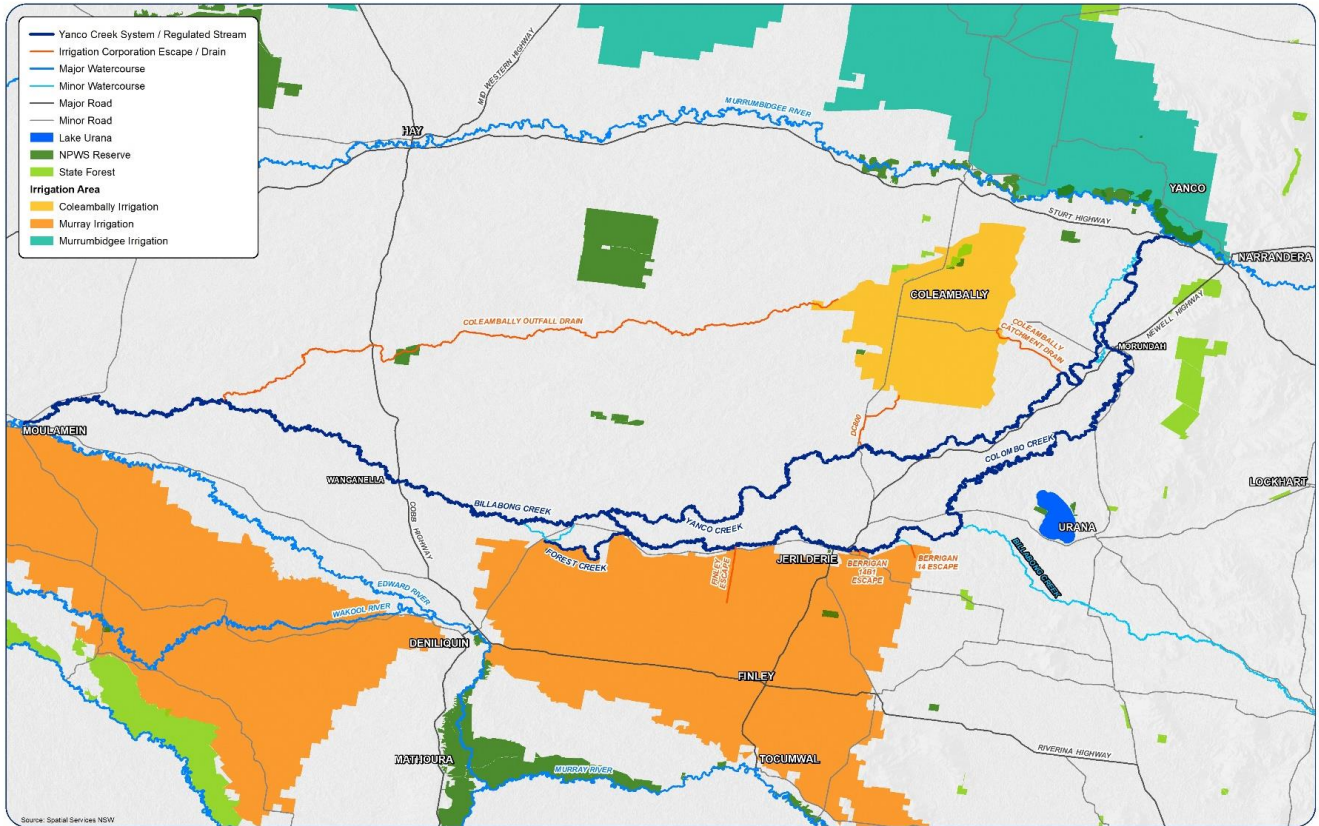
After this plan commences there will be opportunities to monitor its effectiveness and if necessary, make future refinements based on learnings.

Things WaterNSW may consider as part of this ongoing process include:

- monitoring to determine if there is any unacceptable erosion, particularly upstream and downstream of new or upgraded structures
 - this might include use of slowly oscillating regulator pool levels instead of maintaining them at constant levels for extended periods of time
- monitoring to determine if there are any long-term changes to water quality
 - This might include things like water temperature, salinity, dissolved oxygen and/or turbidity
- flow trials to explore what additional opportunities may exist to deliver better social, environmental, economic and/or cultural outcomes
- potential opportunities to deliver inter-valley trade water from the Murrumbidgee to Murray valleys in the Billabong Creek @ Darlot (410134)
- potential opportunities for Barmah-Millewa Choke bypass flows at Finley Escape (particularly given significant reductions to regulated river capacity in the Murray River at the Barmah-Millewa Choke since 2010)
- enhancement of environmental flow peaks from use of the new regulators in the Billabong Creek (e.g. Hartwood and/or Wanganella regulators)
- future opportunities as part of other programs within the Yanco Creek System including but not limited to the Reconnecting River Country and Refreshing Rivers programs.
- cultural flows (subject to the establishment of cultural water that is available for delivery within the Yanco Creek System)
- future amendments to the Murrumbidgee Long Term Water Plan.
- recreational considerations for the height of the Wanganella Regulator pool level during the peak Easter and Christmas – New Year holiday periods
 - This is consistent with the plan's objective of providing balanced social, environmental, economic and cultural outcomes.

Drafting Note – As this is documented as part of a new operations plan that has been through extensive stakeholder consultation, it does not create a mandate for this to apply to other WaterNSW owned regulators.

Appendix 1 – Yanco Creek System map



Source: Spatial Services NSW



Planning, Industry & Environment

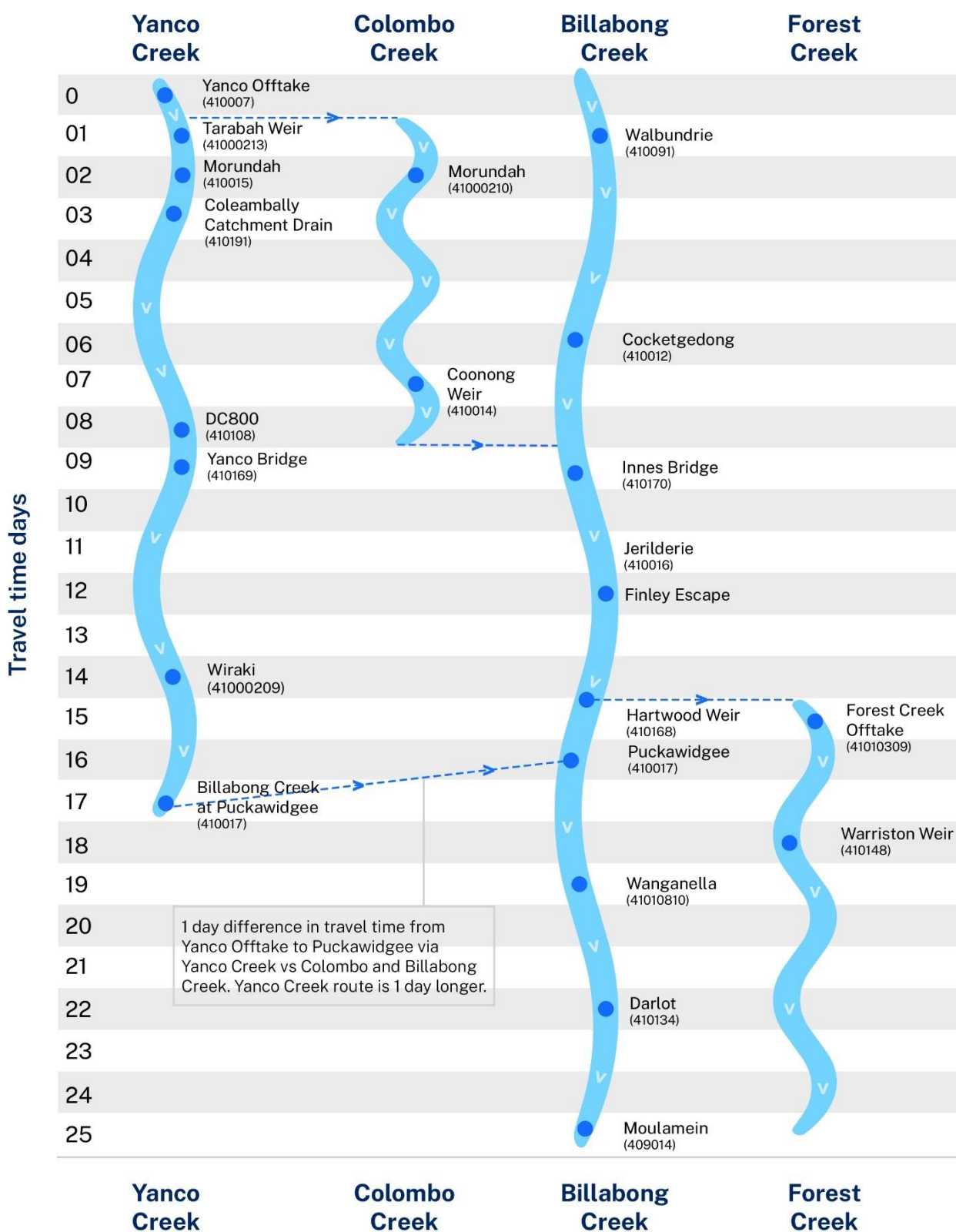
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 Date: 16/04/2019

Disclaimer
 The information contained in this publication is based on knowledge and understanding at time of writing (May 2020). Because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date. The information contained in this publication may not be or may no longer be aligned with government policy nor does the publication indicate or imply government policy.

Yanco Creek System

Yanco Creek System map

Appendix 2 – Yanco Creek System travel times



Note: Numbers in brackets refer to hydrometric station reference numbers. Travel times vary and are indicative only.

Appendix 3 – Yanco Creek System water access licence summary

Licence type [#]	Number of licences	Volume (ML)
Domestic and Stock	158	4,530
Local Water Utility	5	8,336
General Security	165	103,776
High Security	17	2,801
Supplementary	78	27,627
Total	423	152,222

Yanco Creek System water access licence summary

[#]As at 29 May 2022 and excludes government owned water access licences.