Department of Climate Change, Energy, the Environment and Water

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Bullatale inlet regulator replacement

Review of Environmental Factors

NSW Department of Climate Change, Energy, the Environment and Water | February 2024

Acknowledgement of Country

The NSW 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

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First published: March 2025

Department reference number: DOC24/75501

More information

Prepared by 3Rivers on behalf of the NSW Department of Climate Change, Energy, the Environment, and Water

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Document Status – Bullatale Inlet Regulator Replacement Review of Environmental Factors

Revision	Date	Prepared by	Reviewed by
1	21/03/2023	L. McSweeney, S. Cornell	M. Luger, M. Tranter
2	27/03/2023	S. Cornell	J. Ardas, S. Tasker
3	06/09/2023	S. Cornell	M. Luger
4	29/01/2024	S. Cornell	M. Luger
5	29/01/2024	S. Cornell	M. Luger
6	22/02/2024	A. Reid	T. Sinclair

This review of environmental factors has been prepared in a template developed by the New South Wales Department of Climate Change, Energy, the Environment and Water and the National Parks and Wildlife Service specifically for use in assessing the potential environmental impacts of works proposed as part of the Murray and Murrumbidgee Valley National Parks Sustainable Diversion Limit Adjustment Supply Measure Project. It combines key elements of the review of environmental factors templates of each respective organisation.

Declaration

This Review of Environmental Factors (REF) has been prepared by 3Rivers, a joint venture between Jacobs Group Australia and GHD on behalf of NSW Department of Climate Change, Energy, the Environment and Water. The REF has been prepared to satisfy the requirements of Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The REF takes into account the environmental factors specified in the *Guidelines for Division 5.1 Assessments* (Department of Planning and Environment, 2022).

Further, the REF has adequately addressed the matters in Chapter 5 of State Environmental Planning Policy (Biodiversity and Conservation) 2021.

The REF provides a true and fair assessment of the proposed replacement of Bullatale inlet regulator (the 'proposed activity') in relation to its likely effects on the environment. It examines and takes into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

Based on the information provided in the REF, it is concluded that:

(1) The proposed activity is not likely to have a significant impact on the environment, and an Environmental Impact Statement is not required

(2) The proposed activity is not likely to significantly affect threatened species or ecological communities or their habitat, or be carried out in a declared area of outstanding biodiversity value. A species impact statement is not required

(3) The proposed activity is not likely to significantly affect any matters of national environmental significance, nor is the activity being carried out on or is it likely to impact Commonwealth land. The proposed activity was referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water in accordance with the EPBC Act and the Commonwealth Minister for the Environment and Water deemed it not to be a controlled action on 27 January 2023.

Based on the information presented in this REF, it is concluded that by adopting the safeguards identified in this assessment, it is unlikely that there would be significant adverse environmental impacts associated with the proposed activity. Subject to the adoption of the measures to avoid, minimise or manage environmental impacts listed in this REF, the proposed activity is recommended for approval.

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Certification

I, Julian Ardas, certify that I have reviewed this REF as a representative of the NSW Department of Climate Change, Energy, the Environment and Water and agree that, to the best of my knowledge, it accords with the EP&A Act, the EP&A Regulation and the *Guidelines for Division 5.1 assessments* (Department of Planning and Environment, 2022) made under section 170 of the EP&A Regulation.

Signature:

Date:

National Parks and Wildlife Service

I, Tim O'Kelly, certify that I have reviewed this REF as a representative of the National Parks and Wildlife Service, and agree that, to the best of my knowledge, it accords with the EP&A Act, the EP&A Regulation and the *Guidelines for Division 5.1 assessments* (Department of Planning and Environment, 2022) made under section 170 of the EP&A Regulation.

Signature:

Date:

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Executive summary

NSW DCCEEW proposes to replace the existing Bullatale supply channel inlet regulator (Bullatale inlet regulator) located adjacent to the Murray River and surrounded by Murray Valley National Park in south-western NSW. It is proposed to remove the existing inlet regulator and install a replacement inlet regulator that includes a fishway, replace the existing pipes between the regulator and Bullatale supply channel with an open channel, and desilt the inlet channel between the Murray River and the upstream side of the replacement inlet regulator (the proposed activity). The replacement inlet regulator and fishway would be owned, operated and maintained by Bullatale Creek Water Trust.

The purpose of the proposed activity is to modernise the existing ageing inlet regulator by providing a replacement inlet regulator that is safer and more efficient to operate. The fishway installed at the replacement inlet regulator would also facilitate the movement of native fish between the Murray River and the Edward River via Bullatale supply channel and Bullatale Creek.

Key details of the proposed activity are provided in Table E-1-1. A comprehensive description of the proposed activity is provided in Chapter 3.

Table E-1-1 Key details of the proposed activity

Description of proposed activity	Removal of the existing Bullatale inlet regulator and construction of a replacement inlet regulator under Millewa River Road. The replacement inlet regulator would include a fishway to facilitate fish movement past the structure.
Name of NPWS park or reserve	The proposed activity is located on a lot that is vested in the Minister for the Environment under Part 11 of the *National Parks and Wildlife Act 1979*. The lot is surrounded by Murray Valley National Park.
Location of activity (e.g., precinct name or nearby street)	The proposed activity is located where Millewa River Road crosses Bullatale supply channel (also known as Lower Toupna Creek). The site is about 140 metres downstream of where Bullatale supply channel starts at the Murray River.
Street address (if available)	Not applicable.
Estimated commencement date	May to June 2024, but subject to consultation with Bullatale Creek Water Trust and NPWS
Estimated completion date	10 to 12 weeks after construction commences

1 Introduction

1.1 Proposed activity overview

In 2015, the former Office of Environment and Heritage (OEH) prepared a preliminary business case for the Murray and Murrumbidgee Valley National Parks Sustainable Diversion Limit (SDL) Adjustment Supply Measure Project. The business case identified a range of works to existing water supply infrastructure in the Murray Valley National Park and Regional Park and Murrumbidgee Valley National Park to improve their efficiency and effectiveness and, as a result, create water savings.

The NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) has been tasked with progressing the works proposed in the 2015 business case. It has reviewed the package of works proposed in the business case and prepared concept designs for those works recommended for development. A concept design has been prepared for the replacement of the existing Bullatale supply channel inlet regulator ('Bullatale inlet regulator') (the 'proposed activity'), which is located next to Murray Valley National Park on land that is vested in the NSW Minister for Environment and Heritage under Part 11 of the NSW *National Parks and Wildlife Act 1979* (NPW Act).

3Rivers on behalf of NSW DCCEEW has prepared this review of environmental factors (REF) to assess the potential environmental impacts of the proposed activity in accordance with the requirements of Division 5.1 the *Environmental Planning and Assessment Act 1979* (EP&A Act), section 170 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) and the *Guidelines for Division 5.1 assessments* (Department of Planning and Environment, 2022).

1.1.1 The proposed activity

Bullatale inlet regulator (also known as Lower Toupna inlet regulator) is used to manage the flow of water from the Murray River into Bullatale supply channel (also known as Lower Toupna Creek). The supply channel transfers inflows from the Murray River to privately-owned land north of Murray Valley National Park for irrigation. Water in the channel that is in excess of the diversion requirements of irrigators flows to Bullatale Creek and onwards to the Edward River.

The proposed activity would involve demolishing and removing the existing inlet regulator and ancillary infrastructure and installing a replacement inlet regulator that includes a fishway, removing the existing pipes between the regulator and Bullatale supply channel and in their place creating an open channel, and desilting the inlet channel between the Murray River and the upstream side of the replacement inlet regulator. Similar to the existing inlet regulator, Millewa River Road would pass over the replacement inlet regulator and would require about 30 metres of Millewa River Road on either side of Bullatale supply channel to be slightly realigned.

1.1.2 Background information

In 2017, the Murray-Darling Basin states and the Commonwealth Government agreed on a package of 36 SDL Adjustment Mechanism (SDLAM) projects across the southern connected Murray-Darling Basin, with the aim of recovering 605 gigalitres of water each year for the Murray-Darling river system. The NSW Government is currently developing nine projects in collaboration with local communities, key stakeholders and other Basin states with funding from the Commonwealth Government. The NSW Government has brought forward the implementation of five SDLAM projects through the NSW SDLAM Acceleration Program (the Acceleration Program). The Acceleration Program will deliver up to 45 gigalitres of the outstanding amount needed to reach the 605 gigalitre target required by the Basin Plan each year. The Murray and Murrumbidgee Valley National Parks SDL Adjustment Supply Project is one of the five projects in the Acceleration Program.

The proposed activity is part of the Millewa Forest Supply Project, which, together with the Yanga National Park Supply Project, forms the Murray and Murrumbidgee Valley National Parks SDL Adjustment Supply Measure Project.

The proposed activity is located in Millewa Forest, which covers an area of about 38,000 hectares, mostly in Murray Valley National Park (refer to Figure 3-2). Barmah Forest is located immediately south of Millewa Forest in Victoria and the two forests function as a single eco-hydrological system.

From the 1930s, the Millewa Forest water channel network was manipulated by the installation of many banks and regulators and, in some cases, construction of artificial channels. These management interventions influenced the movement of water on the floodplain largely to optimise floodplain forestry. Further infrastructure was constructed during the 1990s to assist with river operations in the Murray and Edward River systems. Many of these structures, including the existing Bullatale inlet regulator, are now old, in poor repair, fail to meet contemporary safety standards and were not designed for ecological outcomes or to optimise fish movement.

Bullatale supply channel is owned by the NSW National Parks and Wildlife Service (NPWS) but operated by Bullatale Creek Water Trust ('the Trust'). Bullatale Creek Water Trust is a private water trust that is subject to Part 4 of the *Water Management Act 2000*. Bullatale inlet regulator is owned, operated and maintained by the Trust to regulate flow into the channel. The Trust has been in operation for more than 100 years and supplies water to 19 individual works, licenced to 12 customers. The Trust holds two co-held licences, which currently comprise a domestic and stock licence of 533 megalitres and a general security licence of 4,882 megalitres. These licences are ongoing with allocation volumes applied annually, subject to water availability. An additional high security licence of 20 megalitres is held by an individual member of the Trust.

1.2 Purpose of this document

The purpose of the REF is to describe the proposed activity, document the likely impacts on the environment, and detail measures to mitigate impacts that cannot be avoided. The REF addresses NSW DCCEEW's obligations under section 5.5 of the EP&A Act, including taking into account the environmental factors listed in Table 1 of the *Guidelines for Division 5.1 assessments* (Department of Planning and Environment, 2022).

The findings of the REF will be considered when assessing:

- Whether the proposed activity is likely to have a significant impact on the environment and therefore the requirement for an environmental impact statement to be prepared and approval sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The permissibility of the works under the NPW Act and the authorisation that would be issued under the NPW Act to construct and operate the new infrastructure
- The significance of any impact on threatened species as defined by the *Biodiversity Conservation Act 2016 (*BC Act) and *Fisheries Management Act 1994* (FM Act) (referred to in section 1.7 of the EP&A Act) and therefore the requirement for a species impact statement or a biodiversity development assessment report.

In the event of any discrepancy between the attachments and this REF, this REF takes precedence.

2 Proposed activity need and justification

2.1 Overview and objectives of the proposed activity

The aims of the Murray and Murrumbidgee Valley National Parks SDLAM Project are to:

1. Enable smarter use of available environmental water, including the ability to sustain key refuge habitats during drier periods
2. Improve environmental outcomes, primarily for flood-dependent vegetation communities, waterbirds and fish
3. Modernise ageing infrastructure, removing constraints to the movement of water across the floodplain and reopening pathways for native fish
4. Create a community and government partnership, providing project benefits for irrigators while minimising disruption to floodplain ecosystems.

The proposed activity is aligned with aim numbers 2, 3 and 4.

The purpose of the proposed activity is to:

- Improve fish passage past the regulator
- Maintain or improve the reliability of supply for Bullatale Creek Water Trust
- Provide a structure that gives the site environmental water managers flexibility in how they can operate the structure to achieve environmental watering outcomes for Millewa Forest
- Ensure the replacement inlet regulator is a simple structure that complies with contemporary safety standards and has low operational and maintenance costs.

The objectives of Bullatale Creek Water Trust are also relevant to the proposed activity. The *Murray and Murrumbidgee Valley National Parks SDL Adjustment Supply Measure Business Case* (OEH, 2015) identified a key requirement for the Trust is to avoid disruption of the existing water supply to landholders. The Trust's needs were further explored in subsequent meetings with the Trust held in June and November 2021. In summary, the Trust seeks to maintain the characteristics of their current supply arrangement being:

- Retain a system that continues to supply water at a low cost to members of the Trust
- Retain autonomy of the ownership, operation and maintenance of their water supply (to the extent permitted by their occupation permit)
- Retain a system that requires relatively low maintenance
- Provide the capacity to maintain the environmental values supported by historic flows in Bullatale Creek (as a consequence of the Trust's past water management)

- Support future agricultural growth by retaining access to excess capacity that currently exists in the system
- Extend the operational period of the supply system via the preferred lowering of the offtake sills.

The proposed activity is aligned with these outcomes sought by the Trust.

2.2 Existing infrastructure

Bullatale inlet channel is on the upstream side of the inlet regulator and connects the inlet regulator to the Murray River (refer to Photo 2-1). The inlet channel is a modified floodrunner. Bullatale supply channel is on the downstream side and connects the inlet regulator to Bullatale Creek (refer to Photo 2-3 and Photo 2-3). The supply channel flows in a northerly direction and was created by modifying natural floodrunners (including Lower Toupna Creek). Trust members extract water that flows from the supply channel into Bullatale Creek using pumps. Flows in excess of the Trust's extraction limits, or which are not wanted, continue along Bullatale Creek and eventually outfall into the Edward River a few kilometres south of Deniliquin.

Photo 2-1 Bullatale inlet channel, looking upstream from the inlet regulator towards the Murray River. The top of the inlet regulator is just visible above the waterline at the bottom of the photograph

Photo 2-2 Aerial view of Bullatale inlet regulator, looking downstream from the inlet channel towards Bullatale supply channel

Photo 2-3 Bullatale supply channel, facing downstream from the inlet regulator

The existing inlet regulator comprises two parallel 0.7-metre diameter buried pipelines that are about 70 metres long. The size of these pipes restricts flow from the inlet channel into the supply channel. The pipes also prevent fish movement.

The upstream end of each pipe is fitted with a penstock gate (refer to examples in Photo 2-4). Each gate can be individually closed to control the flow into the supply channel (refer to Photo 2-5).

Inflow to Bullatale supply channel, and whether it overflows, is determined by:

- The position of the gates on the regulator
- The limitations of the infrastructure (pipe diameter and sill level)
- The passing flow in the Murray River at the inlet channel (which in this report is taken to be the passing flow at Yarrawonga Weir)
- The hydraulic capacity of the supply channel (including the effect of sedimentation on its profile).

The capacity of the channel to supply flow without overflow to Millewa Forest is estimated from hydraulic modelling to be about 79 megalitres per day.

It is understood that the Trust generally leaves the penstocks in a fixed position — 50 per cent open on one of the pipes, 80 per cent open on the other — to prevent overflow from the supply channel into the surrounding forest. The Trust fully opens the gates when there is low flow in the Murray River (less than about 7,000 megalitres per day) and closes the gates to minimise flooding of private land when flows in the Murray River are greater than about 10,500 megalitres per day and overbank flows start to occur.

The existing inlet regulator is dilapidated (refer to Photo 2-6) and there are some safety risks associated with its operation. Silt has built up in the inlet channel resulting in the bed of the inlet channel being higher than the invert level of the regulator's pipes. This means that inflows to the regulator and Bullatale supply channel only occur when there are flows in the Murray River above about 6,000 megalitres per day.

Photo 2-4 The penstock gates of the existing inlet regulator

Photo 2-5 The penstock gate at the upstream end of the existing inlet regulator

Photo 2-6 The upstream end of the existing inlet regulator, shown when there is no flow in the inlet channel

2.3 Existing flows

Flow through the existing inlet regulator into Bullatale supply channel is limited by the sill level at the entrance to the regulator's twin pipe (99.2 metres Australian Height Datum (AHD)) and by the bed level of the inlet channel (99.3 metres AHD). Flow from the Murray River into the regulator and downstream to the supply channel occurs once the river water level exceeds the higher of these levels.

The Murray-Darling Basin Authority has recently developed a computational hydraulic model of the entire Barmah-Millewa Forest that includes the Murray River, Bullatale Creek and Bullatale supply channel, smaller creeks and flood runners and the ground surface to allow simulations of widespread inundation events.

For the purposes of the proposed activity, a local hydraulic model has been extracted from the Murray-Darling Basin Authority's Barmah-Millewa Forest hydraulic model. The local model includes the Murray River, Bullatale Creek and Bullatale supply channel together with a local area of forest along both sides of the supply channel.

The local model predicts that inflow to the existing inlet regulator occurs at a Murray River flow of about 6,000 megalitres per day and that overflow from the supply channel to Millewa Forest starts to occur at a Murray River flow of a little over 10,000 megalitres per day with the penstocks set at 50 per cent and 80 per cent open (refer to Section 2.2) and a 'bank full' flow in the supply channel further downstream of about 79 megalitres per day for events where there is no additional inflow to the channel downstream of the regulator.

A longitudinal profile of the water levels predicted along Bullatale supply channel by the local model for simulated Murray River flows of 4,000 to 10,000 megalitres per day is provided in Figure 2-1. The predicted flows and water levels in Bullatale supply channel shown in Figure 2-1 are based on the penstocks being 50 per cent and 80 per cent open as described above. The figure also shows bed levels and bank levels along the western side of the supply channel, obtained from LiDAR aerial survey. Some of the low points in the banks do not extend far into the forest and result in limited ponding rather than continued flow out of the supply channel. Others, such as the circled point, result in a continuous flow out of the supply channel once the bank is overtopped, and some have been reinforced with rock to form defined overflow sills. Overflow from the supply channel into the forest acts to limit the flow continuing down the supply channel and out of the forest into Bullatale Creek.

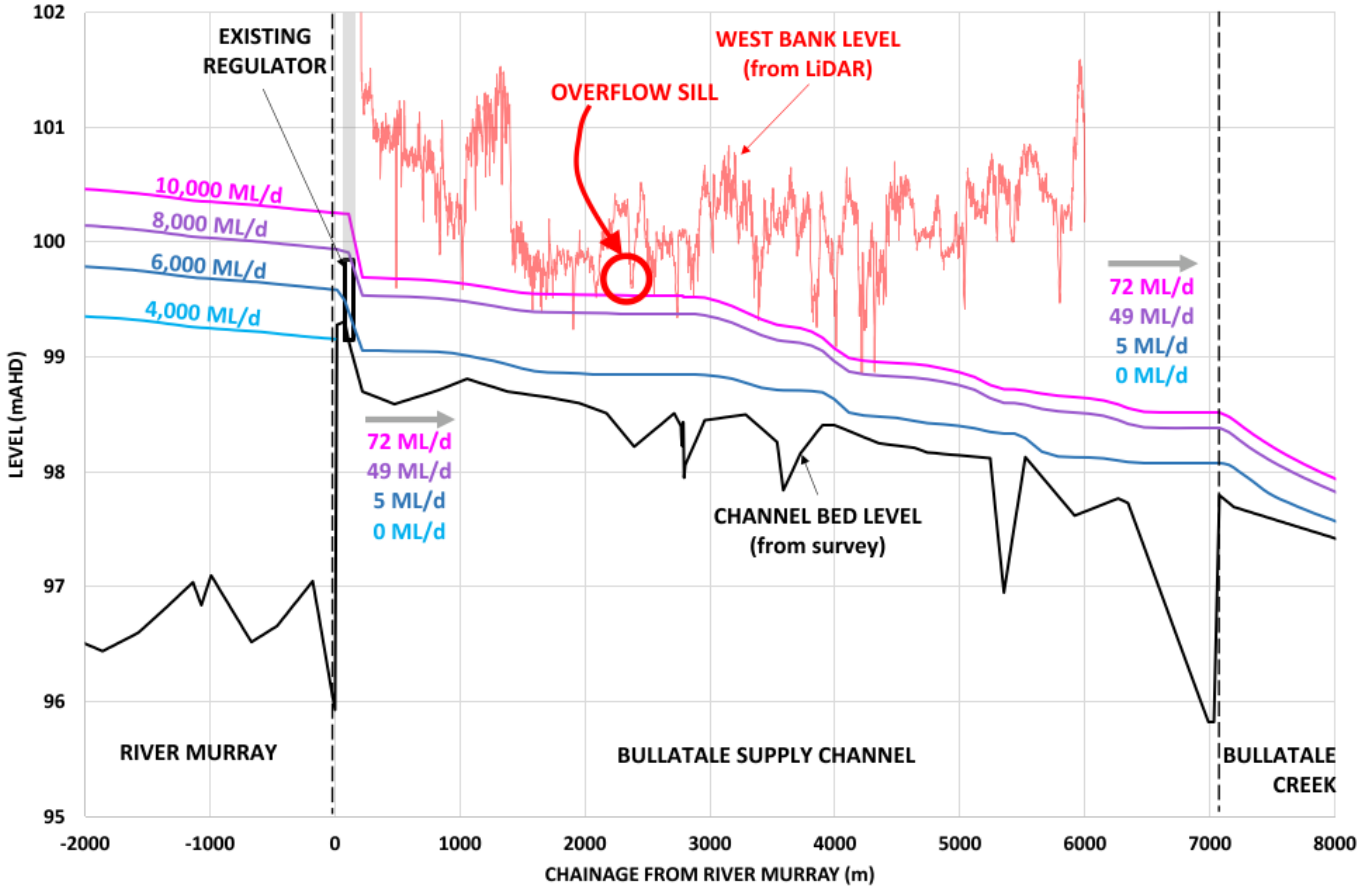


Figure 2-1 Longitudinal profile of modelled water levels in Bullatale supply channel for Murray River flows of 4,000 to 10,000 megalitres per day

The local model does not explicitly simulate flow routes into the supply channel from Aratula Creek and Aluminy Creek, located further upstream on the Murray River, which become active at flows over 10,000 megalitres per day, although these can be included as additional inputs to the model.

2.4 Proposed activity need

The existing inlet regulator is old, in poor repair, does not meet contemporary safety standards and was not designed to optimise fish movement, as noted in Section 1.1.2. The proposed replacement of the existing inlet regulator would provide a modern structure that meets contemporary health and

safety standards and would include a fishway that enables bi-directional fish movement past the structure. The fishway would open up fish movement along about 60 kilometres of waterway between the Murray River and the Edward River via Bullatale Creek.

The improvement in the efficiency of operation of the replacement inlet regulator compared to the existing inlet regulator would contribute to the 45 gigalitre per annum water saving targeted by the Acceleration Programme (refer to Section 1.1.2).

2.5 Options and alternatives considered

The preliminary business case (OEH, 2015) proposed the replacement of the existing inlet regulator as part of a package of works to achieve better environmental outcomes for the Aratula Creek system when flows in the Murray River are between 10,000 and 15,000 megalitres per day. The package of works proposed in the preliminary business case comprised five components:

- A regulating structure at the inlet to Bullatale supply channel
- A regulating structure at the outfall from Bullatale supply channel
- Constructed sills on the banks of the supply channel
- Replacement of Seven Mile Creek Bridge
- Reprofiling of the channel bed.

NSW DCCEEW developed an options evaluation framework to consider a range of options to deliver the package of work.

Preliminary hydraulic modelling of the package of works has been carried out to gain a better understanding of the hydrology of the area and identify which of the five components of the works package are needed to achieve the objectives. Based on this initial work, only one of the five components of the package of works presented in the business case, replacement of the existing inlet regulator at the inlet from the Murray River, is currently proposed for development.

Alternatives to the replacement of the existing inlet regulator that were considered in the 2015 preliminary business case and options evaluation framework are described in the following sections.

2.5.1 Piped supply to Bullatale Creek – gravity fed

The basic concept for this option is to fully pipe water to the Trust through the forest via gravity. 3Rivers has completed a preliminary assessment of this option based on a 1.5-metre diameter pipeline, 3.5 kilometres in length. Key findings of this assessment included:

- High construction impact — The impact area would be more than about 3.5 hectares assuming a 10-metre wide construction footprint using existing access tracks
- High cost compared to the total project budget
- Siltation and corresponding maintenance issues — Flow velocities in the pipeline would be low (less than one metre per second) and this would result in an accumulation of silt over time, which would reduce the pipeline's capacity and commence to flow rate and increase the maintenance required compared to the existing inlet regulator

- Duplication of infrastructure — The existing supply channel would still be required for environmental flow delivery
- Poor comparative performance — 20 per cent siltation within the pipeline would reduce its performance below that of the existing inlet regulator at Murray River flows above about 8,000 megalitres per day.

2.5.2 Piped supply to Bullatale Creek – pumped

The basic concept for this option is to supply water to Bullatale Creek via a pressurised pipeline. 3Rivers has completed a preliminary assessment of this option based on a 0.9-metre diameter pipeline, 3.5 kilometres in length. Key considerations for this option include:

- Pumping duty is estimated to be about 100 megalitres per day at a head of about 30 metres, requiring a motor with a capacity of about 500 kilowatts
- Higher flow velocities in the pipeline could be generated to overcome siltation issues
- Surge protection would be required to pump on a downhill gradient as there would be almost no static head. Dual acting air valves (fast entry/slow release) would need to be considered to manage the risk of much of the pipeline becoming sub-atmospheric due to the drop in pressure when pumping stops
- The need to maintain and clean the pipeline air valves, pump station and generator would result in greater maintenance requirements than the existing inlet regulator
- Diesel-operated pump would be required as there is no power at the site. A diesel-operated pump would introduce a risk of fuel leaks to the environment, carbon emissions and noise disturbance impacts to the public and wildlife
- The pump and diesel fuel storage would put the asset at greater risk of theft or vandalism
- The diesel fuel storage would increase the risk of damage to the asset and surrounding bushland in the event of a bushfire
- The construction impact area is likely to be similar to that of a gravity piped supply i.e. an impact area of about 3.5 hectares, refer to Section 2.5.1
- Overall, this option would be costlier and more difficult to operate and maintain than the existing inlet regulator.

2.5.3 Alternative methods of irrigation supply to Bullatale Creek

The basic concept for this option would be to relocate Bullatale inlet channel and supply channel to an upstream location to avoid intersection with the Aratula Creek system.

An initial assessment of potential upstream locations was completed by 3Rivers using the Murray-Darling Basin Authority's Barmah-Millewa Forest hydraulic model. No alternative locations could be identified that had a commence to flow rate comparable to the existing inlet regulator location.

Therefore, it was concluded that Bullatale Creek Water Trust would be disadvantaged by relocating to an upstream site, which fails to comply with the guiding principles for the project.

2.6 Justification for preferred option

The preferred option is to replace the existing inlet regulator by building a replacement inlet regulator under Millewa River Road comprising of box culverts and removing the existing inlet regulator. An open channel would be created where the existing inlet regulator currently comprises buried pipelines, to connect the downstream end of the replacement inlet regulator to Bullatale supply channel. The replacement inlet regulator would include a bi-directional fishway to enable fish movement past the structure. Desilting of the inlet channel between the Murray River and the upstream end of the replacement inlet regulator is also proposed to restore the historic commence to flow rate in the inlet channel at the Murray River and at the regulator. A detailed description of the preferred option is provided in Chapter 3.

Removing the existing inlet regulator and installing a replacement inlet regulator is the preferred option because it would achieve project aim number 3 (refer to Section 2.1) at the lowest capital cost while avoiding the operation and maintenance risks and costs and environmental impacts associated with some of the alternatives discussed in Section 2.5.

3 Proposed activity description

A concept design has been prepared for the proposed activity and it forms the basis for the assessment of environmental impacts provided in this REF. The key features of the concept design are described in the following sections.

3.1 Location of the proposed activity

Bullatale inlet regulator is located in south-western NSW on the northern side of the Murray River, between Deniliquin to the north, Mathoura to the west and Tocumwal to the east. The location of the proposed activity within the region is shown in Figure 3-1.

Figure 3-1 Regional context

The existing inlet regulator is located where Millewa River Road crosses Bullatale supply channel (refer to Figure 3-2). The Murray River is about 140 metres south of the inlet regulator. The top of the left (southern) bank of the Murray River forms the border between NSW and Victoria.

Bullatale inlet regulator and supply channel are located in Lot [*redacted*], which was vested in the NSW Minister for Environment and Heritage under Part 11 of the NPW Act when Murray Valley National Park and Regional Park were gazetted on 1 July 2010. The vesting of this lot to the Minister means that Bullatale inlet regulator and supply channel are surrounded by Murray Valley National Park but not part of the park itself.

Bullatale inlet regulator is only accessible by travelling through Murray Valley National Park. Bullatale inlet regulator can be accessed from Millewa Road on the northern boundary of the national park, and then proceeding through the national park along Toupna Crossing Road and Millewa River Road. There are several access tracks through the national park that provide less direct access routes to Bullatale inlet regulator although these are not proposed for use during construction.

The replacement inlet regulator is proposed in the same location as the existing inlet regulator. Similar to the existing inlet regulator, Millewa River Road would pass over the replacement inlet regulator.

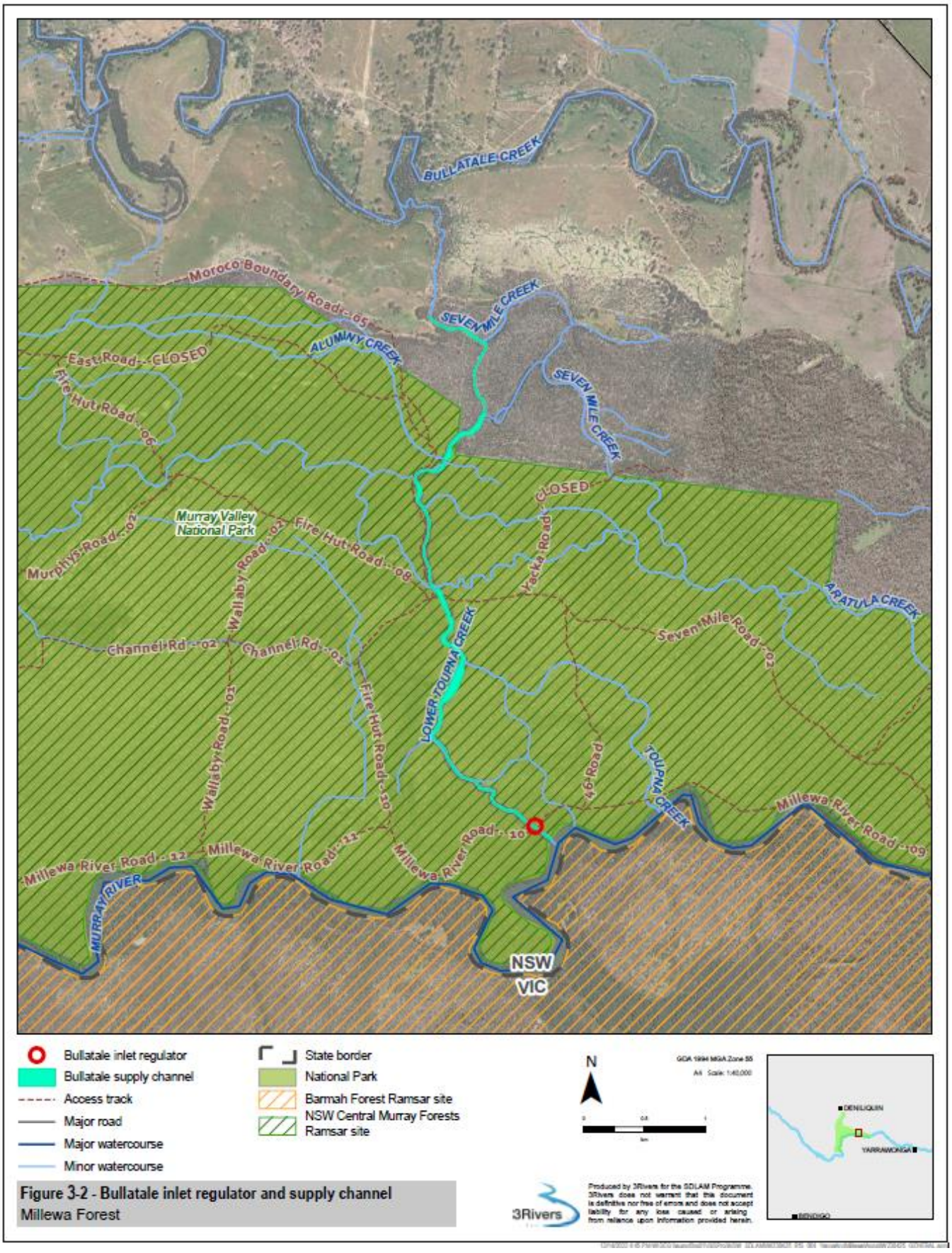


Figure 3-2 Bullatale inlet regulator and supply channel

3.2 Description of the proposed new infrastructure

The proposed activity would involve removing the existing inlet regulator and installing a replacement inlet regulator that includes a fishway and desilting the inlet channel between the Murray River and the upstream end of the replacement inlet regulator.

The replacement inlet regulator would comprise three 2.4-metre wide by 1.8-metre high box culvert structures as shown in Figure 3-3. The structure would be built on the existing alignment of Millewa River Road to minimise impacts to vegetation. The replacement inlet regulator has been designed to match the profile of the downstream waterway.

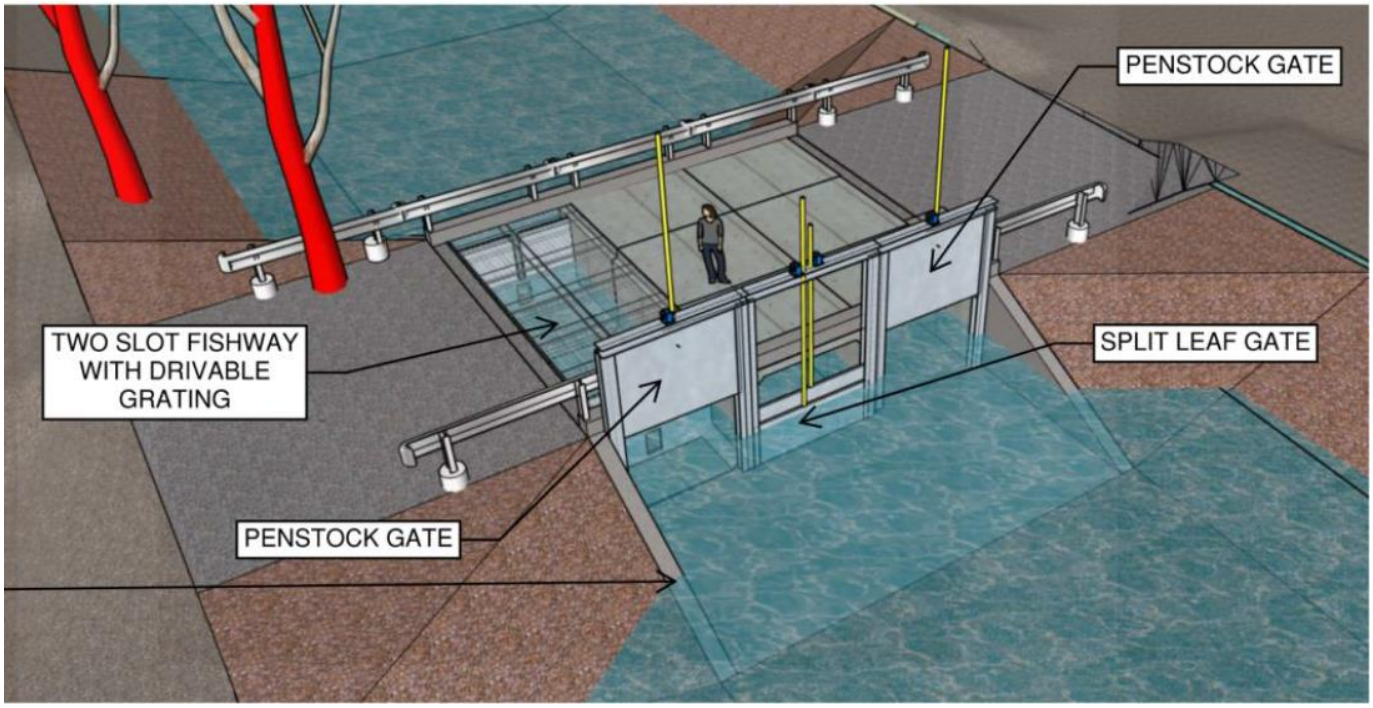


Figure 3-3 Concept design of the proposed replacement inlet regulator

Gates on the replacement inlet regulator would control flows through the structure. The invert of the structure would be set at 99.0 metres AHD to allow for inflows at flow rates above about 4,000 megalitres per day in the Murray River.

The replacement inlet regulator would be substantially shorter than the existing inlet regulator. The short length of the replacement inlet regulator would allow about 70 metres of Bullatale supply channel to be restored to an open channel following the removal of the buried pipelines and infill of the existing inlet regulator.

A bi-directional fishway has been incorporated into the replacement inlet regulator to allow large and small bodied native fish to move past the structure. The fishway would facilitate the movement of native fish between the Murray River and the Edward River via Bullatale Creek.

The replacement inlet regulator would not be electrically controlled or have remote telemetry. The mechanical components would be incorporated into the gate selection and be manufacturer-supplied equipment for installation.

Silt has built-up to a level of 99.3 metres AHD in the inlet channel between the Murray River and the upstream side of the existing inlet regulator. Desilting of the inlet channel is proposed to a level of

99.0 metres AHD (the same level as the invert of the replacement inlet regulator). The removal of the silt that has built-up within the inlet channel would prevent this sediment from being transported downstream and smothering instream habitat.

Safety in design workshops have incorporated safety considerations into the design of the replacement inlet regulator for the benefit of members of the public and the Trust members who would operate and maintain the structure.

3.3 Construction works

The key steps proposed during the construction phase of the proposed activity are:

- Clearing and trimming vegetation within the construction footprint to provide plant and vehicle access and create space for truck turning, loading and unloading of vehicles, storage of plant and equipment, and stockpiling of materials
- If required, minor earthworks to enable vehicles and plant to safely operate within the construction footprint
- Installing temporary in-stream cofferdams to create a dry work site for construction of the replacement inlet regulator
- Excavating, demolishing and removing the existing inlet regulator headwall and other infrastructure within the footprint of the replacement inlet regulator
- Installing the replacement inlet regulator
- Temporarily blocking the inlet channel at the Murray River to prevent inflows
- Desilting the inlet channel between the Murray River and the upstream side of the replacement inlet regulator using a bulldozer pushing material back to the Millewa River Road and then excavating it into a truck for offsite disposal
- Decommissioning what remains of the existing inlet regulator by excavating and removing the balance of the buried twin pipelines and the fill material overlaying these pipelines as well as the downstream headwalls. Excess material may be stockpiled in the construction zone and used for final trimming of site or excess material disposed off-site or used at other locations within the Park
- Cutting and shaping a channel that approximately follows the alignment of the removed pipelines to connect the downstream end of the replacement inlet regulator to Bullatale supply channel
- Stabilising the newly cut section of channel using biodegradable geofabric, rock and locally endemic native vegetation
- Removing the cofferdams, which would enable flows to occur through the structure and new cutting and continue downstream along Bullatale supply channel
- Reprofiling and/or contouring areas disturbed during the works to tie-in with the surrounding landform and direct surface water runoff into the supply channel.

As noted above, a dry work site would be required to construct the replacement inlet regulator. A dry work site could be created by installing temporary cofferdams downstream and upstream of where the replacement inlet regulator would be built. A temporary downstream cofferdam could be

created that incorporates the earthen fill around the headwall at the downstream end of the existing inlet regulator (refer to Photo 3-1). The replacement inlet regulator would be positioned slightly downstream of the existing inlet headwall, which could form part of a temporary upstream cofferdam.

Earth removed during the works that is surplus and can be classed as virgin excavated natural material could be used for other works proposed in Millewa Forest as part of the Millewa Forest Supply Project, or otherwise disposed off-site at an appropriately licenced waste facility. Refer to Section 6.14.2.1.1 for further discussion on the disposal of construction waste.

Photo 3-1 The downstream end of the existing inlet regulator, where the buried twin pipelines discharge flow into Bullatale supply channel

Construction plant required to carry out the works would include:

- 20 to 25-tonne excavator, for multiple applications
- Bulldozer, to clear silt within the inlet channel
- Tipper truck and tag trailer, to cart materials and plant
- Truck and dog trailer, to cart materials
- Concrete agitator trucks, to deliver concrete
- Concrete pumping truck, for in-situ concrete pours
- Skid steer, for site clearing and final trimming

- Electrical generator, for site office and use of electrical equipment
- 15 to 20-tonne Franna crane, to unload and place the regulator gates.

An on-site workforce of about six personnel would be required to carry out the construction works at Bullatale inlet regulator.

3.4 Access and ancillary facilities

As noted in Section 3.1, access to the work site would be from Millewa Road on the northern boundary of Murray Valley National Park, and then proceeding through the national park along the access tracks of Toupna Crossing Road and Millewa River Road.

NSW DCCEEW, on behalf of NPWS, proposes to carry out maintenance work on the access tracks that link the work site to Millewa Road. While this access track maintenance work does not form part of the proposed activity, it does need to be completed before construction of the proposed activity starts to ensure that construction vehicles can safely access the site.

A temporary construction phase laydown area with dimensions of about 16-metres by 35-metres is proposed in the cleared area above the buried pipelines as shown in Photo 3-2 and

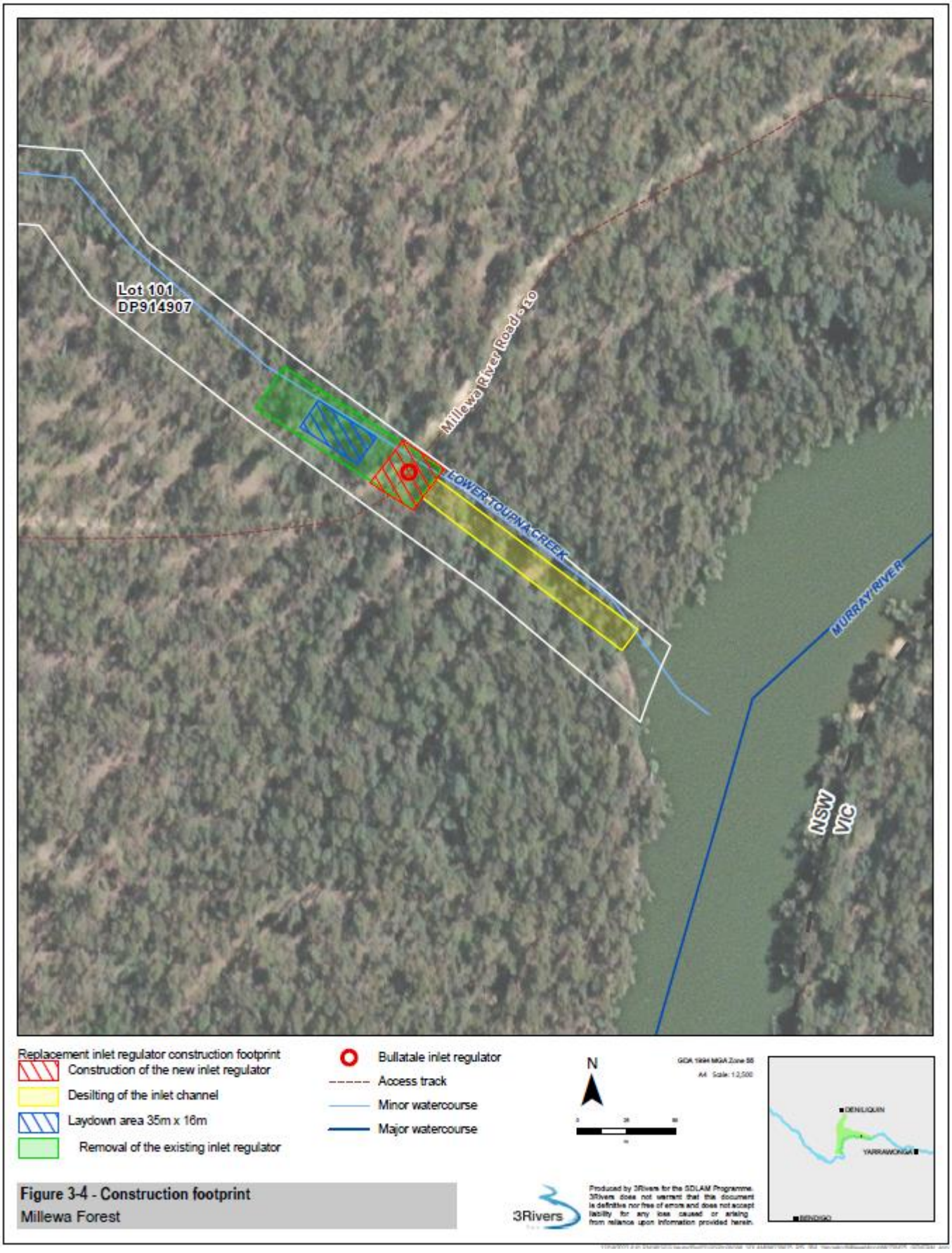


Figure 3-4 - Construction footprint
Millewa Forest

Figure 3-4. Once the replacement inlet regulator is constructed a channel would be cut through part of this cleared area to connect the downstream side of the replacement inlet regulator to Bullatale supply channel. A portable ablution and site office facility would be required temporarily at the work site.

Photo 3-2 The proposed laydown area located above the buried twin pipelines of the existing inlet regulator. Millewa River Road is located behind the vehicles, with the inlet to the regulator on the other side of the road

3.5 Operation

The existing inlet regulator is owned and operated by Bullatale Creek Water Trust, a private water trust under Part 4 of Chapter 4 of the NSW *Water Management Act 2000*. The Trust has been in operation for over 100 years and supplies water to 19 individual works, licenced to 12 customers. The Trust maintains and operates the inlet regulator and supply channel in accordance with an occupation permit renewed annually by NPWS. The Trust holds two co-held licences, which currently comprise a domestic and stock licence of 533 megalitres and a general security licence of 4,882 megalitres. These licences are ongoing with allocation volumes applied annually, subject to water availability. An additional high security licence of 20 megalitres is held by an individual member of the Trust.

NSW DCCEEW proposes to gift the replacement inlet regulator to Bullatale Creek Water Trust to own and operate. The Trust would operate the replacement inlet regulator in accordance with the terms and conditions of an easement that it is currently being negotiating with NPWS (refer to

Section 4.1.1.2), and an operational management plan developed by NSW DCCEEW, and agreed to by the Trust and NPWS, prior to asset handover. The operational management plan would address the Trust's use of the replacement regulator to pass water into Bullatale supply channel for their extraction further downstream. The operational management plan would require the maximum daily volume of water allowed to pass the replacement inlet regulator by the Trust to be no more than the bank full capacity of the supply channel of about 79 megalitres per day, or a water level in the supply channel that does not exceed 99.75 metres AHD.

The replacement inlet regulator would be available to use in managed environmental watering of Millewa Forest. Stakeholders with an interest in and/or responsibility to carry out environmental watering of the forest are:

- NPWS, as the icon site manager for The Living Murray
- The Biodiversity and Conservation Division of the Environment and Heritage Group of the Department of Climate Change, Energy, the Environment and Water, which manages the Barmah-Millewa water account
- The Commonwealth Environmental Water Office and the Murray-Darling Basin Authority, which hold the water entitlement for The Living Murray.

While all these stakeholders are involved in the management of environmental watering of Millewa Forest, for practical reasons NPWS has assumed day-to-day responsibility for carrying out environmental watering of the forest. For simplicity, environmental watering of the forest is discussed in this REF as the responsibility of 'the site environmental water managers'. Decisions by the site environmental water managers on how and when structures in Millewa Forest are operated are guided by a range of detailed management plans that have been reviewed and approved by multiple government agencies. The operational management plan discussed above would recognise the site environmental water managers' right to use of the replacement regulator for environmental watering of the forest. Key planning documents that provide recommendations on the environmental water requirements of the Millewa Forest include:

- *Barmah-Millewa Forest Environmental Water Management Plan* (Murray-Darling Basin Authority, 2012)
- *Murray-Lower Darling Long Term Water Plan* (Department of Planning, Industry and Environment, 2020a).

Decisions to deliver water to Millewa Forest are also guided by adaptive management processes that support the continual improvement of environmental watering in response to ecological monitoring outcomes.

The replacement inlet regulator would be operated at the discretion of the site environmental water managers to deliver environmental water to Millewa Forest in line with the same environmental watering protocols and adaptive management processes that are currently followed. The replacement inlet regulator would have a greater capacity than the existing inlet regulator, which would enable the site environmental water managers to carry out environmental watering more efficiently.

The site environmental water managers would need to collaborate with Bullatale Creek Water Trust to ensure that the operation of the replacement inlet regulator for environmental watering purposes is consistent with the guiding principles identified in Section 2.1.

3.6 Proposed activity footprint

The construction footprint for the proposed activity is shown in

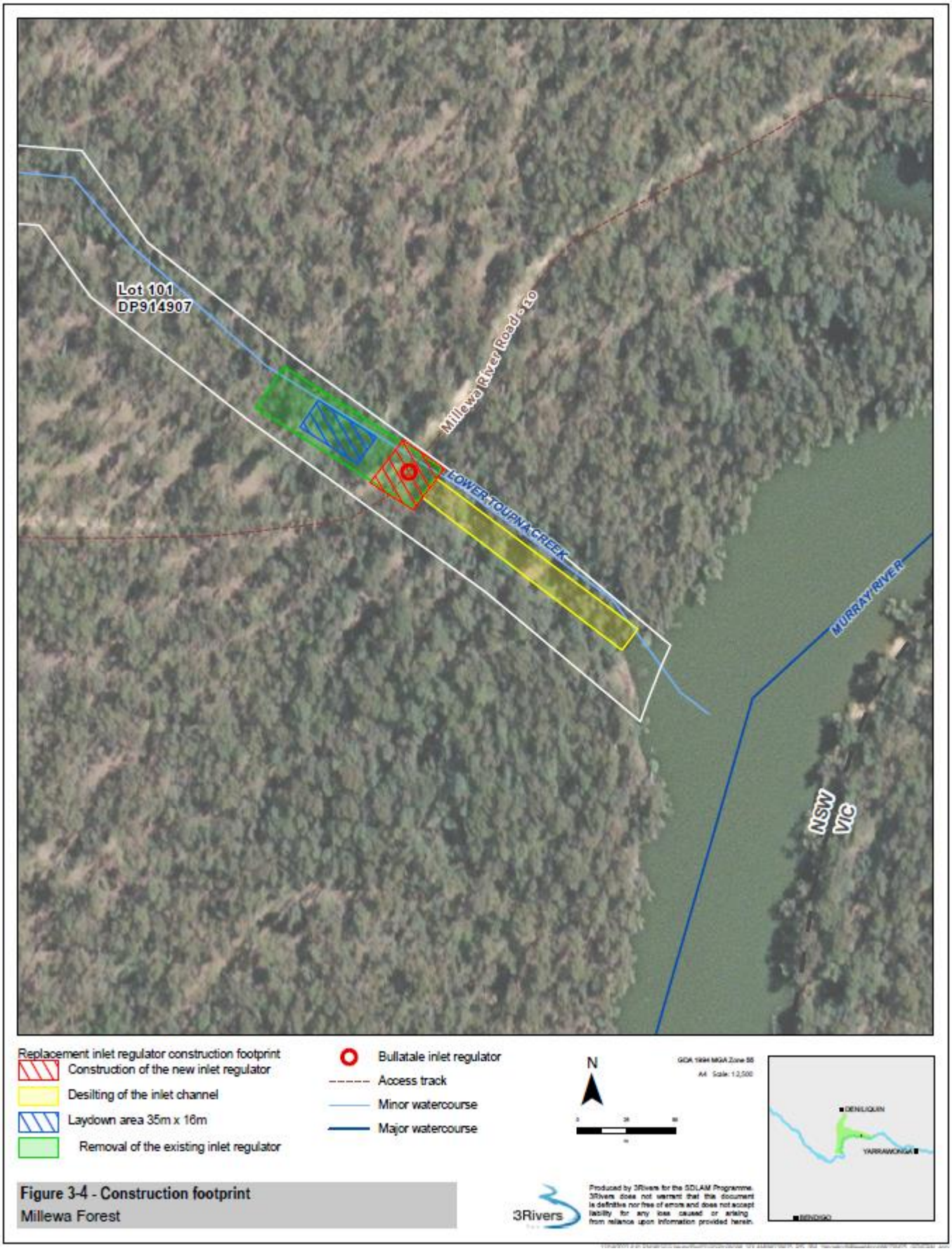


Figure 3-4 - Construction footprint
Millewa Forest

Figure 3-4 and includes:

- The footprint of the replacement inlet regulator, located where Millewa River Road crosses the existing inlet regulator
- A temporary laydown area with dimension of about 16-metres by 35-metres in the cleared area above the buried pipelines of the existing inlet regulator (refer to Photo 3-2)
- The existing area of fill material above the buried pipelines of the existing inlet regulator. This fill material and the twin pipes would be removed and a channel cut to connect the downstream end of the replacement inlet regulator with the existing supply channel
- The inlet channel between the Murray River and the upstream side of the replacement inlet regulator. A two-tonne excavator would operate within the channel to remove silt to a level of 99.0 metres AHD.

The construction footprint has a total area of about 4,000 square metres.

The operational footprint for the proposed activity is the same as the operational footprint of the existing inlet regulator and includes the inlet channel and Bullatale supply channel downstream to Bullatale Creek and onward to the Edward River. As noted in Section 3.5, the operational management plan would require the maximum daily volume of water allowed to pass the replacement inlet regulator by the Trust to be no more than the bank full capacity of the supply channel of about 79 megalitres per day, or a water level in the supply channel that does not exceed 99.75 metres AHD. This requirement would restrict the operational footprint downstream of the replacement inlet regulator to within the banks of the supply channel.

As discussed in Section 3.5, the replacement inlet regulator would be available for the site environmental water managers to use for environmental watering of Millewa Forest. Environmental watering of the forest would occur in accordance with the same management plans that are currently being implemented and, therefore, the inundation area would be the same.

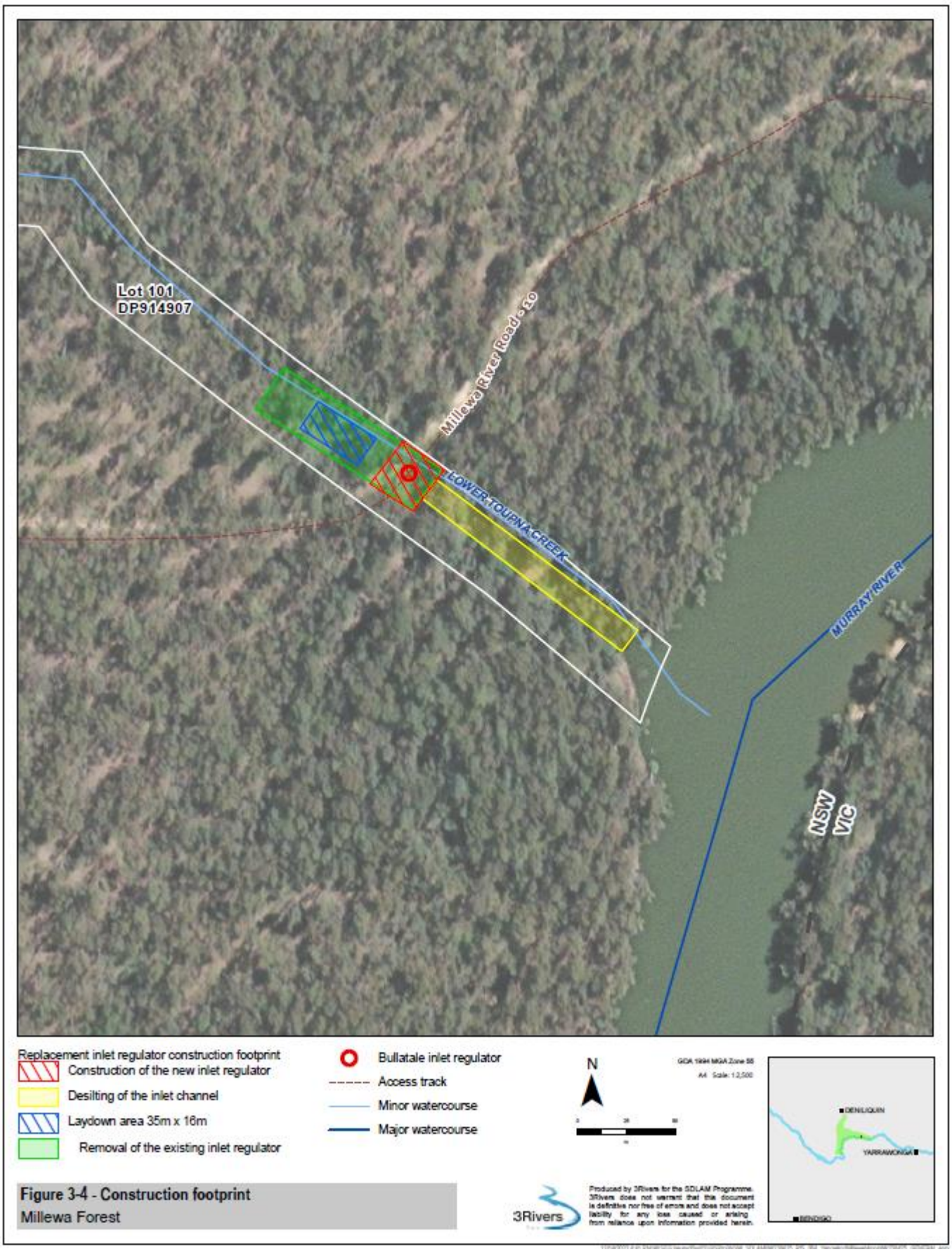


Figure 3-4 Construction footprint

3.7 Timing and staging

Construction of the proposed activity is scheduled to occur between October and December 2024, subject to the site being accessible and there being low water levels in the Murray River.

Construction of the proposed activity is not proposed to be staged. The access track maintenance works proposed between Millewa Road and the site would need to be completed before construction of the proposed activity can start. The steps proposed in the construction of the proposed activity are detailed in Section 3.3.

3.8 Capital investment value

A preliminary estimate of the cost to construct the proposed activity has been prepared by 3Rivers and is about $1.3 million excluding GST (3Rivers, 2023).

As discussed in Section 3.5, Bullatale Creek Water Trust would operate and maintain the replacement inlet regulator. The site environmental water managers would also operate (or direct Bullatale Creek Water Trust to operate) the replacement inlet regulator to achieve its environmental watering objectives. NSW DCCEEW would need to establish an agreement on which party is responsible for operation and maintenance costs or develop a cost sharing arrangement between the parties.

3.9 Public utility adjustment

No public utility adjustments are required to enable the proposed construction works to occur.

If Bullatale Creek Water Trust requires irrigation water during the construction phase a pump would be used to transfer water from the inlet channel upstream of the work site to the supply channel downstream of the work site.

3.10 Land access and acquisition

No land acquisition is required for the proposed activity.

As discussed in Section 3.4, the construction work site would be accessed from Millewa River Road and construction vehicles would require use of existing access tracks in Murray Valley National Park.

The existing inlet regulator and supply channel are located within Lot [*redacted*]. This d does not form part of Murray Valley National Park. The lot was vested in the Minister for the Environment administering the NPW Act for the purposes of Part 11 of the NPW Act on 1 July 2010, at the same time as the national park was gazetted. The lot follows Bullatale supply channel from the Murray River to the northern boundary of the national park and is about 40 metres wide.

Bullatale Creek Water Trust operates and maintains Bullatale supply channel in accordance with Occupation Permit No. 14184 issued by the former Forestry Commission of NSW under Part 5 of the

repealed *Forestry Act 1916*. The permit authorises the Trust's use of a 10-metre wide, 3.5-kilometre long strip of a land along the supply channel for the purpose of water supply (refer to Figure 3-5). When the *Forestry Act 1916* was repealed the permit carried over to Part 5 of the *Forestry Act 2012* in accordance with clause 9 of the savings and transitional provisions in Schedule 3 of the *Forestry Act 2012*. The permit is subject to annual renewal by way of a rental payment.

This authorisation for the Trust's use of part of Lot [*redacted*] carried over when the land was vested in the Minister for the Environment administering the NPW Act, and the occupation permit continues to be maintained under Part 5 of the *Forestry Act 2012*.

Figure 3-5 The proposed construction footprint overlaying the area subject to Occupation Permit No. 14184 and the Part 11 land

Figure 3-5 The proposed construction footprint overlaying the area subject to Occupation Permit No. 14184 and the Part 11 land (Lot [redacted]

4 Legislative context

4.1 Permissibility and assessment pathway

State Environmental Planning Policy (Transport and Infrastructure) 2021 (the Transport and Infrastructure SEPP) facilitates the effective delivery of infrastructure across NSW.

The proposed activity is a water reticulation system for the purposes of the Transport and Infrastructure SEPP. Water reticulation systems are defined in the Standard Instrument — Principal Local Environmental Plan as including a place used for the transport of water including canals. Clause 2.159(1) of the Transport and Infrastructure SEPP allows development for the purpose of water reticulation systems to be carried out without consent on any land. As development that is permissible without consent the proposed activity can be assessed under Division 5.1 of the EP&A Act (refer to Section 4.1.3).

The proposed activity would require approval under Part 12 of the NPW Act as detailed in the following sections.

4.1.1 National Parks and Wildlife Act 1974

The proposed activity is mostly located on Lot [*redacted*], which is vested in the Minister for the Environment administering the NPW Act. Vesting of the land occurred on 1 July 2010 in accordance with section 7 of the *National Park Estate (Riverina Red Gum Reservations) Act 2010* (refer to Section 4.1.1.1). Since then, Bullatale Creek Water Trust has continued to access, operate and maintain the inlet regulator and supply channel in accordance with the provisions of clause 7(2) of Schedule 9 of the *National Park Estate (Riverina Red Gum Reservations) Act 2010*, which allows the Minister for the Environment administering the NPW Act to enable an activity that was carried out on land before it was vested in the Minister to continue to be carried out after the land has vested.

Section 149(4)(a) of the NPW Act allows the Minister for the Environment administering the NPW Act to grant a lease of, or a licence with respect to, lands acquired or occupied under section 146 (1) of the Act. Section 151C(1) allows such a lease or licence to be granted subject to conditions. NSW DCCEEW is consulting with NPWS regarding the granting of a lease or licence under section 149(4)(a) of the NPW Act for the proposed activity.

4.1.1.1 National Park Estate (Riverina Red Gum Reservations) Act 2010

The *National Park Estate (Riverina Red Gum Reservations) Act 2010* was enacted to facilitate the reservation of land under the NPW Act and vesting other lands in the Minister for the Environment administering the NPW Act. The Act facilitated the reservation of Murray Valley National Park and Murray Valley Regional Park from several former State forests.

In accordance with clause 2(12) of Schedule 3 of the Act, Lot [*redacted*] was vested in the Minister for the Environment administering the NPW Act.

Clause 7(2) of Schedule 9 of the NPW Act confirms that the Minister for the Environment administering the NPW Act may exercise their powers under section 149 of the Act to allow an activity to continue to be carried out on land that vested in them under the Act if that activity was carried out on the land before it was so vested. Clause 7(3) allows the Director-General of the Department of Planning, Housing and Infrastructure to authorise the use of relevant access roads for the purpose of enabling any lawful activity to be carried out on land that vested in the Minister for the Environment administering the NPW Act under the Act. In accordance with clause 7 of Schedule 9 of the Act, Bullatale Creek Water Trust has been permitted to continue to access, operate and maintain the existing inlet regulator and supply channel since Lot [*redacted*] vested in the Minister for the Environment administering the NPW Act in accordance with the occupation permit they held at the time the land vested. Figure 3-5 shows the location of Lot [*redacted*] DP[*redacted*] and the land subject to the occupation permit.

4.1.1.2 Leases and licences under the NPW Act

Part 12 of the NPW Act provides for the granting of a lease, licence or easement for the use of land, buildings or structures within a reserve. NSW DCCEEW, on behalf of Bullatale Creek Water Trust, has engaged with NPWS regarding the application of Part 12 of the NPW Act to the proposed activity and this has confirmed that an easement for water supply will need to be granted under section 153 of the NPW Act to operate the replacement Bullatale inlet regulator.

Bullatale Creek Water Trust will negotiate the terms of the draft easements with NPWS. Once the construction and commissioning works are completed, the replacement regulator will be surveyed in accordance with the Conveyancing Act 1919 prior to the easements being granted.

4.1.1.3 Protection of Aboriginal objects and Aboriginal places

Part 6 of the NPW Act provides for the protection of Aboriginal objects and Aboriginal places. Sections 86 and 87 of the Act makes it an offence to harm or desecrate Aboriginal objects and Aboriginal places unless the harm or desecration was authorised by an Aboriginal heritage impact permit or due diligence was exercised to determine whether the subject act would harm an Aboriginal object and it was reasonably determined that no Aboriginal object would be harmed. Section 90 of the Act details the requirements for applying for and granting of Aboriginal heritage impact permits.

An Aboriginal cultural heritage assessment report has been prepared in accordance with the *Code of Practice for the Investigation of Aboriginal Objects in NSW* (DECCW 2011) to inform this REF and is provided in Attachment D and summarised in Section 6.6. The assessment determined that the proposed activity would not alter any existing Aboriginal cultural heritage or values and, therefore, an Aboriginal heritage impact permit is not required.

4.1.1.4 Assets of intergenerational significance

Part 12A of the NPW Act provides for the declaration of land reserved or acquired for reservation to be an environmental or cultural asset of intergenerational significance and makes it an offence to damage, harm or disturb such assets unless it was carried out in accordance with a conservation action plan, an Aboriginal cultural practice, a planning approval under the EP&A Act or an authorised action under the Rural Fires Act 1997.

The proposed activity is not located on a declared asset of intergenerational significance site. The Koala (*Phascolarctos cinereus*) is a threatened species asset of intergenerational significance and it has potential habitat in the construction footprint. However, Murray Valley National Park and Regional Park are not included in the reserves where the conservation action plan for the Koala applies.

4.1.2 National Parks and Wildlife Regulation 2019

The NPW Regulation regulates the use of national parks and land acquired by the Minister under Part 11 of the NPW Act, which, along with other land types, are collectively referred to as 'parks' in the regulation. The NPW Regulation prohibits the following conduct within a park without the consent of a park authority:

- Sections 9 and 10 prohibit the entry and use of heavy and noisy machinery
- Section 14 prohibits interfering with animals or their nests, eggs, habitation or resting place or any beehive
- Section 20 prohibits the construction, operation or use of any structure, installation, engineering, plant or equipment
- Section 21 prohibits the cutting, felling, removal, damage or destruction of vegetation.

Construction of the proposed activity will require a consent from NPWS. The construction works will need to be carried out in accordance with the conditions of the consent.

4.1.3 Environmental Planning and Assessment Act 1979

This REF has been prepared in accordance with Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The REF examines and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity, in accordance with section 5.5 of the EP&A Act.

Section 171(1) of the Environmental Planning and Assessment Regulation 2000 requires that a determining authority must take into account the environmental factors specified in the environmental factors guidelines that apply to the activity. Accordingly, this REF has taken into account the environmental factors specified in the *Guidelines for Division 5.1 assessments* (Department of Planning and Environment, 2022).

NPWS has developed guidelines for the preparation of REFs for activities proposed within national parks. The *Guidelines for Preparing a Review of Environmental Factors: How to Assess the Environmental Impacts of Activities Within NSW National Parks* (Department of Planning and Environment, 2021) are designed to help proponents to develop the contents of an REF and also understand post-determination requirements. The guidelines were considered during the development of the REF template and contents of this REF.

4.1.4 State environmental planning policies

4.1.4.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

As discussed in Section 4.1, the proposed activity is permissible without consent in accordance with clause 2.159(1) of Division 24 of the Transport and Infrastructure SEPP, which addresses water supply systems.

The proposed activity is a water reticulation system for the purposes of the Transport and Infrastructure SEPP. Water reticulation systems are defined in the Standard Instrument – Principal Local Environmental Plan as a place used for the transport of water and includes canals such as Bullatale supply channel. Clause 2.159(1) of the Transport and infrastructure SEPP allows development for the purpose of water reticulation systems to be carried out without consent on any land. Accordingly, development consent is not required under Part 4 Division 4.1 of the EP&A Act. However, environmental assessment and approval is required under Part 5 Division 5.1 of the EP&A Act as discussed in Section 4.1.3.

4.1.4.2 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) contains provisions to protect the biodiversity values and amenity of trees and other vegetation in non-rural areas of NSW (Chapter 2), encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas (Chapters 3 and 4), conserve and enhance the riverine environment of the Murray River (Chapter 5), and control development in certain water catchments (Chapter 6). Only Chapter 5 of the Biodiversity and Conservation SEPP is relevant to the proposed activity.

The objectives of Chapter 5 of the Biodiversity and Conservation SEPP are to ensure that appropriate consideration is given to development with the potential to adversely affect the riverine environment of the Murray River, to establish a consistent and co-ordinated approach to environmental planning and assessment along the Murray River, and to conserve and promote the better management of the natural and cultural heritage values of the riverine environment of the Murray River. Part 5.2 identifies planning principles that a determining authority must take into account when considering a proposed development that may adversely affect the riverine environment of the Murray River including access, bank disturbance, flooding, land degradation, landscape, river related uses, settlement, water quality and wetlands. Part 5.3 identifies consultation requirements for various types of development.

The requirements of Chapter 5 of the Biodiversity and Conservation SEPP have been considered during preparation of the concept design for the proposed activity and this REF. Consultation carried out during preparation of the concept design and REF is discussed in Chapter 5.

4.1.5 Strategic plans

4.1.5.1 NSW Water Strategy

The *NSW Water Strategy* (Department of Planning, Industry and Environment, 2021) is a 20-year State-wide strategy to improve the security, reliability and quality of NSW's water resources over the coming decades. The NSW Water Strategy addresses key challenges and opportunities for

water management and service delivery across the State and sets the strategic direction for the NSW water sector over the long-term.

The strategy outlines key priorities. Priority 3 is to improve river, floodplain and aquifer ecosystem health, and system connectivity and is relevant to the proposed activity.

4.1.5.2 Murray-Lower Darling Long Term Water Plan

The *Murray-Lower Darling Long Term Water Plan* (Department of Planning, Industry and Environment, 2020a) contains ecological objectives and targets for priority environmental assets and ecosystem functions in the Murray-Lower Darling catchment. The objectives and targets have been identified for native fish, native vegetation, waterbirds and river connectivity. The broad environmental outcomes sought in the plan are to:

- Maintain the extent and improve the health of water-dependent native vegetation and wetlands
- Maintain the diversity of waterbird species and increase their numbers across the catchment
- Maintain the diversity and improve the population of native fish in the catchment
- Maintain and protect a variety of wetland habitats and support the movement of carbon and nutrients throughout the river system
- Maintain the number and type of water-dependent species throughout the catchment.

Implementation of the proposed activity would support these environmental outcomes through opening up fish movement along about 60 kilometres of waterway between the Murray River and the Edward River, as well as increasing the duration of the period of flow achievable into Bullatale supply channel as discussed in Section 2.1.

4.1.5.3 Barmah-Millewa Forest Environmental Water Management Plan

The *Barmah-Millewa Forest Environmental Water Management Plan* (Murray-Darling Basin Authority, 2012) consists of a long-term strategic plan that outlines the environmental water requirements of the Barmah-Millewa Forest and how to broadly achieve them with a combination of environmental water works and measures.

The plan provides context for water planning, delivery, monitoring and consultation processes at Barmah-Millewa Forest and provides a broad description of the proposed operating regimes to maximise ecological outcomes. An operating strategy is provided in Schedule 2 of the plan and it aims to achieve the ecological objectives set for the forests by providing the water requirements for key vegetation communities, including wetlands, giant rush, moira grass plains, River Red Gum Forest and woodland and black box communities. The operating strategy also includes specific flow recommendations to support breeding events of waterbirds, including colonial and non-colonial nesters.

Despite the operating strategy, annual water planning, and implementation are responsive to changing water resource conditions, opportunities and environmental priorities throughout the season and from year to year.

4.1.6 Local environmental planning instruments

4.1.6.1 Murray Local Environmental Plan 2011

The proposed activity would be located within the Murray River Council local government area on land subject to the Murray Local Environmental Plan (LEP) 2011. The proposed activity would be located on land zoned C1 – National Parks and Nature Reserves under the LEP.

Under the LEP, development is only permitted without consent on land zoned E1 if it is a use authorised under the NPW Act. The proposed activity is permitted without consent subject to the LEP as it has been deemed authorised under the NPW Act.

The proposed activity is located within the flood planning area identified in clause 5.21 of the LEP. Clause 5.21(2) states that development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development:

a) is compatible with the flood function and behaviour on the land, and

b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and

c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and

d) incorporates appropriate measures to manage risk to life in the event of a flood, and

e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.

As outlined in Section 6.3, the proposed activity would not adversely impact flood behaviour and would be compatible with the current flood function and behaviour on the land given the proposed activity involves replacing an existing inlet regulator. Due to the remoteness of the site and large distance to the nearest residences, the proposed activity would not adversely affect the safe occupation and efficient evacuation of people, would not exceed the capacity of existing evacuation routes, and would not pose a risk to life in the event of a flood.

As outlined in Section 6.1, the potential temporary and short-term erosion and sedimentation impacts posed by the ground disturbance and vegetation clearance during construction of the proposed activity would be significantly reduced with the adoption of appropriate sedimentation and erosion controls in accordance with the Blue Book as detailed in Section 6.1.3. The typically flat terrain would further reduce the risk of soil instability. Therefore, the proposed activity would be consistent with clause 5.21(2) of the LEP.

4.2 Other NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) applies in relation to animals and plants. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

The BC Act establishes procedures and criteria for the recognition of areas of outstanding biodiversity value and species and ecological communities that are threatened. Schedules 1 and 2 of the Act list threatened species and ecological communities respectively. The Act also identifies processes that could adversely affect threatened species or ecological communities or cause species or ecological communities that are not threatened to become threatened. Key threatening processes are listed in Schedule 4 of the Act.

Part 7 of the BC Act identifies biodiversity assessment requirements for approvals under the EP&A Act. In accordance with section 7.2 of the BC Act, development that is an activity subject to environmental impact assessment under Part 5 of the EP&A Act is likely to significantly affect threatened species if it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in section 7.3 of the BC Act or if it is carried out in a declared area of outstanding biodiversity value.

Section 7.8 of the BC Act requires that an environmental assessment under Part 5 of the EP&A Act of a proposed activity likely to significantly affect threatened species is to include or be accompanied by a species impact statement or, if the proponent so elects, a biodiversity development assessment report.

A biodiversity assessment of the proposed activity is provided in Attachment A and summarised in Section 6.4. The proposed activity would not have significant impact on threatened species or ecological communities, or their habitats, and is not in a declared area of outstanding biodiversity value (refer to Section 6.4 and Attachment A). Accordingly, neither a species impact statement nor biodiversity development assessment report is required.

The relevant requirements of the BC Act are addressed in the biodiversity assessment through:

- Desktop review to determine the threatened species, populations or ecological communities that have been previously recorded within the locality
- Identification, assessment and mapping of listed threatened communities and threatened species (or their habitat)
- Assessment of potential impacts on listed threatened species, populations and ecological communities, including identification of key threatening processes relevant to the construction footprint
- Test of significance for potential impacts to threatened species or ecological communities, or their habitats, in accordance with section 7.3 of the BC Act
- Identification of suitable impact mitigation and environmental management measures for listed threatened species, where required.

4.2.2 Rural Fires Act 1977

The *Rural Fires Act 1997* provides for the prevention, mitigation and suppression of bush fires, and aims to protect environmental, cultural and community assets from damage arising from fires. The Act establishes an organisational framework for bush fire management planning, with the creation of rural fire districts under section 6 of the Act and bush fire management committees for each of these districts under section 50 of the Act.

Section 52 of the Act requires each bush fire management committee is required to prepare a bush fire risk management plan for their district. The required contents of bush fire risk management plans are identified in section 54 of the Act and include schemes for the reduction of bush fire hazards and restrictions on the use of fire or other particular fire hazards reduction activities.

The proposed activity is located within the Mid Murray Zone Bush Fire Risk Management Committee area, which includes the Conargo, Deniliquin, Jerilderie, Murray and Wakool local government areas. The committee prepared a bush fire risk management plan for the area in 2009. Information in the plan that is relevant to proposed activity is summarised in Section 6.12.

Under section 3(d) of the Act, the protection of the environment through bush fire prevention activities is required to be carried out having regard to the principles of ecologically sustainable development described in section 6(2) of the *Protection of the Environment Administration Act 1991*.

Section 63 of the *Rural Fires Act 1997* provides that it is the duty of a public authority to prevent the occurrence of bush fires on any land under its ownership or occupancy and to take any steps that a bush fire coordinating committee advises it to take or which are included in an applicable bush fire risk management plan and any other practicable steps to prevent the occurrence of bush fires on, and to minimise the danger of the spread of a bush fire on or from:

a) Any land vested in or under its control or management, or

b) Any highway, road, street, land or thoroughfare, the maintenance of which is charged on the authority.

NPWS's approach to managing fires in parks and reserves is discussed in Section 6.12.

The Act declares the bush fire danger period to run from 1 October to 31 March in the following year (inclusive), which can be modified by the Commissioner of the NSW Rural Fire Service. Total fire bans may be issued by the Minister in the interests of public safety.

The proposed activity does not comprise development for which a bush fire safety authority under section 100B of the *Rural Fires Act 1997* would be required.

4.2.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) applies in relation to fish and marine vegetation. The FM Act provides for the conservation, protection and management of fisheries, aquatic systems and habitats in NSW. The Act is relevant as the proposed activity would directly and indirectly impact aquatic habitats and species.

The FM Act establishes mechanisms for:

- The listing of threatened species, populations and ecological communities or key threatening processes
- The declaration of critical habitat
- Issuing permits for certain works on 'water land'
- Consideration and assessment of threatened species impacts in the development assessment process.

Part 7 of the FM Act relates to the protection of aquatic habitats, including providing management of dredging and reclamation works within permanently or intermittently flowing watercourses, as well as the temporary or permanent blockage of fish passage within a watercourse.

Works associated with construction of the proposed activity would require 'dredging' (excavation of water land or removal of material from water land) or 'reclamation' (using material to fill/reclaim or depositing material to construct anything other than water land) as defined under section 198A of the FM Act.

Section 199 of the FM Act identifies circumstances in which a public authority may carry out dredging or reclamation. Such works are required to be notified to the Minister for Agriculture administering the FM Act in writing. Any matters raised by the Minister require consideration. The proposed activity would require disturbance to the bed of Bullatale supply channel and, therefore, notification to the Minister for Agriculture is required in accordance with section 199 of the FM Act.

Section 218(5) of the FM Act requires that a public authority that proposes to construct, alter or modify a reservoir (including a floodgate) on a waterway must notify the Minister for Agriculture administering the FM Act of the proposed action, and, if the Minister so requests, include as part of the works a suitable fishway or fish by-pass. NSW DCCEEW notified the Department of Primary Industries Fisheries of the proposed action and a fishway has been included in the concept design for the replacement regulator. NSW DCCEEW has engaged with the Department of Primary Industries Fisheries about the design of the fishways (refer to Section 5.2.3).

Construction of the proposed activity would cause a 'temporary or permanent blockage of fish passage within watercourses' as defined under section 219 of the FM Act. A permit to obstruct the free passage of fish would be required under section 219 of the FM Act. It is noted that the existing regulator effectively prevents fish passage so the proposed construction works would result in no worsening of fish passage.

Part 7A of the FM Act relates to threatened species conservation. It details the process for the recognition of threatened species, populations and ecological communities and key threatening processes and offences for harming threatened species, populations or ecological communities and damaging their habitat and critical habitat. Endangered species, populations and ecological communities are listed in Schedule 4 of the Act, critically endangered species and ecological communities are listed in Schedule 4A, vulnerable species and ecological communities are listed in Schedule 5 and key threatening processes are listed in Schedule 6. The proposed activity's potential impacts to threatened species, populations and ecological communities and inclusion of key threatening processes are assessed in Attachment B and summarised in Section 6.5.

4.2.4 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations.

Part 4 of Chapter 4 of the WM Act contains rules for the management and operation of private water trusts. Bullatale Creek Water Trust is a private water trust and is subject to the requirements of Part 4 of Chapter 4 of the WM Act.

Section 89 of the WM Act requires a water use approval for the use of water for a particular purpose at a particular location. A water use approval would be required to extract water for use during the construction phase of the proposed activity.

Section 90 of the WM Act requires an approval to undertake a water management work, which includes construction and use of water supply works. The definition of a water supply work includes any work that has, or could have, the effect of impounding water in a water source.

Section 91 of the WM Act requires an 'activity approval' to carry out a 'controlled activity' in, on or under waterfront land or to carry out an aquifer interference activity. The definition of a controlled activity includes the carrying out of work, the removal of material or vegetation from land, the deposition of material on land and the carrying out of any other activity that affects the quality or flow of water in a water source. Waterfront land is defined as including the bed and banks of rivers as well as land that is 40 metres inland of the highest bank of the river. A river is defined river to include any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved. The proposed activity would involve construction of a replacement inlet regulator and fishway within a watercourse and would therefore be a controlled activity under the WM Act.

Section 41 of the Water Management (General) Regulation 2018 provides that a public authority is exempt from requiring a controlled activity approval to carry out a controlled activity in, on or under waterfront land. Therefore, as NSW DCCEEW is the proponent of the proposed activity, a controlled activity approval is not required. Despite this, relevant controlled activity guidelines have been considered during the design of the proposal.

4.2.5 Heritage Act 1977

The *Heritage Act 1977* provides for the conservation of buildings, works, relics and places that are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the State. Matters protected under the Act include items listed on the State Heritage Register, the heritage schedules of local environmental plans, and/or the conservation registers (or section 170 registers) of NSW government agencies, as well as items subject to an interim heritage order.

Under section 60 of the *Heritage Act 1977*, approval from the Heritage Council of NSW is required before carrying out any work or activities on items listed in the State Heritage Register. The proposed activity would not impact on any items listed on the State Heritage Register.

Section 139 of the *Heritage Act 1977* prohibits a person from disturbing or excavating any land on which the person has discovered or exposed a relic, except in accordance with an excavation permit or a notification granting exception for the permit.

Section 146 of the *Heritage Act 1977* requires that if a relic is discovered or located, the Heritage Council of NSW must be notified of the location of the relic.

Section 170 of the *Heritage Act 1977* requires NSW government agencies to maintain a heritage and conservation register of items of environmental heritage that are vested in, owned or occupied by, or subject to the control of, the agency. The NSW Department of Climate Change, Energy, the Environment and Water maintains the Historic Heritage Information Management System to meets its obligations under section 170 of the *Heritage Act 1977*. The Historic Heritage Information Management System is a database of records of heritage sites and items that exist in the NSW national parks system. A search of the Historic Heritage Information Management System was completed during preparation of this REF and no items were found within the vicinity of the proposed activity (refer to Section 6.7.1.1).

Part 3C of the *Heritage Act 1977* protects historic shipwrecks. Shipwrecks that have been located in the coastal waters of NSW or any other waters within the limits of the State for 75 years or more are recognised as historic shipwrecks in accordance with section 47 of the Act. Movement, damage or destruction of historic shipwrecks is not permitted otherwise than in accordance with an historic shipwrecks permit. The proposed activity would not directly impact any maritime heritage items.

4.2.6 Crown Land Management Act 2016

The *Crown Land Management Act 2016* provides for the ownership, use and management of Crown land in NSW. Ministerial approval is generally required to grant a lease, licence, permit, easement or right of way over a Crown reserve. The Act requires environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land, in accordance with the objects of the Act and the principles of Crown land management.

The proposed activity is not located on Crown land and does not involve any land acquisition or change in land use and does not require the granting of a lease, licence, permit, easement or right of way over a Crown Reserve or changes to any existing lease, licence, permit, easement or right of way.

4.2.7 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) requires that an environment protection licence be held to undertake a scheduled activity or scheduled development work. The proposed activity is not of a kind listed in Schedule 1 of the POEO Act and would not require an environment protection licence under this Act.

Section 43(d) of the POEO Act permits (but does not require) the issue of an environment protection licence for non-scheduled activities. However, compliance with the conditions of such a licence provides a defence to the offence of polluting waters under section 120 of the Act.

Construction activities must comply with the requirements of the POEO Act. Section 139 of the Act relates to the operation of plant and noise pollution and requires that plant be operated in a proper and efficient manner and maintained in an efficient condition.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities and heritage items.

The approval of the Commonwealth Minister for the Environment and Water is required for an action which has, would have, or is likely to have, a significant impact on matters of national environmental significance.

Any potential to significantly impact on matters of national environmental significance is likely to require a referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water for a decision as to whether it is a controlled action requiring approval under the EPBC Act.

The expected impact of the proposed activity on matters of national environmental significance is discussed in Chapter 7. The proposed activity is located within the NSW Central Murray Forests Ramsar site and there are records of, or suitable habitat for, threatened species and migratory species listed under the EPBC Act in the vicinity of the proposed activity. The proposed activity is not expected to have a significant impact on these matters of national environmental significance.

NSW DCCEEW referred the proposed activity to the Commonwealth Department of Climate Change, Energy, the Environment and Water (EPBC number 2022/09390) and it was determined to not be a controlled action on 27 January 2023.

4.3.2 Native Title Act 1993

Native title is the recognition that Aboriginal and Torres Strait Islander people have rights and interests to land and waters according to their traditional law and customs as set out in Australian Law. Native title is governed by the *Native Title Act 1993.*

An indigenous land use agreement, established under the *Native Title Act 1993*, is a voluntary agreement between native title parties and other people or bodies about the use and management of areas of land and/or waters. It can be made over areas where native title has been determined to exist in at least part of the area, where a native title claim has been made or no native title claim has been made.

A search of the National Native Title Register established under section 192 of the *Native Title Act 1993* was carried out on 16 December 2022 shows that Native Title Determination VCD1998/001 (Federal Court file number VID6001/1995) applies to the proposed activity site. The claim was lodged by members of the Yorta Aboriginal Community. A determination was given on 18/12/1998 determining that native title does not exist on the land. There are no current native title claims lodged in relation to land within or adjacent to the proposed activity site and no indigenous land use agreements cover the proposed activity site.

4.4 Consistency with relevant NSW Government policy

Table 4-1 Consistency of the proposed activity with NSW Government policy

Policy name	How proposed activity is consistent
NPWS – People and Wildlife Policy	As per section 47 of the *People and Wildlife Policy*, the protection of wildlife is considered in Section 6.4 and Section 6.5 of this REF. Safeguards that will be implemented to avoid, minimise or manage potential terrestrial and aquatic biodiversity impacts as a result of the proposed activity are outlined in Section 6.4.3 and Section 6.5.3 respectively. The proposed activity is consistent with this policy.
NPWS – Vehicle Access Policy	No new roads are proposed as part of the proposed activity. Vehicle access would be undertaken in accordance with the *Vehicle Access Policy*. As discussed in Section 3.4, construction vehicles would access the construction work site from Millewa Road on the northern boundary of Murray Valley National Park, and then proceed through the national park along the access tracks of Toupna Crossing Road and Millewa River Road. A traffic management plan would be prepared to manage the movement of construction vehicles to and from the proposed activity site. The proposed activity is consistent with this policy. Refer to Section 6.10 for further details on vehicle access and potential traffic impacts.
DCCEEW – Cultural Heritage Community Consultation Policy	Consultation for the Aboriginal cultural heritage assessment component of the proposed activity has been undertaken in line with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, which is understood to supersede this policy.
DPI Fisheries – Policy and Guidelines for Fish Habitat Conservation and Management	Aquatic habitat condition has been assessed against criteria outlined in the *Policy and Guidelines for Fish Habitat Conservation and Management* as detailed in Section 6.5. The proposed activity is consistent with this policy.

4.5 Summary of licences and approvals

Licences and approvals required for the proposed activity are summarised in Table 4-2.

Table 4-2 Licences and approvals required by the proposed activity

Legislation	Licence/approval required
EP&A Act	Planning approval under Part 5 Division 5.1 of the EP&A Act is required. This REF has been prepared to fulfil the requirements of section 5.5 of the EP&A Act.

Legislation	Licence/approval required
WM Act	The following approvals would be obtained prior to construction starting: • A water use approval under section 89 of the WM Act if it is proposed to extract water for use during the construction phase of the proposed activity • A water management works approval under section 90 of the WM Act to modify and operate the proposed replacement inlet regulator, and interim arrangements during construction.
NPW Act	Approval from NPWS is required to construct and operate the proposed activity: • NSW DCCEEW will seek consent from NPWS to carry out the proposed construction works • Bullatale Creek Water Trust will negotiate with NPWS for the establishment of an easement to operate the replacement regulator under section 153 of the NPW Act.
FM Act	The following notifications would occur and approvals and permits obtained prior to construction starting: • Notification of dredging or reclamation work under section 199 of the FM Act • Approval of the fishway design from DPI Fisheries under section 218 of the FM Act • A permit to block fish passage during construction under section 219 of the FM Act (although it is noted that the existing inlet regulator prevents fish passage so the proposed construction works would result in no worsening of fish passage).

4.5.1 Publication triggers

An REF must be published following determination if the proposed activity it assesses requires an approval or permit identified in section 171(4) of the EP&A Regulation before it may be carried out. These triggers are summarised in Table 4-3 in relation to the proposed activity and show that the REF will need to be published because it requires a permit under section 219 of the FM Act to block fish passage during construction. The REF will be published on NSW DCCEEW's website. The published REF will conform with the Web Content Accessibility Guidelines (WCAG) 2.0 Level AA.

Table 4-3 Triggers for publication of the REF

Permit or approval	Applicability
FM Act, sections 144, 201, 205 or 219	Applicable – As noted in Section 4.2.3, construction of the proposed activity would result in the temporary blockage of fish passage within Bullatale supply channel and would require a permit under section 219 of the FM Act. (It is noted that the existing inlet regulator prevents fish passage so the proposed construction works would result in no worsening of fish passage).
Heritage Act 1977, section 57 (commonly known as a section 60)	Not applicable – The proposed activity would not disturb any items on the State Heritage Register (refer to Section 6.7).
NPW Act, section 90 (Aboriginal heritage impact permit)	Not applicable – The proposed activity would not disturb any known Aboriginal heritage items (refer to Section 6.6.2).

Permit or approval	Applicability
POEO Act, sections 47–49 or 122	Not applicable – The proposed activity is not a scheduled development work or a scheduled activity and, therefore, does not require an environment protection licence.

5 Consultation

5.1 Community and stakeholder consultation

NSW DCCEEW has developed a Communication and Stakeholders Engagement Plan for the Millewa Forest Supply Project. The plan identifies the following project stakeholders that are relevant to the proposed activity:

- NPWS, as the park authority responsible for managing Murray Valley National Park and Regional Park and delivery of The Living Murray program at Millewa Forest
- Bullatale Creek Water Trust, as the owner and operator of both the existing inlet regulator and the proposed replacement inlet regulator
- DPI Fisheries, as the agency responsible for the administration of the FM Act, which is the principal piece of NSW legislation for managing the State's fishery resource (refer to Section 4.2.3)
- The Biodiversity, Conservation and Science Directorate of the Environment and Heritage Group, a part of the NSW Department of Climate Change, Energy, the Environment and Water
- Yorta Yorta Nation and Bangerang Nation, the traditional custodians of Millewa Forest, as well as other representatives of the local Aboriginal community including the Cummeragunja and Moama Local Aboriginal Land Councils
- Adjoining landholders to Millewa Forest
- Commonwealth Department of Climate Change, Energy, the Environment and Water, as the Commonwealth agency responsible for administering the EPBC Act including ensuring the protection of Ramsar sites.

NSW DCCEEW has engaged with all of the above stakeholders since it commenced optioneering and preparation of concept designs for the Millewa Forest Supply Project works in early 2021. It has established a stakeholder advisory group as a mechanism to engage with key stakeholders about the progress of the Millewa Forest Supply Project, with representatives of recreational fishers, Murray Tourism Board, NPWS West Branch Regional Advisory Committee, Murray Darling Wetlands Working Group, Cummeragunja Local Aboriginal Land Council and Bullatale Creek Water Trust participating in the group. It has also established a technical advisory group to receive feedback and advice from certain stakeholders on the optioneering and concept design development, with NPWS, Water NSW, DPI Fisheries, the Biodiversity, Conservation and Science Directorate, the Commonwealth Environmental Water Office and the Murray-Darling Basin Authority all participating in this group.

Stakeholder consultation activities for the Millewa Forest Supply Project relevant to the proposed action include:

- Stakeholder advisory group meetings held on 20 May 2021, 21 July 2021, 28 September 2021 and 11 November 2021 to describe the proposed activity and provide updates on the optioneering and

concept design development. NSW DCCEEW hosted a site visit on 8 March 2022 to show the group the sites where works are proposed and discuss the concept designs. Cummeragunja Local Aboriginal Land Council and Bangerang and Yorta traditional custodians were also invited to this site visit

- Cummeragunja Local Aboriginal Land Council and Bangerang Aboriginal Corporation meetings held on 25 August 2021, 22 September 2021 and 11 November 2021 to describe the proposed activity and provide updates on the optioneering and concept design development
- Yorta Nation Aboriginal Corporation meetings held on 22 September 2021 and 11 November 2021 to describe the proposed activity and provide updates on the optioneering and concept design development
- Technical advisory group meetings held on 27 April 2021, 1 June 2021, 13 July 2021, 24 August 2021 and 23 February 2022 to discuss the objectives and purpose of the project, discuss and evaluate design options, and discuss the findings of the hydrology modelling prepared for the project. A site visit was hosted on 9 March 2022 to show the group the sites where works are proposed and discuss the concept designs
- A basis of design workshop held on 29 October 2021 and attended by NPWS, DPI Fisheries, Biodiversity, Conservation and Science Directorate and the Murray-Darling Basin Authority. Matters discussed at the workshop included the objectives of the Millewa Forest Supply Project and the functional requirements of proposed new infrastructure
- Meetings with Bullatale Creek Water Trust held on 23 June 2021, 10 November 2021, 10 February 2022, 21 June 2022 and 9 August 2023 to discuss their expectations for the proposed action and their functional requirements of the proposed replacement Bullatale inlet regulator, hear their knowledge on local hydrology, present and receive feedback on the hydrology modelling of the proposed replacement inlet, and present and receive feedback on the detailed design of the replacement regulator. A site visit was hosted on 23 February 2022 to discuss the proposed action with representatives of the Trust, with the event providing an opportunity to show the project team site characteristics and elements of the existing infrastructure relevant to the design development process
- A fish movement modelling workshop held on 10 March 2022 and attended by representatives of NPWS, DPI Fisheries and the Biodiversity, Conservation and Science Directorate. The workshop was held in Mathoura and included a site visit. A follow-up meeting to progress the fish movement model was held in Buronga on 18 August 2022.

In addition to the above stakeholder engagement activities, a pre-referral meeting for the proposed activity was held with the Commonwealth Department of Climate Change, Energy, the Environment and Water on 11 August 2022. This was followed by a site visit on 16 August 2022 that was attended by representatives of the Commonwealth Department of Climate Change, Energy, the Environment and Water and the NSW Department of Climate Change, Energy, the Environment and Water.

NSW DCCEEW will continue to consult with these stakeholders during the detailed design and construction phases of the proposed activity.

5.2 Statutory consultation – NSW legislation

5.2.1 Transport and Infrastructure SEPP consultation

Part 2.2, Division 1 of the Transport and Infrastructure SEPP contains provisions for consultation with public authorities prior to the commencement of certain types of development. Table 5.1 lists the consultation requirements under the Transport and Infrastructure SEPP and identifies whether they apply to the proposed activity.

NOTE: All consultation periods listed below require a 21-day notification period.
For each row, if the response is 'yes', consultation with the relevant agency will be required and evidence of that consultation submitted as part of the REF.

Table 5-1 Transport and Infrastructure SEPP consultation

Is consultation required under the Transport and Infrastructure SEPP?	Yes	No
Will the proposed activity have a substantial impact on stormwater management services provided by a council? If 'yes', notification to Council is required.	☐	☒
Is the proposed activity likely to generate traffic to an extent that will strain the capacity of the road system in a local government area? If 'yes', notification to Council is required.	☐	☒
Will the proposed activity involve connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council? If 'yes', notification to Council is required.	☐	☒
Will the proposed activity involve connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council? If 'yes', notification to Council is required.	☐	☒
Will the proposed activity involve the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential? If 'yes', notification to Council is required.	☐	☒
Will the proposed activity involve excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the *Roads Act 1993* (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath)? If 'yes', notification to Council is required.	☐	☒
Is the proposed activity likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a State heritage item, in a way that is more than minor or inconsequential? If 'yes', notification to Council is required.	☐	☒
Is the proposed activity located on flood liable land? If so, will the works change flooding patterns to more than a minor extent? If 'yes', notification to Council is required.	☐	☒

Is consultation required under the Transport and Infrastructure SEPP?	Yes	No
Is the proposed activity land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land? If 'yes', notification to Council is required.	☐	☒
Is the proposed activity located on flood liable land and permissible without development consent under the following provision of Part 2.3 of the Transport and Infrastructure SEPP: (a) Division 1 (Air transport facilities), (b) Division 2 (Correctional centres and correctional complexes), (c) Division 6 (Emergency services facilities and bush fire hazard reduction), (d) Division 10 (Health services facilities), (e) Division 14 (Public administration buildings and buildings of the Crown), (f) Division 15 (Railways), (g) Division 16 (Research and monitoring stations), (h) Division 17 (Roads and traffic), (i) Division 20 (Stormwater management systems). * This section does not apply in relation to the carrying out of minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance. If 'yes', consultation with the State Emergency Service is required.	☐	☒
Is the proposed activity located adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act? If 'yes', consultation with NPWS is required.	☒	☐
Is the proposed activity located on land in Zone E1 National Parks and Nature Reserves? If 'yes', consultation with the National Parks is required.	☒	☐
Does the proposed activity include a fixed or floating structure in or over navigable waters? If 'yes', notification to Transport for NSW is required.	☐	☒
Will the proposed activity increase the amount of artificial light in the night sky within the dark sky region as identified on the dark sky region map? If 'yes', notification to the Director of the Observatory is required.	☐	☒
Is the proposed activity located on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument? If 'yes', notification to the Secretary of the Commonwealth Department of Defence is required.	☐	☒
Is the proposed activity within a mine subsidence district within the meaning of the Coal Mine Subsidence Compensation Act 2017? If 'yes', notification to Subsidence Advisory is required.	☐	☒
Is the proposed activity traffic-generating development as listed in Schedule 3 of the SEPP? If 'yes', notification to Traffic for NSW is required.	☐	☒

It is noted that clause 2.17(1)(a) provides an exemption to consultation in that NSW DCCEEW as the proponent must notify NPWS as a public authority from whom an approval is required in order for the activity (as development) to be carried out lawfully. As discussed in Section 4.1.1.2, approval to

carry out the proposed activity is required from NPWS under the NPW Act and, therefore, the requirement to consult with NPWS under clause 2.15(2)(b) of the TISEPP does not apply.

NSW DCCEEW has involved the NPWS West Branch Regional Advisory Committee in consultation for the proposed activity through their participating in technical advisory group and stakeholder advisory group meetings and other consultation activities. NPWS has been closely involved with all aspects of the planning, design, consultation and impact-mitigation of the proposed activity since its inception.

NSW DCCEEW provided NPWS a draft copy of this REF for their comment and has taken into consideration comments provided by NPWS.

NSW DCCEEW will continue to liaise with NPWS as the proposed activity progresses.

5.2.2 Biodiversity and Conservation SEPP consultation

Clause 5.10(1) of the Biodiversity and Conservation SEPP provides that, for activities proposed within the riverine land of the Murray River, consultation must be carried out as follows:

a. *if development consent is required—by the consent authority before determining the development application, or*
b. *if development consent is not required—by the public authority or person carrying out the development, before carrying out the development.*

Clause 5.10(2) provides that consultation by an authority or person with a listed agency must be carried out as follows:

a. *The authority or person must write to the listed agency giving a description of the proposed development*
b. *The authority or person must request the listed agency to comment on the proposed development within 21 days from the date the agency receives the notice*
c. *The authority or person must consider any comments made on the proposed development by the listed agency within those 21 days.*

Clause 5.11(1) defines the general provisions for consultation under the Biodiversity and Conservation SEPP. The applicability of these provisions to the proposed activity is outlined in Table 5-2.

Table 5-2 Biodiversity and Conservation SEPP consultation

Consultation under Biodiversity and Conservation SEPP (clause 5.11(1))	Response
(a) **Where development is contrary to the aims, objectives or principles of this Chapter and may have a significant environmental effect along the Murray River—the P&D (Vic), C&NR (Vic) and the adjacent local Council in Victoria must be consulted.**	Not applicable – The proposed activity is considered to be consistent with the aims and objectives of Chapter 5 of the Biodiversity and Conservation SEPP and is not expected to have a significant environmental effect along the Murray River.

Consultation under Biodiversity and Conservation SEPP (clause 5.11(1))	Response
(b) Where development may affect boating safety—Transport for NSW must be consulted.	Not applicable – The proposed activity would not affect boating safety.

As outlined in Table 5-2, consultation under the Biodiversity and Conservation SEPP is not required for the proposed activity.

5.2.3 Fisheries Management Act 1994

Ongoing consultation with DPI Fisheries regarding the proposed activity has occurred in accordance with the requirements of the FM Act (refer to Section 4.2.3). DPI Fisheries has reviewed the Upper Millewa Forest Works Package – Draft Concept Design Report (3Rivers, 2023). Feedback from DPI Fisheries has ensured that key objectives of the proposed activity are implemented with appropriate consideration of regulations for providing suitable fish passage.

In addition, representative of DPI Fisheries have attended the following:

- Technical advisory group meetings
- Basis of design workshop
- Fish movement modelling workshop and field visit
- Operational plan workshops.

As the proposed activity involves instream works including excavation, dredging and temporary blockage of fish passage, notification and/or approval from DPI Fisheries is required under sections 199, 218 and 219 of the FM Act as detailed in Section 4.5.

5.2.4 National Parks and Wildlife Act 1974

The proposed activity is located on land either acquired under Part 11 of the NPW Act or gazetted as National Park in accordance with section 30A of the NPW Act.

Construction and operation of the proposed activity requires authorisation under the NPW Act. NSW DCCEEW is engaging with NPWS to provide the information required to receive an authorisation to construct the proposed activity (refer to Section 4.1.2), and is facilitating negotiation between NPWS and Bullatale Creek Water Trust for the establishment of an easement under section 153 of the NPW Act to enable the Trust to operate of the replacement regulator (refer to Section 4.1.1.2).

Consultation with Aboriginal stakeholders has occurred during preparation of the Aboriginal cultural heritage assessment report in accordance with section 60 of the NPW Regulation and is described in Attachment D and summarised in Section 5.3 below.

5.3 Consultation with Aboriginal communities

The proposed activity is located within the traditional lands of the Yorta and Bangerang Aboriginal communities (Tindale, 1974). The land, water, plants and animals within a landscape are central to Aboriginal spirituality and contribute to Aboriginal identity.

Stakeholder and community engagement amongst Aboriginal traditional owners and communities for the proposed activity to date has been guided by the First Nations community and stakeholder engagement plan prepared for the project. NSW DCCEEW is committed to supporting close involvement and participation of Aboriginal people in water infrastructure, research, and management. To date, consultations with the First Nations communities have shown positive outcomes for Aboriginal and Torres Strait Islander communities, who have been provided opportunities for input during the development of the proposed activity.

In order to facilitate ongoing community consultation and communication in the plan's delivery, Aboriginal community representatives are invited to participate in the project's stakeholder advisory group, including representatives from the Cummeragunja Local Aboriginal Land Council. This group supports the proposed activity regarding consultation and communication with various community stakeholders.

NSW DCCEEW also has a dedicated First Nations engagement team who have engaged with the project's Aboriginal stakeholders through 'one-on-one' conversations, in-person meetings and site visits to provide more comprehensive engagement than is possible through the more formal stakeholder advisory group meetings. Engagement with Aboriginal stakeholders regarding the potential Aboriginal heritage impacts of the proposed activity has also followed the *Aboriginal Cultural Heritage consultation requirements for proponents* (DECCW, 2010) required as part of the Aboriginal cultural heritage assessment process in NSW.

A search of the National Native Title Tribunal online register was undertaken in December 2022 and indicated:

- Native Title Determination VCD1998/001 (Federal Court file number VID6001/1995) applies to the proposed activity site. The claim was lodged by members of the Yorta Aboriginal community. A determination was given on 18/12/1998 determining that native title does not exist on the land
- There are no current native title claims lodged under the *Native Title Act 1993* in relation to land within or adjacent to the proposed activity site
- No Indigenous Land Use Agreements cover the proposed activity site.

As a result, notification requirements under the *Native Title Act 1993* do not apply to the proposed activity. However, ongoing consultation with relevant Aboriginal communities will be undertaken to assist with the identification of Aboriginal cultural values, improve proposed activity outcomes and to inform the assessment of impacts on Aboriginal cultural heritage for the proposed activity.

5.4 Ongoing stakeholder and community consultation

NSW DCCEEW will continue to consult with stakeholders during the detailed design and construction phases of the proposed activity as required. Stakeholders including the local

community will be kept informed of any changes to the proposed activity resulting from future consultation process or detailed design. Once determined, this REF will be placed on public display for information via the NSW DCCEEW website.

NPWS, Bullatale Creek Water Trust and other key stakeholders will be notified in writing at least two weeks before construction work begins. The notification will outline the proposed duration of the work and any access changes. Contact details to request further information or ask questions will be included in the notification.

6 Environmental assessment

6.1 Topography, geology and soils

6.1.1 Existing environment

The proposed activity is located in the Riverina bioregion which is dominated by river channels, floodplains, backplains, swamps, lakes and lunettes that are all of Quaternary age. Characteristic landforms of the Murray Fans Interim Biogeographic Regionalisation of Australia (IBRA) sub-region include gently undulating landscapes on recent unconsolidated sediments with evidence of former stream channels, braided old river meanders and palaeochannels and broad floodplain areas associated with major river systems and prior steams. Topography in the area of the proposed activity is relatively flat and characterised by natural and modified creeks surrounded by floodplains and bushland areas.

The Murray River at Barmah Choke is characterised by a large volume of deposited sediment, dominated by coarse sand. This contrasts with historical records that describe this location as having a clay bed with sandy point-bars (Grove, 2020). It is hypothesised that the sand slug at Barmah Choke is due to a large pulse of sediment from upstream gold mining and land use changes from the late 1800s to early 1900s (Gower et al, 2020). This sediment is evident in the inlet channel upstream of the existing inlet regulator. Bed aggradation over the last 30 years is estimated to be 70 centimetres for the most downstream section of Barmah Choke, compared to 1.9 metres at the upstream end. Bed aggradation in non-flood years is estimated to be as much as five to six centimetres per year in the widest upstream parts of Barmah Choke, compared to about two centimetres per year for the narrowest downstream sections. In large flood years this is predicted to increase to nine centimetres per year upstream and 4.5 centimetres per year in the downstream narrows (Gower et al, 2020).

The construction footprint has an elevation of approximately 101 metres AHD and is characterised by Quaternary aged alluvial channel deposits. Geotechnical investigations of the construction footprint were undertaken in June 2022. The ground conditions at the construction footprint are typically fine-grained soils (silt and clay) from ground level to between 4.3 metres and 7.2 metres below ground level where they are underlain with coarse grained soils (sand). The fine-grained soils from the construction footprint that were tested were typically clay of low to medium plasticity. It is anticipated that Bullatale inlet regulator would be founded on clay with an undrained shear strength of 65 kPa which provides an ultimate bearing capacity of 455 kN/m^2 and an allowable bearing capacity for design of 182 kN/m^2.

A search of the Australian Soil Resource Information System database carried out on 19 October 2022 did not identify any acid sulfate soils in the proposed construction footprint.

6.1.2 Impacts

6.1.2.1 Construction

The construction of the proposed activity would result in localised ground disturbance and the excavation of surface and subsurface soils adjoining the proposed infrastructure. Surface soils would also be disturbed within construction laydown areas from the movement of plant and vehicles and storage of equipment.

The proposed activity has the potential to cause erosion (including wind erosion from stockpiles), and sedimentation due to localised temporary removal of groundcover and the disturbance of the soil profile. The associated increases in turbidity and suspended sediments in receiving watercourses can lead to reductions in water quality at the site and downstream.

The reuse of clean won site material onsite would minimise disturbance of in-situ soil resources within the construction footprint and avoid the need for borrow pits.

The proposed activity is expected to generate about 6,000 cubic metres of surplus spoil. Spoil would be classified in accordance with the *Waste Classification Guidelines, Part 1: Classifying Waste* (Environment Protection Authority, 2014). Surplus spoil would be transported outside of Murray Valley National Park (and the NSW Central Murray Forests Ramsar site) for either reuse (if classified as virgin excavated natural material or excavated natural material) or disposal at a suitably licenced waste facility. There would be no stockpiling of spoil within or adjacent to the Ramsar site.

The potential temporary and short-term erosion and sedimentation impacts posed by the ground disturbance and vegetation clearance during construction would be significantly reduced with the adoption of appropriate sedimentation and erosion controls in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) ('the Blue Book'). As described in Section 6.1.3, site-specific controls are to be developed in the form of an erosion and sediment control plan and incorporated into the Contractor's construction environmental management plan (CEMP). The typically flat terrain and absence of highly erosive soils would further reduce the risk of soil instability and the subsequent dispersal of sediment during construction. With implementation of suitable controls the potential for negative erosion and sedimentation impacts would be low.

Ground compaction

There is also the potential for ground compaction and loss of soil structure from vegetation removal and construction plant and vehicles traversing over the site and/or construction laydown area resulting in low infiltration rates and increased run-off. The proposed activity has low potential for negative ground compaction impacts due to the short duration of the construction works, small number of plant and vehicles required and small area of the work site, previous disturbance and proximity of the work site to the existing Millewa River Road.

Streambed and bank disturbance

Disturbance of the streambed and banks of the channel would be required within the construction footprint for operation of an excavator. As a result, there is potential for soil erosion and sedimentation downstream if a significant flow event occurred during construction. The removal of riparian vegetation would also increase the potential for erosion of the banks and streambed. However, the likelihood of erosion from flows is considered low as the proposed activity would be scheduled for dry and/or low flow conditions, with cofferdams to be used to stop flows from

entering the in-stream construction area. As a result, the potential for riverbank erosion and a loss of bank stability due to flowing water is considered unlikely except in the event of a sufficiently large flood that overtops the cofferdams.

Contamination

Fuels and lubricants would be used on site during construction activities and these chemicals may pose a potential contamination risk to soils in the event of a spill. Spilt chemicals may alter soil properties and can impact negatively on soil health and consequently plant growth or if absorbed by plants/animals could potentially enter the food chain with adverse impacts. Contaminants in the soil can be mobilised during high rainfall events and surface water runoff which may potentially spread such contamination through the soil profile, or into surface or groundwater potentially impacting aquatic habitats. The potential contamination risk during construction is considered low with further discussion and safeguards detailed in Section 6.14.

Salinity

Salinity impacts occur when salts naturally present in soil or groundwater are concentrated at the surface or in shallow soils generally through transport by rising groundwater. No saline soils have been identified from the publicly available data and geotechnical investigations undertaken for the proposed activity showed low levels of electrical conductivity and chloride and low aggressivity soils. The '*BSM Preliminary Salinity Impact Assessment*' (Jacobs, 2023) has been considered and indicates that no further assessment is required for salinity risks rated nil to low. As such, the *Preliminary salinity risk assessment procedure* (DPE, 2023) is not considered relevant to this proposal and has not been assessed further. Should saline soils exist at the proposed activity work site, they have the potential to impact on surface water and structures associated with the proposed activity if not correctly managed. These risks are further addressed in Sections 6.2.2 and 6.3.2.

6.1.2.2 Operation

Operation of the project would not impact topography, geology or soils, outside of any potential hydrology and erosion impacts assessed in Section 6.3.

6.1.3 Safeguards

Measures proposed to avoid, minimise or manage potential topography, geology and soils impacts as a result of the proposed activity are detailed in Table 6-1.

Table 6-1 Safeguards for topography, geology and soil impacts

Impact	Safeguard	Responsibility	Timing
Erosion and sediment	An erosion and sediment control plan will be prepared as part of the contractor's CEMP. Site specific erosion and sediment control measures will be designed, implemented and maintained in accordance with relevant sections of *Managing Urban Stormwater: Soil and Construction Volume 1* (Landcom, 2004) (the Blue Book). The erosion and sediment control plan will provide details of the cofferdams to be installed upstream and downstream of instream work sites and the strategies that will be implemented to stabilise soils during the construction phase.	Contractor	Construction

6.1.4 Residual impacts

The potential temporary and short-term erosion and sedimentation impacts of the ground disturbance and vegetation clearance during construction would be significantly reduced with the adoption of appropriate sedimentation and erosion controls in accordance with the Blue Book as detailed in Section 6.1.3. The typically flat terrain would further reduce the risk of soil instability and the subsequent dispersal of sediment during construction. There is also the potential for hydraulic leaks and localised soil and water contamination during construction, if not adequately managed. However, given the works would occur in dry waterways and quantities of earthworks are anticipated to be minimal, this not considered to be a significant risk.

Therefore, potential soil impacts associated with the construction of the proposed activity are considered likely to have a low impact due to the localised nature of the proposed works and safeguards detailed above.

6.2 Surface water and drainage

6.2.1 Existing environment

The Murray River at Murray Valley National Park is characterised by Barmah Choke, an 80 -kilometre stretch of the Murray River along which channel depth and width progressively decreases. Barmah Choke restricts the flow of the Murray River to about 7,000 megalitres per day, estimated at Picnic Point. This is the lowest channel flow capacity of any stretch of the Murray River. Because the Murray River is so narrow at Murray Valley National Park, flows often spill over onto the floodplain. Barmah Choke results in flooding of the park commencing above flows of about 10,400 megalitres per day at Yarrawonga (Murray-Darling Basin Authority, 2012).

Before major water resources development, water moved onto the floodplain once the river channel capacity constraint was breached, usually in winter, spring and early summer (Murray-Darling Basin Authority, 2012). Water then moved across the floodplain via a network of braided floodrunner channels, some of which terminate in lakes or swamps.

There have been significant changes to flow regimes within the Millewa Forest primarily due to the regulation of the Murray River following the construction of Hume and Dartmouth Dams. In the twentieth century, banks and a large number of water regulating structures were installed along the Murray River and throughout the floodplain for river regulation and to optimise River Red Gum forestry.

6.2.1.1 Catchment overview

The proposed activity is located within the central portion of the Murray River catchment, otherwise known as Central River Murray catchment. The Central River Murray catchment is a highly developed section which extends from the Hume Dam in the east, upstream of Albury, to the confluence of the Murray and Darling rivers at Wentworth. Elevations range from about 150 metres at the Hume Dam to less than 50 metres at the confluence of the Murray and Darling rivers. Average annual rainfall is about 700 millimetres at the eastern end of the central catchment, but mostly ranges from 500 millimetres to 300 millimetres from east to west respectively, where rainfall is received predominantly in winter and spring (Murray-Darling Basin Authority, 2022a).

From the 1930s, the Millewa Forest water channel network was manipulated by the installation of many banks and regulators and, in some cases, construction of artificial channels. These management interventions influenced the movement of water on the floodplain largely to optimise floodplain forestry. Further infrastructure was constructed during the 1990s to assist with river operations in the Murray and Edward systems. Many of these structures, including the existing inlet regulator, are now old, in a state of disrepair, fail to meet contemporary safety standards and were not designed to optimise fish movement.

6.2.1.2 Bullatale supply channel

Bullatale supply channel extends from Bullatale inlet regulator on the Murray River, to private land north of the park and eventually to Bullatale Creek. Some sections of the channel are natural waterways or modified natural waterways. Bullatale supply channel at Bullatale inlet regulator was created by modifying Lower Toupna Creek. Bullatale supply channel is used to provide water to irrigated farmland to the north of Murray Valley National Park. The supply channel flows in a northerly direction to connect to Bullatale Creek, which flows in a north-westerly direction before joining the Edward River a few kilometres south of Deniliquin.

Flow in Bullatale supply channel is regulated to suit the irrigation needs of members of Bullatale Creek Water Trust. Even if the gates on the existing inlet regulator are fully opened, the structure is a constraint on natural flows in the supply channel.

Whilst the supply channel itself is highly modified, it is classified as a tenth order, perennial waterway and flows through a densely forested area within Millewa Forest in Murray Valley National Park.

6.2.1.3 Inlet channel

The inlet channel is a straight, incised channel which extends approximately 160 metres from the upstream extent of the existing inlet regulator to the confluence with the Murray River (refer to Photo 2-1). The inlet channel has become silted up over time, dominated by coarse sand. Bullatale supply channel downstream of the regulator is similarly straight and incised but becomes wider and

meandering further downstream. Between the upstream and downstream sections, an approximately 70-metre length of the channel is filled in at the existing inlet regulator to bury its twin-pipelines.

The inlet channel was inspected in April 2022 during the investigations for this REF and observed to have a well-defined channel with some sections of steep embankments (refer to Section 3.4.2 of Attachment B). The inlet channel (upstream) appeared to be in good condition, however the water appeared brown and slightly turbid. No odour, froth, scum or oily sheen were present at the time of the inspection. The water within Bullatale supply channel (downstream) appeared transparent with a low-moderate flow. There was no odour present during the time of investigations, however, accumulated froth and scum were present at the culvert opening.

6.2.1.4 Existing water quality

Water quality was monitored at seven locations along Bullatale supply channel on 13 April 2022, when flow of 7,539 megalitres per day was recorded in the Murray River downstream of Yarrawonga Weir, and there was accordingly flow in the channel.

Lower Toupna Creek was monitored at four locations, all of which exhibited good water quality at the time of sampling with low turbidity and pH and dissolved oxygen within acceptable limits for protection of aquatic ecosystems (refer to Appendix C of Attachment B). Electrical conductivity was low and below the target limit. Toupna Creek was monitored at Seven Mile Creek Bridge and exhibited variable water quality between upstream and downstream of the bridge. At the time of sampling, downstream water quality was generally poorer due to low dissolved oxygen (about 57 per cent saturation) and pH that only just met the lower guideline limit of 6.5. Upstream of the bridge however, water quality was better with higher dissolved oxygen and pH. Turbidity and electrical conductivity were similar between the upstream and downstream sampling locations, complying with respective guidelines for protection of aquatic ecosystems. The water quality of Aluminy Creek was good with low turbidity and electrical conductivity, dissolved oxygen levels of approximately 88 per cent and pH within the range of 6.5 and 8.

In summary, the Bullatale supply channel system appears to exhibit good water quality as indicated by the results of the water quality sampling of the forest streams that supply water to the system. Based on the water quality sampling, the NSW Department of Climate Change, Energy, the Environment and Water's (2023) water quality objectives for the Murray River catchment of protection of aquatic ecosystems and visual amenity are currently being achieved (refer to Appendix A of Attachment B).

Site-specific water quality monitoring was undertaken at the existing inlet regulator in April 2022 (refer to Section 3.6.2 of Attachment B). Water quality was found to be good, with measured turbidity and dissolved oxygen within the recommended guideline limits for protection of aquatic ecosystems. pH levels for rivers and streams in Ramsar-listed water dependent ecosystems should be between 6.5 and 7.5. At the time of sampling, pH levels were measured as 7.7 upstream and 7.93 downstream, meaning that at the time of sampling, pH did not comply with the Basin Plan target. Electrical conductivity was measured at a level lower than the Basin Plan target, inferring good water quality. There was low turbidity and good transparency through the water column at the time of sampling indicating that the water quality objective for visual amenity was met. The creek itself

was generally free of debris with the exception of a small amount of froth and scum observed at the regulator opening.

6.2.2 Impacts

6.2.2.1 Construction

Construction activities have the potential to impact water quality from mobilisation of sediments and other contaminants via runoff or construction discharges/dewatering. Adverse impacts to water quality could occur due to:

- Dust (including cement dust), litter and other pollutants being blown from the construction footprint into Bullatale supply channel and the surrounding Millewa Forest
- Loose sediment associated with earthworks, including inlet channel excavation and vehicle movement across exposed earth, mobilising and being transported outside of the construction footprint
- Accidental spills or leaks of fuels and/or oils from the maintenance, refuelling and use of construction plant equipment, and vehicles travelling to and from site
- Runoff contaminated with by-products of activities occurring on site, such as stockpiling, concreting and material laydown
- Loss of containment of concrete slurries or washout water
- Mobilisation of poor-quality water from dewatering instream areas e.g., dewatering to establish a dry work site.

Mobilisation of sediments and poor water quality may harm native species that are unable to tolerate changes to water quality and may cause the following adverse aquatic impacts:

- A decrease in trophic interactions due to decreased visibility
- Reduced light penetration, which can limit growth of aquatic vegetation
- Potential loss of habitat or reduced suitability of habitat for native fauna that are sensitive to changes in water quality.

In addition to sedimentation impacts, concrete works which would be required for construction of the replacement inlet regulator could result in concrete dust, concrete slurries or washout water entering downstream waters. Concrete by-products can be extremely alkaline, with a pH of as much as 12, and therefore have the potential to alter the pH of the receiving water which can be harmful to aquatic life that are sensitive to changes in water quality. Additionally, concrete washout water contains high levels of chromium that can accumulate in the gills and intestines of fish.

6.2.2.2 Operation

As the proposed replacement inlet regulator would be operated in a similar manner to the existing inlet regulator, negligible changes to water quality are expected. The lower commence to flow rate in the inlet channel would result in water flowing downstream of the replacement inlet regulator more often than occurs at the existing inlet regulator, which would reduce the frequency of flows in the supply channel ceasing. All other things being equal, flowing water has better water quality

than standing water due to greater oxygenation from the movement of the water and reduced temperature variation due to mixing and the greater depth of the water column.

6.2.3 Safeguards

Measures proposed to avoid, minimise or manage potential surface water and drainage impacts as a result of the proposed activity are detailed in Table 6-2.

Table 6-2 Safeguards for surface water and drainage impacts

Impact	Safeguard	Responsibility	Timing
Impact of construction activities and mobilising sediment	Erosion and sediment control measures will include but not be limited to: • Sediment fences along the clearing boundary • Stockpiling materials on site for the shortest time feasible • Contouring disturbed areas of the supply channel's bed and banks to reinstate natural contours or otherwise in accordance with the design drawings • Covers on truck loads when transporting loose material • Covers on (or watering of) stockpiles. Where feasible, these control measures will be in place before any vegetation clearing or earthwork starts and will remain in place throughout the construction phase until the site rehabilitation plan has been fully implemented.	Contractor	Detailed design Construction
Instream works	The construction soil and water management plan will include contingency measures in the event of high flows in the Murray River during the construction works.	Contractor	Construction
	Control measures to manage potential pollution or sedimentation impacts from instream works will include but not be limited to: • Cofferdams to create dry sites for instream works • Undertake work when flows in the inlet channel are low/dry for a suitable duration to complete work • Develop contingencies for unexpected moderate to high flows in the Murray River during instream works. Control measures will be in place prior to commencement of any instream works.	Contractor	Detailed design Construction

Impact	Safeguard	Responsibility	Timing
Spills and leaks	• An emergency spill response procedure will be prepared in accordance with NSW DCCEEW's incident management protocols to minimise the impact of accidental spillages of fuels, chemicals and fluids during construction • Hazardous materials such as oils, chemicals and refuelling activities will occur in bunded areas and as far from the inlet channel and Bullatale supply channel as feasible.	Contractor	Detailed design Construction
Concrete works	• Bunded receptacles for concrete waste including concrete slurries and washout water will be provided at the work site to capture, contain and appropriately dispose of any concrete waste at a suitably licenced waste facility. These will be located as far from the inlet channel and Bullatale supply channel as feasible • Concrete elements of the replacement inlet regulator will be prefabricated, where practicable.	Contractor	Detailed design Construction
Dewatering site within temporary dry works areas	The construction soil and water management plan will outline procedures (as per the Blue Book) and water quality standards (ANZG, 2018) to be achieved prior to discharging water to the supply channel.	Contractor	Detailed design Construction
Water quality monitoring	Visual monitoring of local water quality e.g. turbidity, hydrocarbon spills/slicks will be carried out daily during construction to identify any potential spills or deficient erosion and sediment controls. Should a change in water quality appear evident samples will be collected and analysed.	Contractor	Construction

6.2.3.1 Water quality monitoring

The frequency for monitoring water quality during construction will be confirmed during detailed design however as a minimum, visual monitoring should occur daily during construction to identify any change in water quality as a result of construction. During visual inspection where there is potential for release of construction water runoff and visible oil and grease water quality samples should be collected.

Should the results of monitoring identify that the water quality management measures are not effective in adequately mitigating water quality impacts, additional mitigation measures will be identified and implemented as required.

6.2.4 Residual impacts

Implementation of the safeguards identified in Section 6.2.3 would significantly reduce the potential for mobilisation of sediments and other contaminants during construction. Implementation of the safeguards, together with the small construction footprint and short duration of the works, means

there is a low potential for adverse impacts to water quality during the construction phase of the proposed activity.

As the proposed new infrastructure is expected to be operated in a manner consistent with the existing inlet regulator, no adverse impacts to water quality are expected during the operational phase of the proposed activity. The lower commence to flow rate in the inlet channel and supply channel as a result of the proposed activity should result in more frequent flows, which should improve water quality compared to the operation of the existing inlet regulator, all other things being equal.

6.3 Hydrology and groundwater

6.3.1 Existing environment

6.3.1.1 Groundwater

The proposed activity is located within the Central River Murray catchment. Groundwater in this catchment is mainly found in the extensive alluvial groundwater systems on the New South Wales side of the Murray River (Murray-Darling Basin Authority, 2022a). Groundwater systems are highly connected to surface water throughout the Central River Murray catchment.

Groundwater observations during geotechnical investigations for the proposed activity observed groundwater depths of between 2.8 metres below ground level (BGL) and 4.2 metres BGL within the vicinity of the proposed activity. Initial groundwater strikes in these boreholes occurred consistently at or very close to the top of the sand layer and then rose between 2.2 metres and 4.2 metres to lie within the silt/clay layer. This indicates the possibility that there are sub-artesian conditions at the location of the proposed activity.

6.3.1.2 Hydrology

The twin pipelines of the existing inlet regulator provide a fixed restriction on the flow into Bullatale supply channel, although they have the capacity to pass a flow that can overtop the banks of the supply channel downstream. The penstocks on the pipes can be partly or fully closed to control the flow into the supply channel to avoid or reduce overtopping of the supply channel's banks at lower flows in the Murray River. Bullatale Creek Water Trust is understood to generally leave the gates in a fixed position year-round, with one of the gates being 50 per cent open and the other 80 per cent open. Bullatale Creek Water Trust is understood to close both penstock gates at the inlet regulator when there are high flows in the Murray River to prevent flows through the structure contributing to flows in the supply channel.

The Murray-Darling Basin Authority has recently developed a computational hydraulic model of the entire Barmah-Millewa Forest that includes the Murray River, Bullatale Creek, Bullatale supply channel, smaller creeks and flood runners and the ground surface to allow simulations of widespread inundation events. The model has been used by Murray-Darling Basin Authority to simulate flow events ranging from 15,000 to 50,000 megalitres per day in the Murray River.

For the purposes of the proposed activity, a local hydraulic model has been extracted from the Murray-Darling Basin Authority's model to allow flow scenarios in the supply channel to be

simulated more rapidly and to allow model data to be easily updated or modified. The local model includes the Murray River, Bullatale Creek, Bullatale supply channel together with a local area of forest along the west and east sides of the supply channel.

The model results currently predict overflow from Bullatale supply channel to Millewa Forest commencing at a Murray River flow of a little over 10,000 megalitres per day with the penstocks being 50 per cent and 80 per cent open as described above and as shown in Figure 6-1. The capacity of the channel to supply flow without overflow to Millewa Forest is estimated to be about 79 megalitres per day. The channel capacity is relatively sensitive to the channel shape, bed levels, bank levels and degree of vegetation growth.

Flow into the supply channel is also limited by the bed level of the inlet channel and the sill level at the entrance to the twin pipe regulator. Upstream of the regulator the inlet channel bed levels are up to 99.30 metres AHD, which is slightly higher than the regulator sill level of 99.2 metres AHD. Commencement of flow to the inlet channel from the Murray River occurs once the river water level exceeds the highest of these levels, at a flow of about 6,000 megalitres per day based on the local model results. This is reflected in Figure 6-1, which shows no flow through the existing outlet regulator at a Murray River flow rate of 4,000 megalitres per day, and a small flow of about five megalitres per day at a Murray River flow rate of about 6,000 megalitres per day.

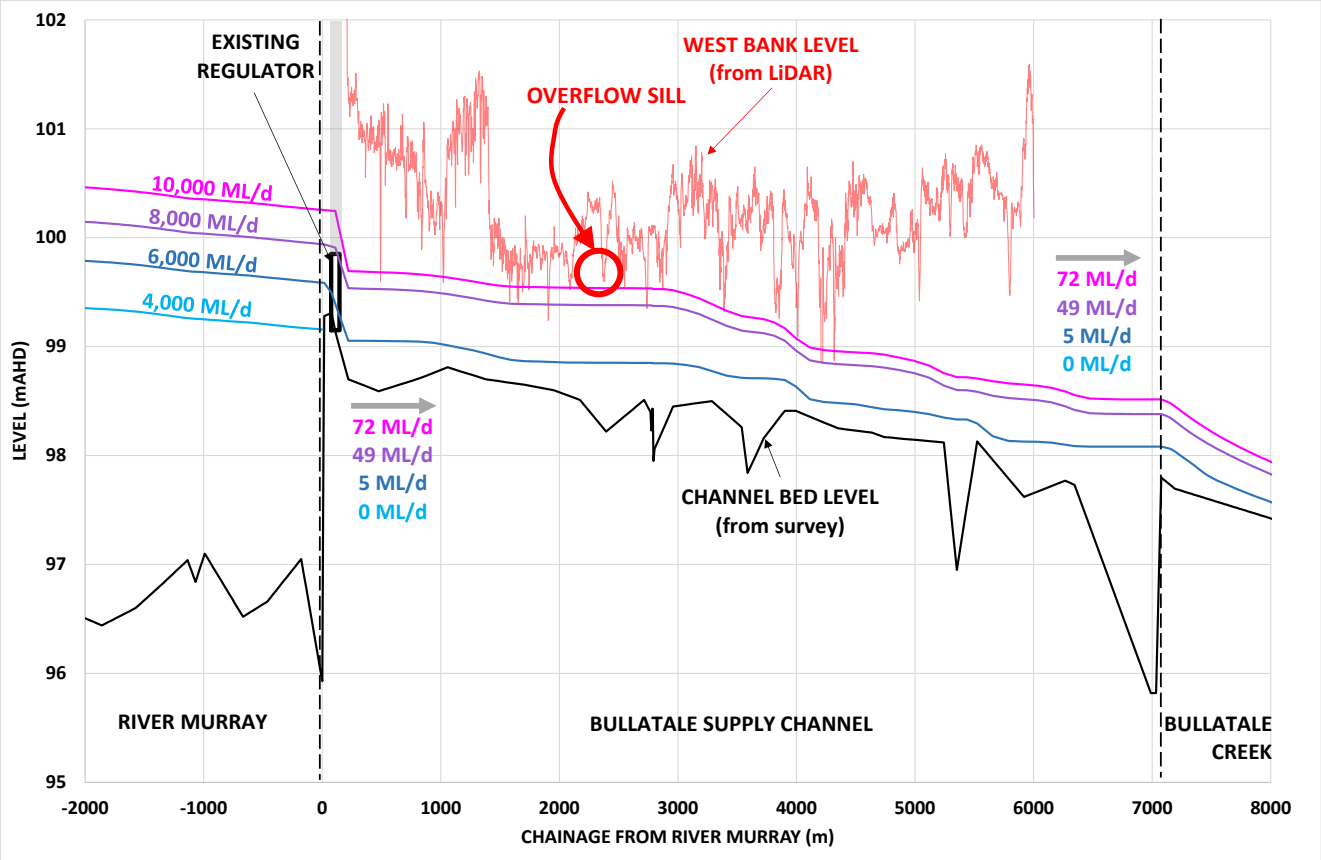


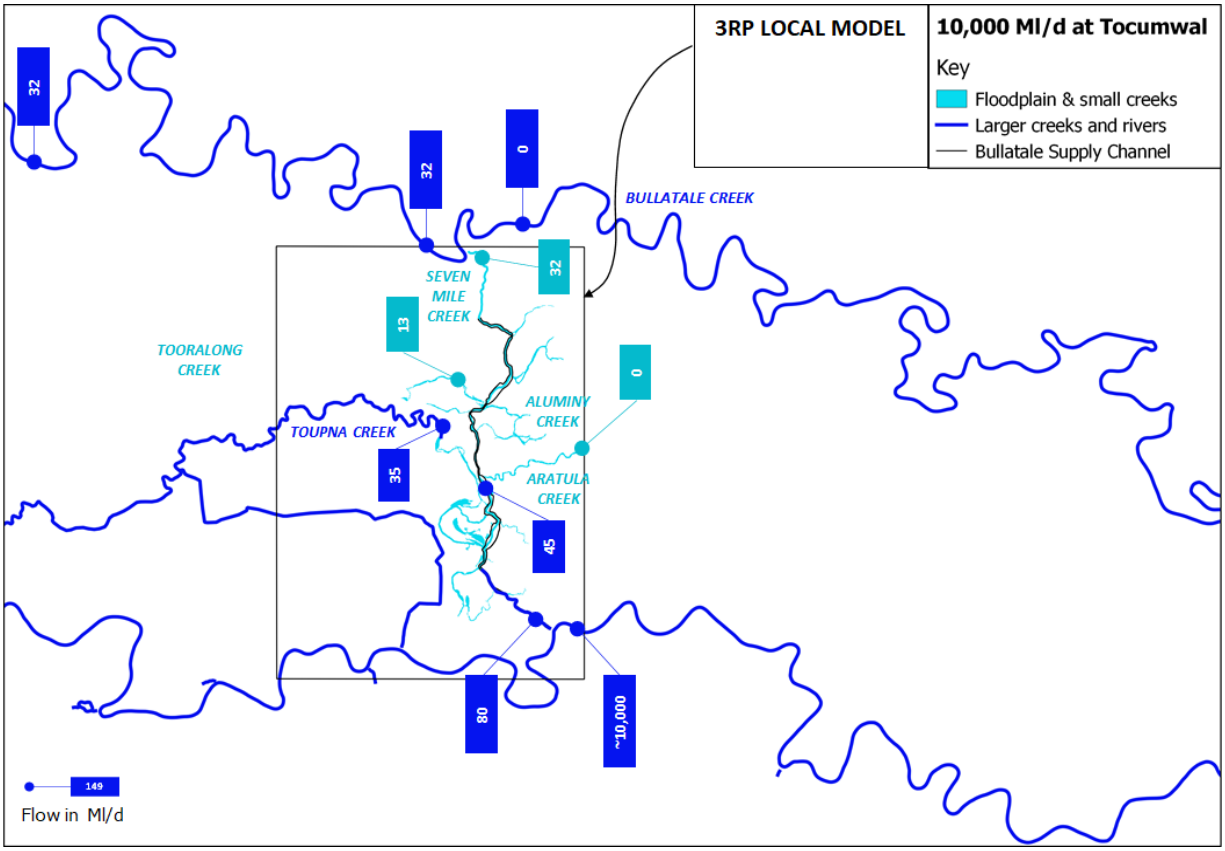
Figure 6-1 Longitudinal profile of the existing supply channel between the Murray River and Bullatale Creek showing the bed level and water level for flows up to about 10,000 megalitres per day

For flows above about 10,000 to 11,000 megalitres per day in the Murray River, overflow from the river further upstream, at Scott's Beach and Low Sandy Creek, passes through the forest in a

westerly direction and into Aratula Creek and Aluminy Creek. This is shown in Figure 6-2, which compares flows in Bullatale supply channel and surrounding waterways for Murray River flows of 10,000 megalitres per day and 15,000 megalitres per day.

The flows arriving from the east contribute to the flow in the lower reach of Bullatale supply channel. Some of this flow is predicted to overflow from the supply channel and pass into the creeks and forest west of the channel, primarily Toupna Creek. The balance of the flow passes downstream along the supply channel and Seven Mile Creek, supplementing the flow into Bullatale Creek. There is also flow into Bullatale Creek further downstream, through Tooralong Creek to the west of the supply channel.

Importantly, as Murray River flows increase above about 10,000 megalitres per day, the higher flows into the inlet channel do not result in comparatively higher flows to Seven Mile Creek and ultimately Bullatale Creek, but instead higher flows into Millewa Forest, as shown in Figure 6-2 and Figure 6-5. Most of the increase in flows spills over the supply channel banks and enters Millewa Forest and Toupna Creek as described above.



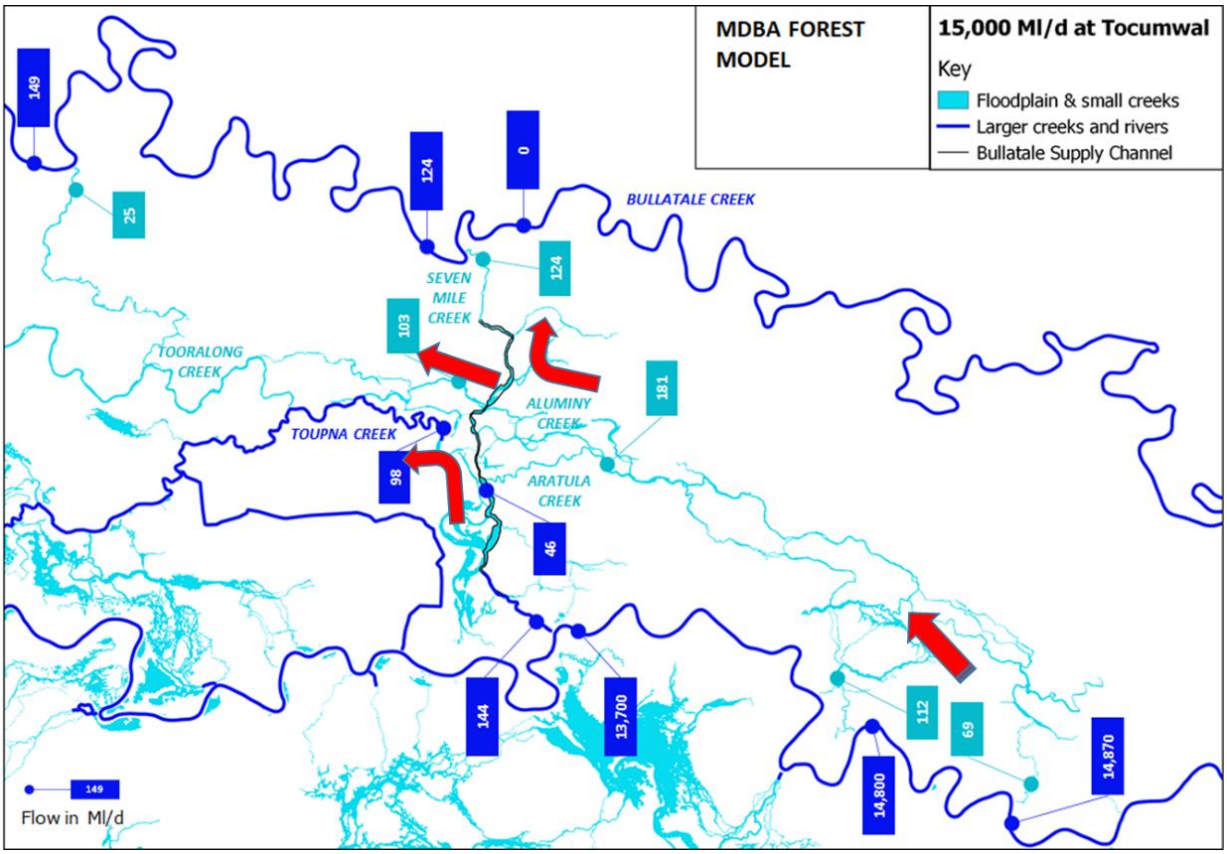


Figure 6-2 Modelled flow distribution in major floodplain waterways around Bullatale supply channel for the existing inlet regulator for flow of 10,000 megalitres per day and 15,000 megalitres per day at Tocumwal

As noted in Section 1.1, Bullatale Creek Water Trust holds licence to extract about 5.4 gigalitres of water from Bullatale Creek annually. The Trust's experience is that when flow in the Murray River is less than 7,500 megalitres per day the volume of water flowing in Bullatale Creek can be insufficient to meets its water demand. Figure 6-3 shows this flow rate overlaid on a hydrograph of Murray River flows at Yarrawonga for the period from 2012 to 2021 and indicates that the Trust is more likely to experience a supply shortfall during autumn and winter.

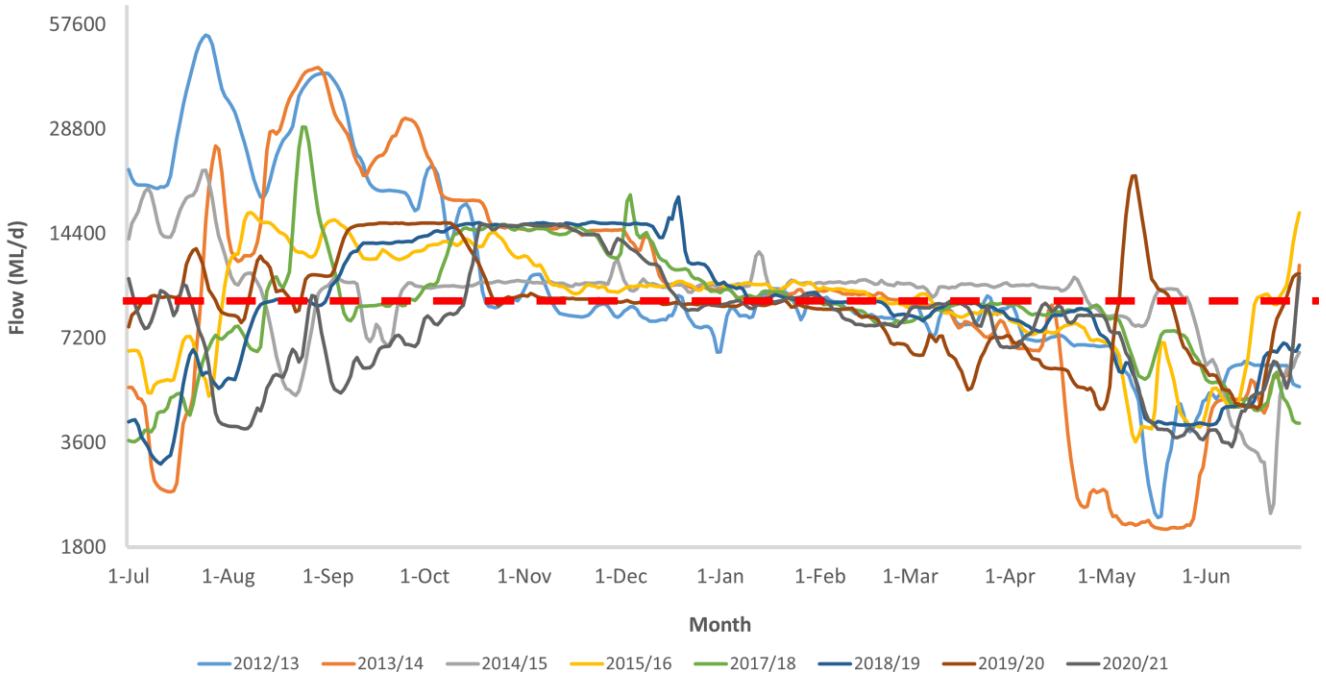


Figure 6-3 Murray River flows 2012 to 2021, with the red dashed line indicating the 7,500 megalitres per day flow rate below which Bullatale Creek Water Trust can experience a supply shortfall

6.3.2 Impacts

6.3.2.1 Construction

6.3.2.1.1 Groundwater

Groundwater is expected to be relatively shallow at the construction footprint. Therefore, there is a risk that groundwater would be encountered during excavations required to form the foundations of the new Bullatale inlet regulator and to cut a channel between the replacement inlet regulator and Bullatale supply channel. Any required dewatering would likely have localised and temporary impacts to groundwater, and construction impacts to regional groundwater systems are anticipated to be insignificant.

6.3.2.1.2 Hydrology

Construction of the proposed activity would require the installation of temporary cofferdams to create a dry work site to enable instream works. The construction phase of the proposed activity would be scheduled to occur when there are low flows in the Murray River and the inlet channel is dry and/or experiencing low flow conditions. The commence to flow rate in the inlet channel currently occurs when flows in the Murray River are about 6,000 megalitres per day. Murray River flow data for the period 2012-13 to 2020-21 shows that flows below 6,000 megalitres per day most often occur from May to July (refer to Figure 6-3). If the construction works are carried out when flows in the Murray River are below about 6,000 megalitres per day then there would be no impact to flows in Bullatale supply channel.

If Bullatale Creek Water Trust requires water during the construction phase while cofferdams are in place that block flow into the inlet channel that would otherwise have reached the existing inlet regulator an equivalent flow in the supply channel would be created using a bypass pump.

6.3.2.2 Operation

6.3.2.2.1 Groundwater

During operation of the replacement inlet regulator, the inlet channel and the replacement inlet regulator would have a lower commence to flow rate of about 4,000 megalitres per day in the Murray River. Bullatale Creek Water Trust would operate the replacement inlet regulator to provide flows in the supply channel above this new commence to flow rate, which would result in water flowing down the supply channel at times when the existing inlet regulator would have been unable to pass a flow and, therefore, potential for slightly greater losses to groundwater.

6.3.2.2.2 Hydrology

A hydrology assessment of the operation of the proposed activity is provided in Attachment C. The assessment identifies that the hydraulic design of the proposed replacement inlet regulator would have a greater flow capacity and duration than the existing inlet regulator. These findings are summarised in the following sections.

Increased flow capacity

The large size and short length of the proposed culverts would significantly reduce the head loss at the replacement inlet regulator compared to the existing inlet regulator, allowing a higher flow through the regulator and into the supply channel than is possible at the existing inlet regulator. The average annual volume possible through the replacement inlet regulator without exceeding the bank full capacity of the supply channel is 16,400 megalitres, which is about 50 per cent greater than that possible through the existing inlet regulator (11,100 megalitres).

Figure 6-4 shows that a 'bank full' flow of about 79 megalitres per day in Bullatale supply channel could be achieved at the replacement inlet regulator at Murray River flows of about 7,100 megalitres per day. This is about 3,700 megalitres per day lower than the about 10,800 megalitres per day flow rate in the Murray River required to achieve an about 79 megalitres per day flow rate downstream of the existing inlet regulator.

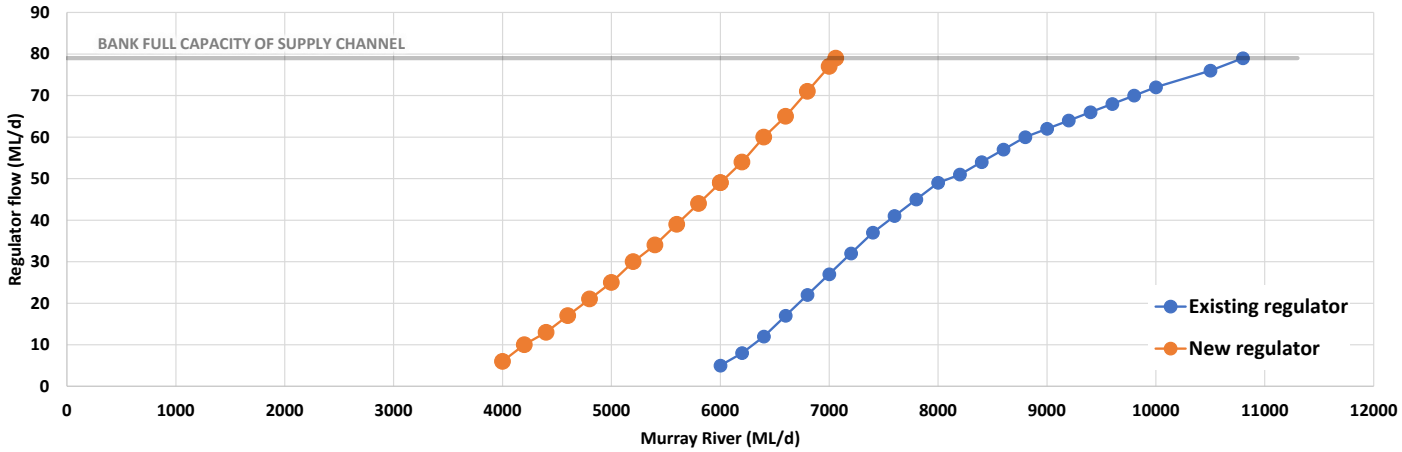


Figure 6-4 Flow through the proposed Bullatale inlet regulator compared to the existing inlet regulator

The gates proposed for the replacement inlet regulator would allow the flow into Bullatale supply channel to be limited to the 'bank full' capacity of the channel. This requires the water level downstream of the regulator to be limited to about 99.75 metres AHD to avoid overflow at the bank sills further downstream.

Similar to the existing inlet regulator, at Murray River flows above about 10,000 megalitres per day uncontrolled flow would start to enter the forest and the supply channel through overflow from the river upstream of the replacement inlet regulator and into the Aratula Creek system. Like at the existing inlet regulator, increased flows in the Murray River directly into Bullatale supply channel would not result in a comparable increase in flows to Seven Mile Creek and ultimately Bullatale Creek, as shown in Figure 6-5, but increased flows into the forest and Toupna Creek as explained above.

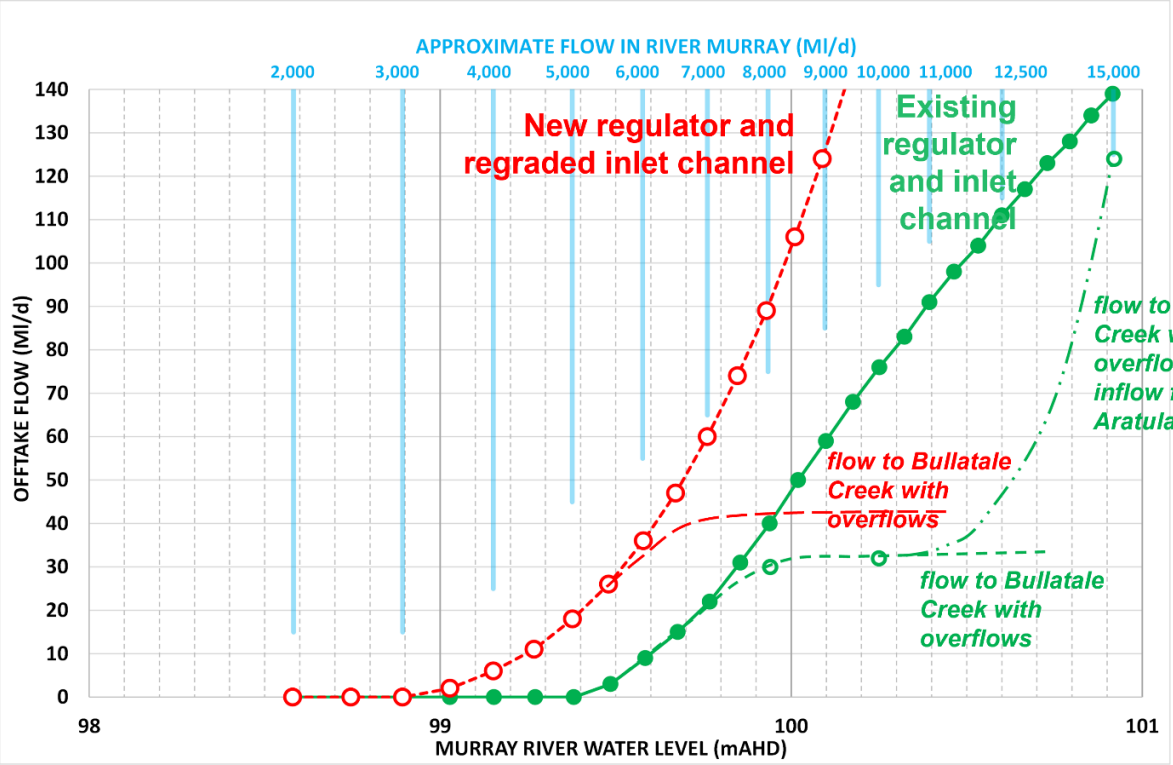


Figure 6-5 Modelled flows through the replacement inlet regulator for various Murray River flows and overflows to Bullatale Creek (shown in red), compared to flows through the existing inlet regulator (shown in green). For the existing inlet regulator only, overflows to Millewa Forest are also shown for Murray River flows above 10,000 megalitres per day

Increased duration of flow

The invert level of the proposed replacement inlet regulator is set at 99 m AHD, which approximately corresponds to the lowest surveyed bed level upstream of the regulator and is 0.15 metres lower than the existing inlet regulator pipe sill. The channel upstream of the regulator would also be desilted to a uniform bed level of 99 m AHD. These changes would lower the commence to flow rate in the inlet channel and through the proposed inlet regulator to about 4,000 megalitres per day in the Murray River. In comparison, flow commences in the existing inlet channel and inlet regulator at a flow rate of about 6,000 megalitres per day in the Murray River. The effects of the change in the commence to flow rate have been assessed using the local hydraulic model

developed with reference to a representative sample period of river flow from 15 August 2012 to 14 August 2021. Within the irrigation season (15 August to 15 May), the number of days per month when flow is possible would generally remain the same with the new regulator, except for the 'shoulder season' months of August, March and April where flow may be possible for up to an additional 6 days per month on average, based on the period of river flow considered (refer to Figure 6-6).

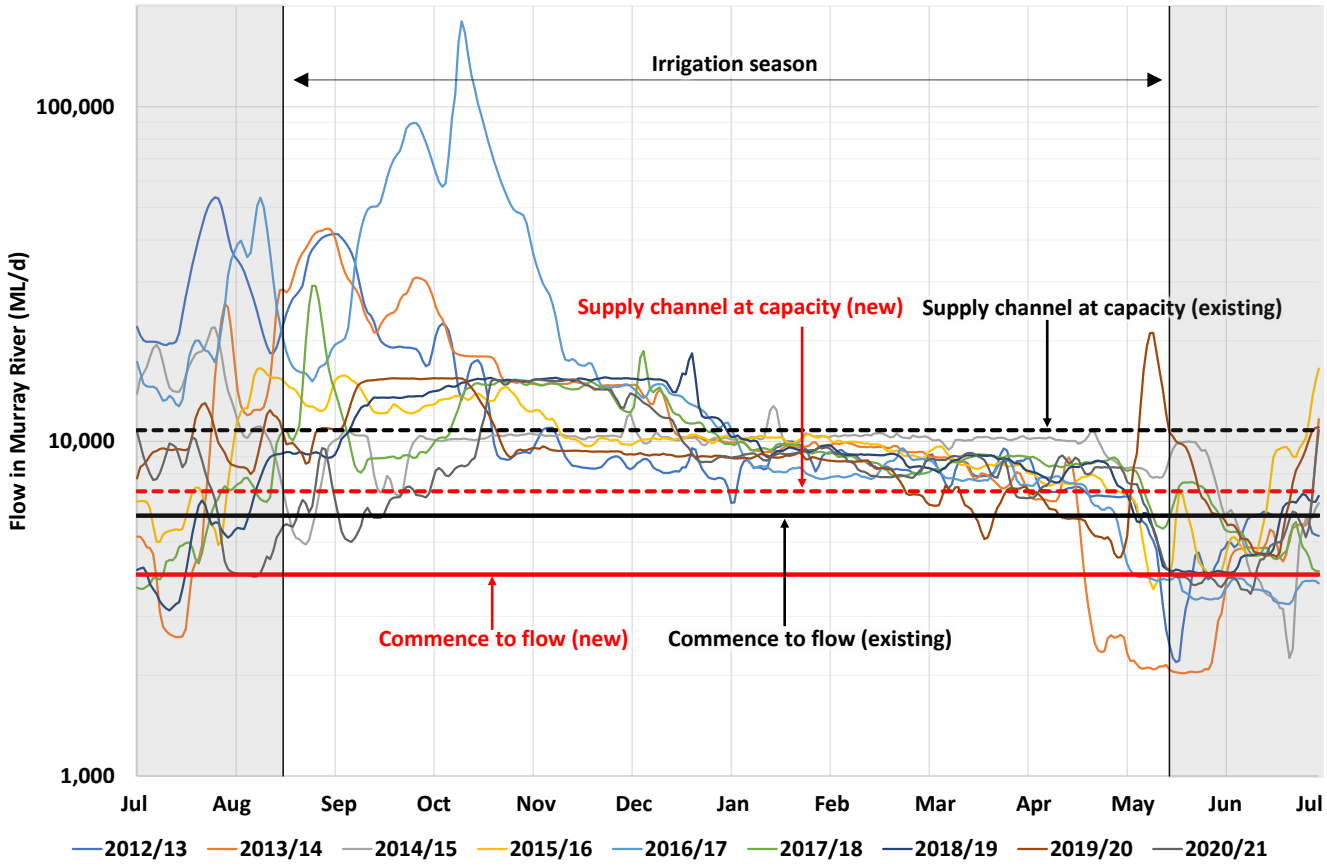


Figure 6-6 Commencement flows to the existing and replacement inlet regulators and flow to full supply for existing and new regulator compared to sample period of flow in Murray River (2012 to 2021)

6.3.3 Safeguards

Measures proposed to avoid, minimise or manage potential hydrology impacts as a result of the proposed activity are detailed in Table 6-3.

Table 6-3 Safeguards for surface water and drainage impacts

Impact	Safeguard	Responsibility	Timing
Cessation of flow downstream of the inlet regulator during construction	If Bullatale Creek Water Trust requires water during the construction phase while cofferdams are in place that block flow into the inlet channel that would otherwise have reached the existing inlet regulator an equivalent flow in the supply channel would be created using a	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	bypass pump. The following controls would be implemented during bypass pumping: • The inlet to the bypass pump will be fitted with a fish screen • Flow would discharge into a bunded area to avoid scouring of the channel bed and capture any coarse sediment in the flow. The bunded area will be sized so that water spills from the bunded area back into the creek at low velocity.		
Groundwater ingress into the work site during construction	Any groundwater that enters excavations within the work site will be tested and, if suitable, pumped into Bullatale supply channel or otherwise pumped into a treatment pond and treated before being discharged into the supply channel. If a treatment pond is proposed it must be located within the construction footprint and its location, size and proposed use must be documented in the construction soil and water management plan. The construction soil and water management plan will include water quality criteria for any water to be discharged into the supply channel.	Contractor	Construction
Overtopping of the banks of Bullatale supply channel during operation	Subject to suitable flows in the Murray River, and based on NSW DCCEEW's hydrology analysis, the position of the gates of the replacement inlet regulator will be trialled during commissioning of the replacement inlet regulator to establish a gate position that produces a flow less than the bank full capacity of Bullatale supply channel and that will enable Bullatale Creek Water Trust to extract their entitlement over an optimal range of Murray River flow rates.	NSW DCCEEW in conjunction with Bullatale Creek Water Trust	Commissioning

6.3.4 Residual impacts

Hydrology impacts during the construction phase would be low because the works would be carried out when there are low flows in the Murray River and no or very low flow in the inlet channel. The operation of the replacement inlet regulator would result in downstream water level increases which may create minor additional losses to groundwater. During operation, the proposed replacement inlet regulator would achieve the current supply flows at Murray River flows around 2,000 megalitres per day lower than at present.

6.4 Terrestrial biodiversity

The *Bullatale Inlet Regulator Replacement – Biodiversity Assessment Report* (refer to Attachment A) assesses the potential terrestrial biodiversity impacts of the proposed activity. The assessment details the findings of a field survey of a study area that includes the construction footprint and a 500-metre buffer around the construction footprint. The key findings of the assessment are summarised in the following sections.

6.4.1 Existing environment

River regulation has led to the deterioration of the Millewa wetland system (Gawne et al., 2011). Altered water regimes are considered to have had a significant impact on water-dependant flora and fauna, particularly on colonial nesting waterbirds (Leslie, 2001) and native fish (King et al., 2009). There is strong evidence of a continuing decline in the Barmah-Millewa Forest ecosystem condition (Gawne et al. 2011), as evidenced through multiple studies over recent decades (Raymond et al., 2016; Sharpe, 2018; Suarez et al., 2018; Raymond et al., 2018; NPWS, 2018). Ground and aerial surveys of waterbirds conducted annually over the past 40 years continue to show significant declines since monitoring commenced in 1983 (Porter et al., 2021).

Previous research in Millewa Forest has found that insufficient inundation of floodplain habitat has resulted in reduced frog species richness via a reduction in habitat quality and availability (Howard et al., 2021). Disease such as chytridiomycosis – present within Millewa Forest – and shifts in climate can also be influential (Howard et al., 2012).

In addition to the pressures of ongoing river regulation, altered flow regimes and periods of drought, Millewa Forest has also been used as a working forest for timber harvesting and grazing (Harrington and Hale, 2011). Agricultural production is a dominant land use in the area immediately surrounding Millewa Forest with substantial clearing and modification of the landscape. This has resulted in increased pressure from introduced plant and animal species in the system, with a high proportion of exotic plant cover in terrestrial areas (up to 60 per cent in some years) and highly invasive aquatic weeds present in the forest's wetlands and waterways (Ward, 2016).

The pressures on Millewa Forest are reflected in the findings of the Murray-Darling Basin Authority's standard condition assessment of tree health which has been monitored repeatedly since 2009. The 2015 surveys found only 17.5 per cent of the forest to be in good condition, with most of the forest described as being in moderate condition (71.3 per cent). The remainder of the forest was described as being in poor condition (9.2 per cent), degraded (1.0 per cent) or severely degraded (1.0 per cent) (Murray-Darling Basin Authority, 2016). Past logging practices and changes to flooding patterns have resulted in high tree densities, with one third of the forest mapped as high stem density stands when the park was gazetted in 2010 (OEH, 2018). This results in competition for resources, particularly water, and results in slow growth rates (and replacement of habitat value trees) and reduced resilience to changing climatic patterns (OEH, 2018).

6.4.1.1 Native vegetation

A field survey of the construction footprint and surrounding area was undertaken on 29 March 2022. The field survey confirmed the presence of River Red Gum sedge-dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW (Plant

Community Type (PCT) 2) within the construction footprint. This PCT within the construction footprint has been classed as low condition vegetation. PCT 2 is not listed as a Threatened Ecological Community (TEC) under the EPBC Act or the BC Act.

Regrowth River Red Gum (*Eucalyptus camaldulensis*) and Silver Wattle (*Acacia dealbata*) dominate the channel of the inlet and supply channels and the northern end of the construction footprint. Occurrences of *Bolboschoenus sp.* are located within the lower stratum and within the inlet and supply channels, along with Common Reed (*Phragmites australis*). Two hollow stags were recorded within the construction footprint containing two 30-centimetre hollows.

6.4.1.2 Threatened flora species

No threatened flora species are considered likely to occur within the construction footprint and no threatened flora species were detected during the field survey.

6.4.1.3 Threatened fauna species

Eight threatened fauna species listed under the EPBC Act and BC Act were assessed as having either a moderate or high likelihood of occurrence within the construction footprint. These species are listed in Table 6-4.

Table 6-4 Threatened fauna species with a moderate or high likelihood of occurring within the construction footprint

Common name	Species	EPBC Act[1]	BC Act[1]	Likelihood of occurrence
Birds				
Dusky Woodswallow	*Artamus cyanopterus*	-	V	High
Varied Sittella	*Daphoenositta chrysoptera*	-	V	High
Hooded Robin (south-eastern form)	*Melanodryas innamomi cucullata*	-	V	Moderate
Scarlet Robin	*Petroica boodang*	-	V	High
Superb Parrot	*Polytelis swainsonii*	V	V	High
Diamond Firetail	*Stagonopleura guttata*	-	V	Moderate
Mammals				
Koala	*Phascolarctos cinereus*	E	E	Moderate
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	-	V	Moderate

[1]Status: V = Vulnerable species, E = Endangered species.

No threatened fauna species were detected during the field survey. A wombat burrow was observed during the survey. The wombat burrow is presumed to be currently occupied by a resident wombat as evidenced by fresh wombat footprints surrounding the burrow.

Bird species would be expected to use vegetation within the construction footprint for nesting and roosting and to forage on flowering trees, while bat species, such as the Yellow-bellied Sheathtail-

bat, may roost in the area's hollow bearing trees. Importantly, there were no culverts present within the construction footprint suitable for bat species.

6.4.1.4 Non-threatened fauna species

The vegetation identified for removal may provide foraging and nesting habitat for non-threatened fauna species including arboreal mammals, birds and reptiles. Common species of the area would face the same impacts as threatened fauna (refer to Section 6.4.1.3). While non-threatened species were not the subject of targeted surveys, species such as the Common wombat (*Vombatus ursinus*) and Echidna (*Tachyglossus aculeatus*) are known to occur in the study area. Platypuses (*Ornithorhynchus anatinus*) and Water Rats (*Hydromys chrysogaster*) may occur in the study area, particularly within and along the supply channel. Native freshwater turtles may be found within the supply channel or nesting in the riparian zone. There would be a minor loss of foraging habitat for common fauna species, including minor indirect impacts such as noise/vibration disturbance. The greatest risk is displaced sediment entering waterways during construction. This could result in impacts to aquatic habitat for common freshwater species. However, the construction footprint is small and ground cover vegetation would recover in the early operational phase.

6.4.1.5 Groundwater dependent ecosystems

The Atlas of Groundwater Dependent Ecosystems (Bureau of Meteorology, 2022) identifies a portion of the construction footprint as containing groundwater dependent terrestrial vegetation (moderate potential groundwater dependent ecosystem). PCT 2 is potentially representative of terrestrial groundwater dependent ecosystems, however this PCT may not be entirely dependent on groundwater. It is likely that this PCT may depend on the subsurface presence of groundwater in some locations where an alternative source of water (i.e., rainfall) cannot be accessed.

6.4.1.6 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value within or near the construction footprint.

6.4.1.7 Weeds of National Significance, Priority Weeds and High Threat Weeds

No Weeds of National Significance were identified within the construction footprint during the field survey. Within the construction footprint, Bathurst Burr (*Xanthium spinosum*) and St. John's Wort (*Hypericum perforatum*) were recorded

(refer to

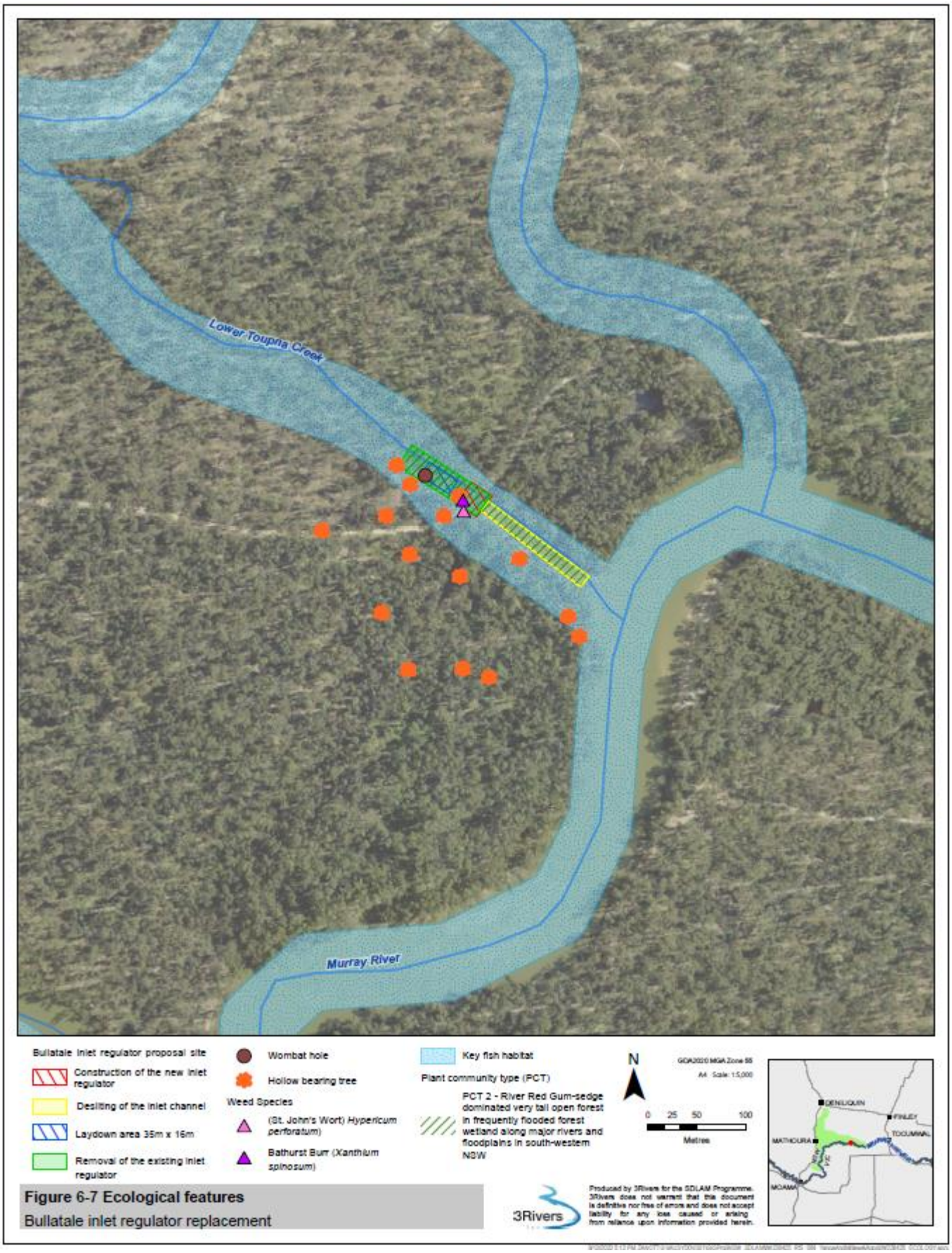


Figure 6-7 Ecological features
Bullatale inlet regulator replacement

Figure 6-7) and are listed as weeds of concern in the *Riverina Regional Strategic Weed Management Plan* (Riverina Local Land Services, 2017). Bathurst Burr is also listed as a Priority Weed under the *Biosecurity Act 2015* for the Riverina region and as a High Threat Weed within the Biodiversity Assessment Method Calculator.

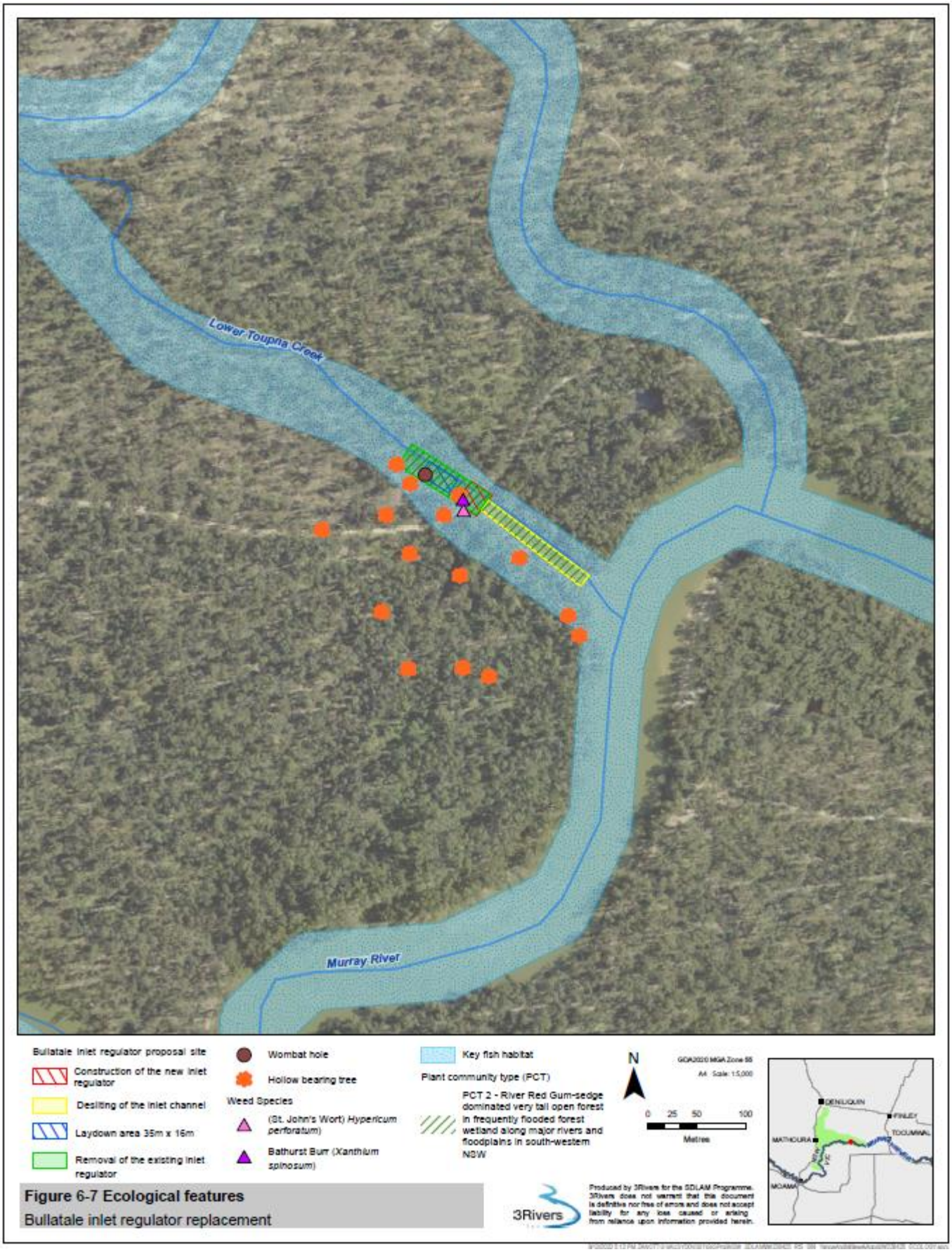


Figure 6-7 Ecological features

6.4.1.8 Migratory species

Twelve migratory bird species are predicted to occur in the locality based on the Commonwealth Department of Climate Change, Energy, the Environment and Water's EPBC Act Protected Matters Search Tool and NSW Bionet Atlas database (EESG, 2022). Based on the likelihood of occurrence assessment, these species are considered to have low to unlikely potential to occur due to a lack of suitable habitat in the construction footprint. No migratory species were detected during the field survey.

While migratory bird species do use the habitats within the locality, the construction footprint would not be classed as an 'important habitat' as defined under the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment, 2013).

6.4.1.9 Wetlands of international importance (Ramsar wetlands)

Ramsar sites are rare or unique wetlands that are important for conserving biological diversity. They are listed under the Convention on Wetlands of International Importance (Ramsar Convention). The construction footprint is located within the NSW Central Murray Forests Ramsar site. Barmah Forest is another Ramsar site which is located about 130 metres from the construction footprint on the southern bank of the Murray River.

6.4.2 Impacts

6.4.2.1 Construction

6.4.2.1.1 Loss of vegetation and habitat

The proposed activity would result in the removal of a maximum of 0.42 hectares of native vegetation, comprising low condition PCT 2. At least one of the two hollow-bearing trees within the construction footprint would require removal. The other directly impacted vegetation includes small to medium non-hollow bearing trees and groundcover. Any fauna species using the directly impacted trees and habitat would be displaced.

With extensive preferred habitat in the adjacent contiguous riparian vegetation and the connected Murray Valley National Park, the degree of impact resulting from vegetation removal in the locality is considered minor.

6.4.2.1.2 Threatened flora

The vegetation to be removed as a result of the proposed activity may contain suitable habitat for Floating Swamp Wallaby-grass (*Amphibromus fluitans*). Due to previous disturbance within the construction footprint and the extent of these threatened species regionally, the local populations that will remain after construction are considered unlikely to be placed at further risk of extinction and the populations (if present) would remain viable.

6.4.2.1.3 Threatened fauna

Potential impacts to threatened fauna species would result from the removal of foraging habitat. Native vegetation within the construction footprint provides suitable habitat for a range of threatened fauna species listed under the BC Act and EPBC Act. The vegetation identified for

removal may provide foraging habitat for species including mammals, birds and frogs. Additionally, indirect impacts on fauna such as noise/vibration disturbance during construction may also occur.

6.4.2.1.4 Wildlife connectivity and habitat fragmentation

The extent of vegetation clearing would generally be minor and would not separate the existing woodland into two patches or impact the existing vegetation connectivity along Lower Toupna Creek. Therefore, the vegetation clearing associated with the proposed activity would not impact the mobility of resident or migratory fauna within the patch and into the adjacent riparian vegetation or the connected Murray Valley National Park.

6.4.2.1.5 Edge effects

The term edge effects refers to the indirect impact created during vegetation clearing which increases exposure of vegetation patches to disturbances. The construction footprint has been designed largely within an area that has been previously disturbed. The area of intact remnant vegetation predicted to be impacted by the proposed activity would be marginal and is part of a larger patch, and therefore, would not contribute further to fragmentation.

6.4.2.1.6 Injury and mortality

Direct impact to fauna by strikes of mechanical equipment or entrapment in equipment and excavations would be possible during the construction phase. Direct strikes and associated stress could result in injury and death to fauna. However, this risk is considered negligible because the scale and duration of construction is small and discrete within an existing disturbed area.

Fauna injury or death has the greatest potential to occur during vegetation clearing. Some mobile species such as birds may not be greatly affected unless they are nesting. Other less mobile species or those that are nocturnal and nest or roost in trees during the day may find it difficult to rapidly move when disturbed. Safeguards for terrestrial biodiversity are discussed in Section 6.4.3.

6.4.2.1.7 Proliferation of weed species

Proliferation of weed species is likely to occur as vegetation is removed and soil disturbed and stockpiled during earthworks. Areas of bare soil would be exposed for the machinery lay down areas providing opportunity for weed establishment. During construction there is potential for weed seeds and plant material to disperse into adjoining areas of moderate to high quality native vegetation where weed species do not currently occur in high density.

Common weed species identified within the construction footprint include St. John's Wort (*Hypericum perforatum*) and Bathurst Burr (*Xanthium spinosum*). Under the *Biosecurity Act 2015*, land managers are required to follow the regional and non-regional duties which have been allocated to each weed species.

Table 6-5 Weed species recorded in the construction footprint and their control methods

Species	Control methods
St. John's Wort (*Hypericum perforatum*)	• Chemical control: St. John's Wort is susceptible to some herbicides. Directions specified on the labels and material safety data sheets must be adhered to. • Mechanical control is unsuitable for this species.
Bathurst Burr (*Xanthium spinosum*)	• Chemical control: Bathurst Burr is susceptible to some herbicides, particularly on young plants. Directions specified on the labels and material safety data sheets must be adhered to. • Mechanical control: Mechanical slashing should be undertaken before the burrs have formed.

6.4.2.1.8 Pests and pathogens

The proposed activity is unlikely to significantly increase the value of the habitat for pest species in the construction footprint over the long-term. Rabbits tend to colonise more disturbed and modified open habitats, and the proposed activity is unlikely to contribute to increased levels of predation on native fauna from foxes and cats as the construction footprint would be typically limited to existing disturbed areas.

While pathogens were not observed or tested for as part of this assessment, the potential for pathogens to occur should be treated as a risk during construction. The most likely causes of pathogen dispersal and importation associated with the proposed works include earthworks, movement of soil, and attachment of plant matter to vehicles and machinery. Pathogens would be managed within the construction footprint in accordance with the *Biosecurity Act 2015*.

6.4.2.1.9 Noise, vibration and dust

Anthropogenic noise can alter the behaviour of animals or interfere with their normal functioning (Bowles 1997). Anthropogenic noise can cause permanent hearing impairment in animals in the case of extremely loud noise, interfere with communication between animals and disrupt normal activities such as foraging (Hoskin and Goosem, 2010). There is potential for impacts to locally common fauna from noise and vibration during construction, which may result in fauna temporarily avoiding habitats adjacent to the construction. The impacts from noise emissions are likely to be localised and the magnitude of this impact would be low. Additionally, there are no nightworks expected during construction for the proposed activity, which eliminates disturbance to fauna residing within or near the construction footprint during dusk and dawn periods as well as nocturnal fauna. Construction noise and vibration may lead to some animals temporarily ceasing to use habitat next to the construction footprint during the construction phase or may impair their normal activities, but it is considered unlikely to cause a significant impact on any species given the works would occur next to Millewa River Road, area in an area with a history of site disturbance, and noise impacts would only occur over a short period of time.

Dust pollution is likely to be greatest during periods of substantial earthworks, vegetation clearing, vehicle movements for construction and during adverse weather conditions. However, deposition of

dust on foliage is likely to be highly localised and additional dust generated would be temporary, and not expected to generate additional impacts.

6.4.2.1.10 Ramsar wetlands and nationally important wetlands

The proposed activity would not negatively impact on the ecology of the Ramsar wetlands which they are located within or adjacent to, as these works aim to improve the management, health and sustainability of Lower Toupna Creek.

6.4.2.2 Operation

6.4.2.2.1 Threatened flora

Local populations of threatened flora are considered unlikely to be placed at further risk of extinction by operation of the proposed activity. The expected changes to the flows in the inlet and supply channels (refer to Section 6.3.2.2.2) would benefit riparian vegetation. The newly cut section of the supply channel where the twin pipes of the existing inlet regulator are located would slightly increase the area of waterway available for riparian vegetation to grow. Improved flow regimes and riparian habitat as a result of the proposed activity would benefit these species long-term.

6.4.2.2.2 Injury and mortality

During operation, direct impact to fauna as a result of vehicle strikes is possible. Vehicle strikes and associated stress can result in injury or death to fauna. However, once the replacement inlet regulator is commissioned, Bullatale Creek Water Trust are expected to attend the inlet regulator no more frequently than they attend the existing inlet regulator, and are likely to attend less given that there would be less need for maintenance of the structure compared to the existing inlet regulator. Therefore, the risk of vehicle strikes to fauna during operation of the replacement inlet regulator would be no greater than the current risk.

Safeguards for terrestrial biodiversity are discussed in Section 6.4.3.

6.4.2.2.3 Pathogens

While pathogens were not observed or tested for as part of this assessment, the potential for pathogens to occur should be treated as a risk during operation. The most likely causes of pathogen dispersal and importation associated with the proposed activity include attachment of plant matter to machinery. Pathogens would be managed within the construction footprint in accordance with the *Biosecurity Act 2015*.

6.4.2.2.4 Noise and vibration

No change in noise and vibration during operation of the proposed activity is anticipated that would result in any increased impacts to biodiversity near to the inlet regulator or along the inlet and supply channels.

6.4.2.3 Significance assessments

Tests of significance have been undertaken in accordance with section 7.3 of the BC Act and the *Threatened Species Test of Significance Guidelines* (OEH, 2018). The conclusions of the significance assessments are that significant impacts are unlikely to any threatened species listed under the BC Act.

For threatened biodiversity listed under the EPBC Act, significance assessments have been completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment, 2013). As a result of the proposed activity, it is considered that a significant impact is unlikely for any matters of national environmental significance.

As noted in Section 4.3.1, NSW DCCEEW referred the proposed activity to the Department of Climate Change, Energy, the Environment and Water (EPBC number 2022/09390) and it was determined to not be a controlled action on 27 January 2023, which supports the conclusions of the tests of significance. For threatened biodiversity listed under the EPBC Act.

6.4.3 Safeguards

Measures proposed to avoid, minimise or manage potential terrestrial biodiversity impacts as a result of the proposed activity are detailed in Table 6-6.

Table 6-6 Safeguards for terrestrial biodiversity impacts

Impact	Safeguard	Responsibility	Timing
Impact to surrounding vegetation	The approved construction footprints will be accurately and clearly marked out by a surveyor using flagging tape and signage prior to the start of works. The signage will prohibit any access or construction work outside the construction footprints. The biodiversity management plan will specify the type of flagging and signage required to delineate the approved construction footprints.	Contractor	Prior to construction
	The vegetation clearing boundary will be accurately and clearly marked out using flagging tape prior to the start of works. The clearing boundary must not extend outside the approved construction footprint. The biodiversity management plan will specify the type of flagging required to delineate the clearing boundary. If there are opportunities to not clear the entire approved construction footprint, preference should be given to avoiding clearing of areas containing established trees (including hollow-bearing trees) and good quality native vegetation and instead concentrate clearing to areas of the footprints that are subject to previous disturbance. To assist in this process, the biodiversity management plan will include figures of the approved construction footprints showing the locations of hollow-bearing trees, vegetation communities; important flora and fauna habitat areas; and locations where threatened species,	Contractor	Prior to construction

Impact	Safeguard	Responsibility	Timing
	populations or ecological communities have been recorded.		
	Materials, plant, equipment, work vehicles and stockpiles will be stored, parked or placed as applicable within the clearing boundary or on existing access tracks at or leading to the work site that are temporarily closed to traffic and as a result are available for the sole use of the contractor.	Contractor	Construction
	Where feasible, materials, plant, equipment, work vehicles and stockpiles will be stored, parked or placed as applicable away from the driplines of trees that are outside the clearing boundaries or that are within the clearing boundaries but proposed for retention.	Contractor	Construction
	If any damage occurs to vegetation outside the approved construction footprint it is to be reported and managed as an environmental incident in accordance with the environmental incident management procedure contained in the CEMP. NSW DCCEEW and NPWS will be notified so that appropriate remediation strategies can be developed and implemented.	Contractor, NSW DCCEEW	Construction
	Construction personnel will be informed of the environmentally sensitive aspects of the construction footprint, including being shown plans of directly impacted and adjoining areas that identify vegetation communities; important flora and fauna habitat areas; and locations where threatened species, populations or ecological communities have been recorded.	Contractor	Construction
Impact to native plants and animals including threatened species	A pre-clearing inspection will be undertaken 48 hours prior to any native vegetation clearing by a suitably qualified ecologist and the Contractor's Environmental Manager (or delegate). The pre-clearing inspection will include, as a minimum: • A check of the physical demarcation of the clearing boundary and construction footprint • Identification of trees that are just outside the marked clearing boundary that require protection to avoid unintended damage during the clearing and subsequent construction works	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	• Identification of hollow bearing trees that need to be removed in accordance with the hollow-bearing tree removal procedure • Identification of other habitat features that need to be relocated outside the clearing boundary • Identification of any threatened flora and fauna • Implementation of the erosion and sediment control plan for the worksite, including erosion control structures. The completion of the pre-clearing inspection will form a hold point requiring sign-off from NSW DCCEEW.		
	Trees within the construction footprint that do not require felling will be protected during the construction phase in accordance with Australian Standard 4970-2009 *Protection of Trees on Development Sites*.	Contractor	Construction
	If hollow-bearing trees require removal the following procedure will be followed: • Non-hollow bearing trees and vegetation surround a hollow-bearing tree will be removed first. Trees should be felled into the construction footprint to avoid damaging adjacent vegetation • Leave the hollow-bearing tree standing for at least one night after other clearing to allow any fauna using the hollows to leave • An NPWS ranger or suitably qualified ecologist is to be present during felling of hollow-bearing trees • Before felling a hollow-bearing tree, tap along the trunk using an excavator or loader to scare fauna from the hollows. Repeat several times • After felling a hollow-bearing tree check its hollows and surrounds to ensure no fauna have become trapped or injured. Any fauna found should be safely located to nearby habitat by the attending NPWS ranger or ecologist • If a hollow-bearing tree is removed in stages the non-hollow-bearing branches should be removed before the hollow-bearing branches are removed.	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	In consultation with NPWS, felled hollow-bearing trees should be cut into sections and the sections with hollows prioritised for placement into the surround forest to provide additional potential habitat for ground dwelling fauna such as reptiles and small mammals.		
	The biodiversity management plant will include a procedure for dealing with the presence of native fauna species within the construction footprint during the construction works. The procedure will require construction work at the site of the find to immediately cease and the subject animal allowed to leave the construction footprint without being harassed. If an animal needs to be relocated to outside the construction footprint, the contractor is to notify NSW DCCEEW and they will in turn notify NPWS to agree on appropriate mitigation measures (including relocation measures). The contractor will only restart work at the subject site when authorised by NSW DCCEEW.	Contractor	Construction
	Construction and worker vehicles and machinery will be checked at the start and end of each workday to ensure fauna are not entrapped.	Contractor	Construction
	Construction during the Superb Parrot breeding period (September to January) will be avoided if possible. If this cannot be achieved, this species will be considered during pre-clearing surveys to ensure that no impacts will occur.	Contractor	Construction
	The following mitigation measures will be implemented to ensure any resident wombats are removed prior to construction: • Inspect the burrow for activity/occupation (monitor and inspect burrows for at least three days and rake entrances to allow for identification of fresh tracks) • Coordinate removal and/or relocation efforts with NPWS to provide on-site assistance in safely deterring wombats from the burrow and finding them a new home, checking the wombat for any signs of 'mange' (a deadly disease if untreated in	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	wombats) and/or in the event of injury to any animals • An ecologist will be present to assist with the relocation of any resident wombats if requested by NPWS • Once the burrow is determined to be empty, collapse the entrance to prevent re-burrowing.		
Impacts to habitat features	Relocation of habitat features (e.g., fallen timber, hollow logs) from within the clearing boundary will occur in accordance with an approved project-specific procedure to be included in the biodiversity management plan.	Contractor	Construction
	• Revegetation of the banks of the channel cut between the replacement inlet regulator and existing supply channel will be undertaken as soon as possible. • A rehabilitation plan will be prepared as part of the CEMP and will include rehabilitation of the new section of channel. The rehabilitation plan will focus on prevention of soil erosion and re-establishing local endemic plant species including riparian vegetation in the new section of channel.	Contractor	Construction
Impacts from introduction and spread of weeds	Weed management will be undertaken in consultation with NPWS in areas affected by construction prior to any clearing works in accordance with the *Biosecurity Act 2015* to ensure weeds are not spread to the surrounding environment; including during transport of waste off-site to a licenced waste disposal facility.	Contractor	Construction
	All weeds, propagules, other plant parts and/or excavated topsoil material that is likely to be infested with weed propagules will be treated on site or bagged, removed from site, and disposed of at a suitably licensed waste facility. If pesticide use is proposed it must occur in accordance with NPWS's requirements including the *Pesticide Use Notification Plan* (NPWS, 2022).	Contractor	Construction
Impacts from introduction and spread of	All vehicles and machinery engaged in earthworks and vegetation clearance activities will follow the Myrtle Rust hygiene protocol for vehicles and heavy	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
plant pathogens	machinery in Table 5 of the *Hygiene Guidelines* (Department of Planning, Industry and Environment, 2020).		
Wildlife impacts from vehicle strike	Drivers must stay vigilant for fauna during machinery operation and vehicle movements.	Contractor	Construction

6.4.4 Residual impacts

Habitat features, including small and medium trees and native understorey species, would require removal as a result of the proposed activity. The proposed activity would require the removal of a maximum of 0.42 hectares of low condition PCT 2. At least one of the two hollow bearing trees within the construction footprint would require removal. Overall, the temporary short-term impacts of the proposed activity have a low risk of harm on biodiversity values.

Eight threatened fauna species have the potential to occur within the construction footprint based on background research and the presence of suitable habitat. Assessments of significance determined that the proposed activity would not have a significant impact on identified threatened species.

Mitigation measures described in Section 6.4.3 will be implemented during the construction and operational phases to lessen the potential ecological impacts of the proposed activity.

6.5 Aquatic biodiversity

The *Bullatale Inlet Regulator Water Quality and Aquatic Ecology Impact Assessment* (refer to Attachment B) assesses potential aquatic biodiversity impacts of the proposed activity. The assessment details the findings of a field survey of a study area that includes the construction and operational footprints and the waterway 50-metre upstream and downstream of these footprints. The key findings of the assessment are summarised in the following sections.

6.5.1 Existing environment

6.5.1.1 Aquatic habitat

The rivers, anabranches and wetlands of Millewa Forest are important habitats for native fish populations. Despite this, connectivity among habitats has been a long-standing issue in the Barmah-Millewa Forest (Cadwallader, 1977, in Stuart et al., 2020) and ongoing declines in species diversity have been recorded in the forest since. Existing floodplain regulators were not designed with fish passage considerations, or consideration of the need for native fish moving between flowing anabranches, floodplains and the Murray River (Sharpe, 2018). Tracking studies of large bodied native fish identified that during periods of hydrological connection between the river and creek habitats (at Murray River flows greater than 8,000 megalitres per day), large bodied native

fish move from the main river channel into Millewa Forest creeks (Jones, 2008; Jones and Stuart, 2008; Sharpe, 2018; Jones et al., 2022).

Tracked fish occupied creek habitats until river flows begin to recede, upon which they move back to the Murray River (in unregulated creeks). However, they were stranded in regulated creeks, unable to pass flow regulation structures back to the Murray River, but they persistently attempted to move back to the river, undertaking searching movements up to impassable regulators (Jones et al., 2022). Impassable barriers at creek/river effluent points can strand very high numbers of large and small bodied fish on the floodplain when high river flows recede (Jones and Stuart 2008; Sharpe, 2018). Restoring native fish pathways between the Millewa Forest floodplain and the Murray River is a priority for the recovery of fish populations (Sharpe, 2018; Stuart et al., 2020).

Bullatale supply channel is classified as a tenth order, perennial waterway and flows through a densely forested area within Millewa Forest in Murray Valley National Park. As such, it has areas of good aquatic habitat and a continuous riparian zone along its length. Common aquatic features within and surrounding Bullatale supply channel include instream aquatic vegetation, large woody debris, exposed root mass along banks, backwaters, deep pools, instream bars and benches, and overhanging riparian vegetation.

Despite there being good habitat features, there are also aquatic weed infestations within the waterway at several locations, particularly Arrowhead (*Sagittaria platyphylla)*. According to DPI Fisheries' key fish habitat mapping, Bullatale supply channel is considered to be key fish habitat and recognised as predicted habitat for the threatened Flathead Galaxias, Macquarie Perch, Murray Crayfish and the Silver Perch (DPI, 2022).

At the time of inspection (April 2022), the inlet channel appeared to have good aquatic habitat features, including instream macrophytes and large woody debris. Bullatale supply channel also exhibited good aquatic features, including large woody debris and stands of Common Reed (*Phragmites australis*). Based on the aquatic habitat present, predicted threatened species and connection to the Murray River, the inlet channel is considered "Type 1 – Highly Sensitive key fish habitat" and "Class 1 – Major Fish Habitat".

Bullatale supply channel also exhibited good aquatic features, including large woody debris and stands of Common Reed (*Phragmites australis*). Based on the aquatic habitat present and predicted threatened species, Bullatale supply channel is also considered "Type 1 – Highly Sensitive key fish habitat" and "Class 1 – Major Fish Habitat"

6.5.1.2 Aquatic weeds

Based on databases, literature and records from surveys of Millewa Forest, aquatic species (both non-native and native) which are predicted or are present in the inlet channel and Bullatale supply channel and are considered aquatic weeds include:

- Arrowhead (*Sagittaria platyphylla*) (non-native) — Infestations identified at several sites during field assessment but not in the construction footprint, also identified in databases (ALA, 2022) and recent surveys
- Azolla (*Azolla sp.*) (native) — Identified at several sites during field assessment and in databases (ALA, 2022), however the areas were not considered over-abundant with this species

- Cumbungi (*Typha orientalis*) (native) — Identified at several sites during field assessment and databases (ALA, 2022), however the areas were not considered over-abundant with this species
- Duckweed (*Lemna disperma*) (native) — Identified at several sites during field assessment and databases (ALA, 2022), however the areas were not considered over-abundant with this species
- Watermilfoils (*Myriophyllum spp.*) (native) — Identified at several sites during field assessment, databases (ALA, 2022), however the areas were not considered over-abundant with this species.

6.5.1.3 Threatened and important aquatic species and communities

The following threatened aquatic fauna were identified as either being present or as being likely to occur within Bullatale supply channel, inlet channel or the construction footprint based on field survey evidence, database searches, predicted habitat and the predicted distribution maps for threatened species listed under the FM Act. These are outlined in Table 6-7 and include:

- Four Commonwealth and State-listed threatened aquatic species
- Five other important aquatic species
- One endangered ecological community (EEC).

Table 6-7 Threatened aquatic fauna

Common name	Species	EPBC Act[1]	FM Act[1]	Likelihood of occurrence	Preferred habitat and comments
Murray Cod	*Maccullochella peelii*	V	-	Present	Murray Cod has patchy distribution across the lower and mid-altitude reaches of the Murray-Darling Basin (Lintermans, 2007). Preferred habitat generally consists of deep holes in slow-flowing rivers, and particularly around instream rocks, woody debris, fallen trees or undercut banks which provide shelter and protection from predators (Lintermans, 2007).
Silver Perch	*Bidyanus bidyanus*	CE	V	Present	The current distribution of Silver Perch is likely to be limited to a portion of the mid-Murray River below Yarrawonga Weir, as well as several of its anabranches and tributaries including the Edward River, an anabranch of the Murray River that flows through Deniliquin, and the Murrumbidgee River. Preferred habitat is generally found in fast-flowing, more open sections of river (DPI, 2017a) but they can also be found in lowland, turbid and slow-flowing rivers (Lintermans, 2007).

Common name	Species	EPBC Act[1]	FM Act[1]	Likelihood of occurrence	Preferred habitat and comments
Trout Cod	*Maccullochella macquariensis*	E	E	Present	Trout Cod are endemic to the southern Murray-Darling system. There are only three known self-sustaining populations left in the wild. The largest is in the Murray River below Yarrawonga Weir and small translocated populations in Cataract Dam and upper reaches of Sevens Creek (Lintermans, 2007). The species prefers deep pools and instream cover such as large boulders, fallen trees and woody debris (DPI, 2017b).
Murray Crayfish	*Euastacus armatus*	-	V	Present	Murray Crayfish are endemic to the southern tributaries of the Murray-Darling Basin. The species is known to occupy parts of the Murray River upstream of Mildura, in the Murrumbidgee River and in some dams, and is the only species in the Euastacus genus that lives in both cold and warm water habitats. Murray Crayfish can be found in a variety of habitats ranging from pasture lands to forests. Their preferred habitat is cool, flowing water that is well oxygenated (DPI, 2019). They can tolerate water temperatures up to 27˚C and moderate salinity. They create burrows that vary in complexity.
Golden Perch	*Macquaria ambigua*	-	-	Present	Golden Perch naturally inhabit the Murray-Darling River system (except at high elevations) and exist in the internal drainage systems of Lake Eyre and the Bulloo River. The abundance of Golden Perch has dramatically decreased in the Murray-Darling due to migration obstruction, the alteration of flow regimes and temperature stratification. Golden Perch have been translocated into other rivers of NSW, Queensland and the Northern Territory. They prefer warm, slow moving, turbid streams.

Common name	Species	EPBC Act[1]	FM Act[1]	Likelihood of occurrence	Preferred habitat and comments
Platypus	*Ornithorhynchus anatinus*	-	-	Likely	Platypuses are known to live in the rivers, streams and lakes of eastern Australia. They are found in the major permanent river systems in the south of NSW, west of the Great Dividing Range, and occasionally in South Australia. Out of the water, platypuses spend most of their time in burrows which have been dug into the river bank, with their entrances usually above water level. The animals use a number of short resting burrows (3-5 metres in length) as protection from predators and temperature extremes. Burrows used for nesting tend to be more elaborate, with many side branches.
Broad-shelled Turtle	*Chelodina expansa*	-	-	Likely	Broad-shelled Turtles are mostly found in turbid waters of depths greater than three metres. It is mostly a riverine turtle, generally inhabiting permanent streams but is also found in oxbows, ponds in floodplains, backwaters, and swamps across its distributed region. The Broad-shelled Turtle will tend to inhabit environments that are undisturbed and have moderate vegetation cover for nest construction. The turtle has shown a preference for aquatic habitats in structured environments, where submerged logs, root systems and dead trees occur.
Eastern Long-necked Turtle	*Chelodina longicollis*	-	-	Present	Eastern Long-necked Turtles are the most widespread species of freshwater turtle in Australia. It lives in slow-moving rivers, lakes and waterways across most of NSW, but is often found on land.

Common name	Species	EPBC Act[1]	FM Act[1]	Likelihood of occurrence	Preferred habitat and comments
Murray River Turtle	*Emydura macquarii*	-	-	Present	Murray River Turtles occur primarily in rivers and waterbodies associated with rivers such as backwaters, oxbows, anabranches and deep, permanent waterholes on the floodplains in the Murray-Darling Basin. This species appears to avoid shallow water.
Lowland Murray River Drainage System	-	-	-	Present	The proposed activity is situated wholly within the endangered ecological community (EEC) known as the 'Lowland Murray River Drainage System' (Lowland Murray River EEC). Lowland rivers provide a wide range of habitats for fish and invertebrate. Floodplains also provide a mosaic of habitat types, including permanent and temporary wetland, as well as terrestrial habitats (DPI, 2007). In Murray Valley National Park, diverse habitats are representative of this EEC, including permanent and intermittent river channels, intermittent swamps, and billabongs.

[1]Status: V = Vulnerable species, E = Endangered species, CE = Critically endangered species.

6.5.2 Impacts

6.5.2.1 Construction

6.5.2.1.1 Direct harm to native fauna

Dry work areas would be required at two separate locations within the construction footprint. One of these areas would be located above the existing buried twin pipes which is permanently dry except in the event of an overland flow, and the other would at the inlet channel between the Murray River and the replacement inlet regulator. During dewatering, species that are present in the inlet channel may be harmed through entrainment into pumps without implementation of appropriate safeguards. Further, aquatic species may be smothered (e.g., clogging fish gills) if highly turbid water is allowed to enter a receiving waterway without adequate treatment.

Construction runoff from temporary construction compounds and access tracks may indirectly result in harm or mortality of aquatic fauna if poor water quality and sediment are mobilised to

downstream receivers. Mobilised sediment would increase turbidity which can clog fish gills or decrease trophic interactions for aquatic species due to reduced visibility.

6.5.2.1.2 Loss or degradation of instream habitat features and aquatic vegetation

The construction of the replacement inlet regulator, removal of the existing inlet regulator and desilting of the inlet channel would require clearance of a small amount of instream vegetation and/or displacement of aquatic habitat features, particularly stands of emergent macrophytes (Common Reed) and large woody debris (snags), which may be within the desilting area at the time of construction.

Snags are often used as breeding habitat and provide protection for juveniles. As described in Table 6-7, Golden Perch, Silver Perch, Murray Cod, Trout Cod and Murray Crayfish could live within or around these features, particularly in the inlet channel. Other important native species such as Platypus, Broad-shelled Turtle, Eastern Long-necked Turtle and Murray River Turtle are also known to use these features for their habitat. Removal of aquatic vegetation and aquatic habitat features therefore has the potential to result in habitat loss, reduced reproductivity or direct mortality of adults, larvae and young-of-year native species.

6.5.2.1.3 Temporary barriers to fish passage

The inlet channel would not provide habitat for aquatic fauna during the proposed channel desilting works. As discussed in Section 3.3, · the inlet channel would be temporarily blocked at the Murray River to create a dry work site to enable the desilting works to occur. Ideally, the desilting work would occur when flow in the Murray River is below the level at which there is inflow from the river into the inlet channel (i.e., below 6,000 megalitres per day) as this would mean the habitat is naturally unavailable rather than as a consequence of the desilting works. It would also avoid the need to relocate any aquatic fauna within the inlet channel when the temporary barrier is introduced and the inlet channel dewatered.

The temporary cofferdams proposed upstream and downstream of the existing inlet regulator to create a dry instream work site for construction of the replacement inlet regulator would impede larval drift into Bullatale supply channel. The cofferdams would also temporarily prevent fish passage between the inlet channel and Bullatale supply channel, however, because the existing inlet regulator already prevents fish passage the temporary impact of the cofferdams on fish passage is not considered a significant risk.

6.5.2.1.4 Proliferation of pest species

Mobilisation of sediment from construction activities can favour the proliferation of pest species (i.e., Common Carp) that may be able to tolerate poorer water quality than native species. This has the potential to impact native aquatic species as invasive species have been found to out-compete native species for food and habitat (Marshall et al., 2019).

6.5.2.1.5 Significance tests for threatened aquatic species and communities

The potential for construction and operation of the proposed activity to have a significant impact to threatened aquatic species, populations and ecological communities has been assessed in accordance with State and Commonwealth significant impact criteria (refer to Attachment B). The assessments determined that the proposed activity is unlikely to have a significant impact on

threatened aquatic species, populations or communities. Table 6-8 provides a summary of key considerations and the outcomes of the significance tests.

Table 6-8 Summary of the tests of significance for impacts to threatened aquatic species, populations and ecological communities

Common name	Species	Assessment	Determination of significance
Lowland Murray River Drainage System	-	The proposed activity is not anticipated to result in direct adverse impacts to the aquatic ecosystem within Bullatale supply channel, and has the potential to enhance aquatic habitat values by providing additional flowing habitat and submerging physical aquatic habitat features to offer additional habitat complexity. With additional flowing habitat, provision of fish passage through the proposed fishway and more habitat features, the proposed activity may assist in restoring habitat for native species that are currently not present within Bullatale supply channel, including flow-dependent specialists such as Murray Cod, Trout Cod, Silver Perch and Murray Crayfish. Furthermore, about 70 metres of Bullatale supply channel downstream of the replacement inlet regulator would be transformed from filled to open channel. Revegetation of the channel with endemic, inundation tolerant and dependent plant species would assist to restore the aquatic habitat value of the instream area which would support native aquatic species. The proposed construction works would include the temporary removal of vegetation and woody debris, however, as they would be reinstated the proposed activity is unlikely to fragment or isolate populations of threatened species or impact on the long-term survival of the ecological community in the locality.	The proposed activity is not likely to significantly impact on Lowland Murray River EEC.
Silver Perch	*Bidyanus bidyanus*	The fish passage provided by the replacement inlet regulator would enable movement of Silver Perch into and out of Millewa Forest that is not possible at the existing inlet regulator. The existing preferred aquatic habitat values for Silver Perch within Bullatale supply channel and the surrounding forest would be unchanged as a result of the proposed activity. Any increase in flows and water levels in the supply channel has the potential to enhance the preferred aquatic	The proposed activity is not likely to significantly impact on Silver Perch.

Common name	Species	Assessment	Determination of significance
		habitat values for Silver Perch, for instance by providing additional flowing habitat and submerging physical aquatic habitat features to offer greater habitat complexity. With additional flowing habitat, provision of fish passage through the proposed fishway and more habitat features, the proposed activity may assist in restoring habitat for Silver Perch that is currently not present within Bullatale supply channel.	
Murray Cod	*Maccullochella peelii*	The fish passage provided by the replacement inlet regulator would enable movement of Murray Cod into and out of Millewa Forest that is not possible at the existing inlet regulator. The existing preferred aquatic habitat values for Murray Cod within Bullatale supply channel and the surrounding forest would be unchanged as a result of the proposed activity. Any increase in flows and water levels in the supply channel has the potential to enhance the preferred aquatic habitat values for Murray Cod, for instance by providing additional flowing habitat and submerging physical aquatic habitat features to offer greater habitat complexity. With additional flowing habitat, provision of fish passage through the proposed fishway and more habitat features, the proposed activity may assist in restoring habitat for Murray Cod that is currently not present within Bullatale supply channel.	The proposed activity is not likely to significantly impact on Murray Cod.

Common name	Species	Assessment	Determination of significance
Trout Cod	*Maccullochella macquariensis*	The fish passage provided by the replacement inlet regulator would enable movement of Trout Cod into and out of Millewa Forest that is not possible at the existing inlet regulator. The existing preferred aquatic habitat values for Trout Cod within Bullatale supply channel and the surrounding forest would be unchanged as a result of the proposed activity. Any increase in flows and water levels in the supply channel has the potential to enhance the preferred aquatic habitat values for Trout Cod, for instance by providing additional flowing habitat and submerging physical aquatic habitat features to offer greater habitat complexity. With additional flowing habitat, provision of fish passage through the proposed fishway and more habitat features, the proposed activity may assist in restoring habitat for Trout Cod that is currently not present within Bullatale supply channel.	The proposed activity is not likely to significantly impact on Trout Cod.
Murray Crayfish	*Euastacus armatus*	Any increase in flows and water levels in the supply channel has the potential to enhance the preferred aquatic habitat values for Murray Crayfish, for instance by providing additional flowing habitat and submerging physical aquatic habitat features to offer greater habitat complexity. With additional flowing habitat and more habitat features, the proposed activity may assist in restoring habitat for Murray Crayfish that is currently not present within Bullatale supply channel.	The proposed activity is not likely to significantly impact on Murray Crayfish.

6.5.2.2 Operation

The operation of the replacement inlet regulator would result in higher water levels and a reduced head loss, compared to current conditions, as detailed in Section 6.3.2.2.2. Higher water levels within the supply channel has the potential to impact on a number of aquatic ecosystem functions and processes. Increased water depth has the potential to result in less light intensity that may affect the growth, reproduction and species diversity of submerged macrophytes which can in turn influence the carbon assimilation and nutrient intake. In contrast, higher water levels throughout the system provide greater stability of other factors important to aquatic ecosystems such as temperature and sediment characteristics. The reduced head loss that is expected would likely result in lower flow velocity and turbulence through the replacement inlet regulator which could support fish passage and reduce community fragmentation.

A greater depth of water in the inlet channel as a result of the desilting work is not expected to result any adverse impacts to aquatic habitat values. The instream vegetation present within the inlet channel is inundation dependent, consisting of stands of *Phragmites australis* (Common Reed), which would be unaffected by the minor additional depth of water. The condition of other physical features present within the inlet channel, for instance, snags and exposed root mass along channel banks would similarly be unaffected by the minor increased depth of the channel except that they may become submerged which in turn may provide additional habitat complexity to support aquatic species.

The about 70 metres of Bullatale supply channel immediately downstream of the replacement inlet regulator that would be transformed from filled to vegetated open channel would assist to restore the aquatic habitat value of the instream area which would support aquatic species.

The potential increase in flow rates and duration downstream of the replacement inlet regulator is not anticipated to result in adverse impacts to the aquatic ecosystem. It is expected that higher flow and longer flow duration may benefit the aquatic ecosystem as it may provide more suitable habitat for native species, such as medium and large-bodied fish species (Murray Cod, Silver Perch, Trout Cod) and crayfish (Murray Crayfish) which prefer flowing habitat and are all currently not present within Bullatale supply channel. With additional flows and provision of fish passage through the fishway, the supply channel may provide suitable habitat for these threatened species. Further, additional flow during low-flow periods would assist to reduce the risk of stagnation of water within the supply channel thereby potentially reducing the risk of algal blooms and low oxygen concentrations.

6.5.2.2.1 Improved connectivity for native fish

Currently, the existing inlet regulator largely obstructs fish passage, except for in an overland flow event. A key objective of the proposed activity is to restore fish passage by replacing the existing inlet regulator with a structure that would enable fish passage. The replacement inlet regulator would allow fish to move more freely into the Millewa Forest floodplain system and fish would also be able to disperse from the main anabranches of the Murray River back into the main river, potentially providing benefits beyond Bullatale supply channel.

6.5.2.2.2 Proliferation of aquatic pest species

According to recent monitoring, there are five non-native species present across the Barmah-Millewa Forest complex: Common Carp, Goldfish, Redfin Perch, Eastern Gambusia, and Oriental Weatherloach. Research effort has been placed on the potential effects of Common Carp due to their confirmed occurrence and high abundance found during aquatic fauna surveys in the forest, and ability to exploit wetlands and other inundated habitats which are available during environmental watering events.

As the replacement Bullatale inlet regulator would not alter the current flow or inundation regime of environmental water delivery onto the floodplain, it is expected that there would be no additional risk of providing preferred habitat for Carp spawning and recruitment. Carp could, however, benefit from increased fish passage past the replacement inlet regulator. As such, Carp may indirectly impact native aquatic species as they outcompete them for food and other resources and may contribute to degradation of water quality and habitat conditions which habitat specialists may not be able to tolerate.

6.5.2.2.3 Spread of aquatic weeds

Although minor, there is potential for any additional flow through the replacement inlet regulator to exacerbate the spread of aquatic weeds by providing improved connectivity for dispersal of propagules (e.g., seeds or vegetative parts) within the waterway.

Importantly, the existing aquatic weed community of the Millewa Forest is the product of the current hydrology and interactions with morphological, physiological and life history characteristics of the plants as well as a potential dispersal vectors. Since there are no proposed changes to the operating regime of the replacement structure when built, potential changes to the aquatic weed community composition from hydrological influences are not anticipated.

6.5.3 Safeguards

Measures proposed to avoid, minimise or manage potential aquatic biodiversity impacts as a result of the proposed activity are detailed in Table 6-9.

Table 6-9 Safeguards for aquatic biodiversity impacts

Impact	Safeguard	Responsibility	Timing
Interactions with fauna during construction	A pre-construction survey will be undertaken in areas that will be enclosed by cofferdams.	Contractor	Prior to construction
	A fish screen will be installed on pumps to prevent entrainment of fish into pumps during dewatering.	Contractor	Construction
	The biodiversity management plan will include a procedure for dealing with the presence of native fauna species within the construction footprints during the construction works. The procedure will require construction work at the site of the find to immediately cease and the subject animal allowed to leave the construction footprint without being harassed. Where assistance is required to relocate an animal, the contractor is to notify NSW DCCEEW and they will in turn notify NPWS to agree on appropriate mitigation measures (including relocation measures). The contractor will only restart work at the subject site when authorised by NSW DCCEEW.	Contractor	Prior to construction
Removal of snags, riparian and instream vegetation	Large woody debris, snags and native aquatic vegetation will be relocated (where possible outside the breeding season of spring and summer) from instream work sites (including at cofferdams if required) to a suitable downstream location in Bullatale supply channel in consultation with a qualified ecologist, NPWS and NSW DCCEEW.	NSW DCCEEW, Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	Rehabilitation of disturbed areas of riparian and instream vegetation will be undertaken as soon as practicable, progressively and in accordance with the site rehabilitation plan prepared as part of the CEMP and in consultation with NPWS. Where possible, woody debris, snags and native instream vegetation that was relocated downstream to make way for the instream work site will be used in the rehabilitation works.	Contractor	Construction
	Rehabilitation in the construction footprint will involve replacing and stabilising topsoil and re-planting native trees and plants.	Contractor	Construction
Sediment build-up in the fishway	Inspections and maintenance of the fishway will be carried out on a regular basis to ensure that fish passage is not obstructed.	Bullatale Creek Water Trust	Operation
Use of fishway during operation and surrounding habitat	Existing aquatic species monitoring at Millewa Forest as part of The Living Murray initiative will document impacts/benefits on the aquatic ecosystem due to the replacement inlet regulator.	NPWS, in liaison with Arthur Rylah Institute for Environmental Research	Operation
Invasive species	An ongoing management response should be adopted to mitigate movement and proliferation of invasive aquatic species in the floodplain environments.	NPWS	Operation

6.5.3.1 Aquatic fauna monitoring

The on-going annual fish community surveys at Millewa Forest led by the Arthur Rylah Institute for Environmental Research as part of The Living Murray program are expected to identify whether predicted operational impacts of the proposed activity on fish are realised. It is recommended that NPWS engage with the Arthur Rylah Institute for Environmental Research to consider whether any changes to the monitoring program are needed as a result of the proposed activity.

In addition to operational aquatic fauna surveys, it is recommended that a spotter / catcher be available on-site during instream construction works, particularly during dewatering, riparian and instream vegetation clearance, removal of large woody debris and channel bed excavation.

6.5.4 Residual impacts

With implementation of the safeguards and management measures in Table 6-9, aquatic ecosystem values within the construction and operational footprints would be low. Any residual impacts are not

expected to significantly compromise the functionality, long-term connectivity or viability of habitats, or ecological processes within assemblages of biota.

6.6 Aboriginal heritage

The *Bullatale Inlet Regulator Millewa New South Wales Aboriginal Cultural Heritage Assessment* (Austral Archaeology, 2022) assesses the potential for Aboriginal archaeological material to occur within the construction footprint. The assessment is provided in Attachment D and is summarised below.

6.6.1 Existing environment

6.6.1.1 Landscape context

The works associated with construction of the existing inlet regulator and Millewa River Road included large-scale earthworks that have significantly impacted the ground in the immediate vicinity of the infrastructure. The introduction of stock to the area may have harmed any surface cultural heritage and the introduction of timber cutting to the area from the 1880s may have harmed any modified trees present.

The geological formation associated with the construction footprint is the alluvial channel deposits – meander plain facies. The classification of the soil that is associated with this geological unit is Vertosols soil.

6.6.1.2 Ethnographic context

The proposed activity is located within the traditional lands of the Yorta Yorta and Bangerang Aboriginal groups (Tindale, 1974). The Murray River catchment has an extensive history of human habitation with evidence of human occupation in the Central Murray Valley for at least 15,000 to 9,000 years before present (Macumber & Thorne, 1975).

The Murray River was able to support large populations of Aboriginal people due to the river's permanence and provision of multiple resources. With the large variety of food resources available, human groups could be semi-sedentary along the river, despite the hunter gatherer lifestyle being reliant on seasonally available food resources (Craib, 1991; Atkinson and Berryman, 1983; Greenwood, 2003). Resources along the river included materials that were used for the creation of canoes, nets, stone tools, and other items for the collection and transportation of goods (Atkinson and Berryman, 1983).

For eight to nine months of the year, groups could rely on the resources that the Murray River provided. These resources were collected through a variety of methods including netting, spearing, and trapping with stone weirs along drainage channels. Meat and roots were cooked either on an open fire or in an earthen oven. Over time, repeated use of a location would see the creation of earth mounds (Greenwood, 2003).

Before the first explorers arrived in the area, an epidemic of smallpox had already spread throughout the Aboriginal population and caused an estimated 50 per cent decrease in the Aboriginal population about 50 years before the first Europeans arrived in Murray Valley (Atkinson

and Berryman, 1983; Curr, 1883). Curr believed that there was an Aboriginal population of about 1200 in the region in about 1850. After colonial contact, the Aboriginal population continued to decline and was forcibly relocated to several missions and reserves in Victoria and New South Wales.

6.6.1.3 Previous archaeological work

A previous report on an archaeological survey in the Murray Valley recorded Aboriginal sites at five locations along the northern bank of the Murray River, between Albury and Mildura (Bucan, 1974). Bucan observed that nearly half of the sites located within the survey were oven mounds associated with water sources. Scarred trees were the second most common site recorded.

The NSW National Estate Grants Program 1987/88 (State Forests of NSW): Murray-Murrumbidgee Aboriginal Survey – Lake Victoria and Koondrook State Forests identified six archaeologically sensitive landforms which included floodplains, levees/point bars, ephemeral creeks, lagoons, river margins and sand dunes. The study also provides a description of the types of Aboriginal archaeological sites that are located within the Murray River Valley. Surface artefact scatter, shell middens, fish weirs, oven mounds, scarred trees, pathways (native tracks), burials, ceremonial grounds, natural sacred sites, and contact/historical sites were all identified as sites that are found within the Central Murray region. Dates for the Central Murray have been assessed at multiple locations within the region as being between 13,000 years before present at Kow Swamp and 1,100 years before present at Algebonia.

Another report which focused on burials associated with sand dunes on the Riverine Plain found that burial grounds are reported more in the west than in the east of the Riverine Plain, with isolated burial being common in the east (Bonhomme, 1990). Burial locations are dependent on the topography of the area, with sand dunes being locations of 'cemeteries' and artificial mounds being constructed in areas where there are no or few sand dunes. Sand bodies become more favoured as burial sites in the western portion of the Riverine Plain than in the east. Burial grounds in sand bodies will also contain multiple burials with isolated individual burials not being overly common throughout the region.

A report by Littleton (1999) compared burial practices between the Lower Murray, Central Murray, Upper Murray and Lower Darling. The Upper Murray, which is the closest region studied to the proposed activity, had the highest number of sites with 164 sites that contain 739 burials. The Upper Murray had a lower number of burials per site than the Central Murray and Lower Darling.

6.6.1.4 Search of heritage registers

A search of the Heritage NSW Aboriginal Heritage Information Management System (AHIMS) database identified 36 previously recorded sites within a 20-kilometre x 20-kilometre buffer of the proposed activity. These AHIMS sites are a mix of modified trees (36 per cent of all sites) followed by earth mounds (28 per cent) and hearths (28 per cent), with the remainder being burials (eight per cent). A review of the AHIMS listings indicates that the vast majority of sites are located close to permanent water sources or are located within wetlands and are often in undisturbed areas. As the distance from water increases, the presence of cultural heritage decreases. None of the AHIMS sites were located within the construction footprint of the proposed activity. The nearest AHIMS site to the construction footprint is about 1.8 kilometres away.

6.6.1.5 Archaeological survey

An archaeological survey was conducted on 17 June 2022 by qualified archaeologists who were accompanied by registered Aboriginal parties to determine the presence of surface and subsurface heritage items. The archaeological survey identified no Aboriginal cultural heritage and it was determined that there was low archaeological potential based on the significant ground disturbance that occurred for the development of the existing inlet regulator and the inlet and supply channels.

6.6.1.6 Assessment of significance

The construction and operational footprints are considered to have low aesthetic significance values due to the development of the existing inlet regulator and the inlet and supply channels. The footprints are also considered to have low potential for any further research value or educational potential due to previous significant disturbance.

As noted above, the Murray River would have been a highly valuable resource to Aboriginal people and the proposed construction and operational footprints therefore have moderate historic significance values due to their proximity to the river. Historic values refers to associations with particular places in Aboriginal history and includes physical values as well as intangible elements such as memories, stories or experiences.

6.6.2 Impacts

The proposed activity would not alter any existing Aboriginal cultural heritage or values due to the heavy modification of the original landscape during previous works within the construction footprint, and because during operation the replacement inlet regulator would be operated to restrict downstream flow to the bank full capacity of the supply channel.

6.6.3 Safeguards

Measures proposed to avoid, minimise or manage potential Aboriginal heritage impacts as a result of the proposed activity are detailed in Table 6-10.

Table 6-10 Safeguards for Aboriginal heritage impacts

Impact	Safeguard	Responsibility	Timing
Unexpected finds	Unexpected Aboriginal cultural heritage finds will be managed in accordance with NPWS's *Unexpected Finds Protocol - Aboriginal Cultural Heritage.* Key steps are summarised below. **Aboriginal objects** If an Aboriginal object is discovered during construction, all works in this location must stop and no further harm must occur to the area. The find must be left in place and protected from any further harm. Notify the NSW DCCEEW Project Manager of the find, who in turn will notify NPWS, and the Environment Line (13 15 55) and arrange for a	Contractor/NSW DCCEEW	Construction

Impact	Safeguard	Responsibility	Timing
	qualified archaeologist and representatives of the registered Aboriginal parties to inspect the find. If they confirm that the find is an Aboriginal object, the item will be recorded on AHIMS, agreement reached on its management, and an application made for an Aboriginal heritage impact permit. **Aboriginal human/ancestral skeletal remains** If Aboriginal human/ancestral skeletal remains are discovered, all work in the vicinity of the remains must stop. Notify the NSW DCCEEW Project Manager of the find, who in turn will notify NSW Police if the material is determined to be of human origin and less than 100 years old, or NPWS Aboriginal Partnerships and Heritage Unit, and Heritage NSW if the remains are believed to be Aboriginal. If in doubt or required by NSW Police, NSW DCCEEW will obtain specialist advice from a forensic anthropologist or bioarchaeologist to confirm that the bones are human, their age and whether they are Aboriginal or not. The remains must be left in place and protected from further harm or damage or unauthorised access until further advice states otherwise. If the remains are confirmed to be Aboriginal, NSW DCCEEW will notify the registered Aboriginal parties. Aboriginal ancestral remains will be recorded in a culturally appropriate manner in collaboration with Heritage NSW and the registered Aboriginal parties. Work will not recommence at the location until authorised in writing by Heritage NSW if the remains are considered by the NSW Police and Heritage NSW to be Aboriginal.		

6.6.4 Residual impacts

Given there are no previously recorded sites located within the construction footprint, no Aboriginal cultural heritage was identified during archaeological surveys, and during operation the replacement inlet regulator would be operated to restrict downstream flow to the bank full capacity of the supply channel, it is anticipated that impacts to Aboriginal heritage as a result of the proposed activity would be negligible. If unexpected finds occur during the proposed activity, the processes identified in Section 6.6.3 would be implemented.

6.7 Historical heritage

A historical heritage assessment of the proposed activity is provided in Attachment E. The assessment identifies that the existing Bullatale inlet regulator has no heritage significance. The details of the assessment are summarised in the following sections.

6.7.1 Existing environment

6.7.1.1 Desktop searches

Relevant statutory and non-statutory heritage registers were searched and the construction footprint was found to not be included on the World Heritage List, Commonwealth Heritage List, National Heritage List, NSW State Heritage Register, Murray Local Environmental Plan 2011, Murray Development Control Plan 2012 or the Historic Heritage Information Management System.

The construction footprint is within the area of the 'Barmah and Millewa Forests' listing on the Register of the National Estate, which is a non-statutory archive. The register entry for Barmah and Millewa Forests notes that the area contains a rich cultural landscape related to historical activities in the area.

6.7.1.2 Historical context

In 1884, with the implementation of the Crown Lands Act 1884, the land surrounding the construction footprint was classified as 'resumed' meaning it was let through annual leases and could be subject to various forms of 'alienation' (Hanson, 1889). The area in the vicinity of the construction footprint was mainly subject to ordinary timber licenses, although Crown plans show that in 1902 the McLaurin family leased the area until 1923.

In 1907, under the Water and Drainage and Artesian Wells (Amending) Act 1906, Bullatale Creek Water Trust was established to conduct works along Bullatale Creek (NSW Government Gazette, 23 October 1907, p.5877-5880).

From 1914, modifications started being made to the Murray River and its tributaries as part of the River Murray Waters Agreement, which sought to ensure that water levels within the river were maintained so that it was navigable while also providing water for irrigation (Mead, 1915). This agreement came about due to the effects of the Federation Drought that lasted from 1895 to 1902, which drastically reduced the water levels within the Murray River. As a part of the plan, locks, reservoirs and dams were built the length of the Murray River to ensure large quantities of water could be stored in the river system to maintain suitable water levels (Mead, 1915; Murray-Darling Basin Authority, 2022b). In NSW, this agreement was enforced by the River Murray Waters Act 1915, which established the Murray River Commission to oversee the construction and maintenance of infrastructure that was outlined in the Act. In 1987, this agreement was superseded by the first Murray-Darling Basin Agreement.

In 1917, the construction footprint and surrounding area was proclaimed as part of the Millewa State Forest, which was re-dedicated in 1919.

In 1938, an application by the Bullatale Creek Water Trust was made to the Water Conservation and Irrigation Commission to create Bullatale supply channel by carrying out works to connect Lower

Toupna Creek to Seven Mile Creek (Bill Dudley, Bullatale Creek Water Trust, pers coms, 21 February 2023; NSW Government Gazette, 4 October 1963, p.2964).

On 4 October 1963, Bullatale Creek Water Trust's application to create Bullatale supply channel was approved. The works involved cutting a channel from Lower Toupna Creek to Seven Mile Creek that connected it with Bullatale Creek. The works included the site of the existing Bullatale inlet regulator (NSW Government Gazette, 4 October 1963, p.2964).

Since constructing the supply channel, Bullatale Creek Water Trust has continued to operate and maintain it and the inlet regulator (Bill Dudley, Bullatale Creek Water Trust, pers coms, 21 February 2023). There has been no major construction or upgrades to the infrastructure within the construction footprint under the ownership of the Trust.

6.7.1.3 Site inspection

An inspection of the construction footprint was carried out by archaeologists on 17 June 2022 and did not identify and evidence of structures than the existing inlet regulator. The construction and the material of the inlet regulator were found to not be indicative of any time period and there was no evidence of alterations subsequent to its construction.

6.7.2 Impacts

The heritage significance of the existing inlet regulator was assessed against the criteria in the *NSW Heritage Manual, Assessing Heritage Significance* (NSW Heritage Office, 2001). The structure was found to have no heritage significance. In particular, it is not important to the cultural or natural history of the area, does not have a strong or special association with any community or cultural group, does not embody any aesthetic characteristics, and it has no rare or uncommon features.

6.7.3 Safeguards

Measures proposed to avoid, minimise or manage potential historic heritage impacts as a result of the proposed activity are detailed in Table 6-11.

Table 6-11 Safeguards for historic heritage impacts

Impact	Safeguard	Responsibility	Timing
Unexpected finds	If historical archaeological relics are discovered during construction, all work will cease in the area. The contractor will notify the NSW DCCEEW Project Manager, who in turn will notify NPWS. A historical archaeologist will be engaged to assess the item's significance.	Contractor/NSW DCCEEW	Construction

6.7.4 Residual impacts

There are no listed historical heritage items identified within the construction footprint. Construction and operation of the proposed activity is unlikely to affect any historical heritage item.

6.8 Air quality

6.8.1 Existing environment

Based on the existing land uses surrounding the construction footprint, the existing air quality at the construction footprint would be characteristic of a bushland environment. The main contributors to air quality in the environment surrounding the proposed activity would include emissions from motor vehicles and machinery used for park operations. Existing air quality would also be impacted during periods of high wind, bushfires, other forms of fires, or dust storm events.

A search of the National Pollutant Inventory in December 2022 did not identify any sources for air polluting substances near the proposed activity.

There are no sensitive receivers located within one kilometre of the proposed activity. The nearest sensitive receivers would be users of the Great Riverside Camp, which is located in Barmah National Park, on the Victorian side of the Murray River, about 1.2 kilometres south-west of the proposed activity.

6.8.2 Impacts

6.8.2.1 Construction

Air quality impacts as a result of the proposed activity are expected to be negligible. During construction activities, air quality impacts would be limited to localised and temporary indirect impacts from elevated exhaust emissions and dust generation. Dust particles may be generated as a result of a range of activities associated with the proposed activity including:

- Vegetation clearing
- Construction traffic on unsealed roads
- Haulage of spoil
- Stockpiling
- Loading and unloading of material
- Rock and concrete crushing
- Earthworks including stripping topsoil, excavations and placement of fill.

Airborne dust or exhaust emissions from vehicles, plant and equipment can cause nuisance, harm or injury to recreational users, nearby residents and contractor staff if not adequately managed. However, dust generation and exhaust emissions during construction are considered to have only temporary, non-continuous and localised impacts on potential receptors. Given the short duration, small area and relatively minor nature of the proposed construction works, any air quality impacts would be temporary, localised and minor. As there are no sensitive receivers nearby and Millewa River Road would be temporarily shut to through traffic at the construction site, no sensitive receivers are likely to experience adverse air quality impacts during the construction phase. Any adverse impacts will be managed through the preparation and implementation of a CEMP and environmental safeguards listed in Table 6-12.

6.8.2.2 Operation

The only air quality impacts during operation of the proposed activity would be emissions from vehicles used to access the replacement inlet regulator to carry out operational and maintenance tasks. The operational and maintenance requirements of the replacement inlet regulator would be infrequent and minor and no greater than those of the existing inlet regulator. Therefore, operational air quality impacts are expected to be minor and no greater than those associated with the existing inlet regulator.

6.8.3 Safeguards

Measures proposed to avoid, minimise or manage potential air quality impacts as a result of the proposed activity are detailed in Table 6-12.

Table 6-12 Safeguards for air quality impacts

Impact	Safeguard	Responsibility	Timing
Dust generation during construction	Works methods will be modified during high wind conditions if excessive dust is generated.	Contractor	Construction
	All vehicles on-site will be confined to a designated route.	Contractor	Construction
	Reduce vehicle speeds to minimise dust emissions.	Contractor	Construction
Impacts on air quality during construction	Visual monitoring for dust will be implemented during the works. Where required, a hose or water cart would be used to regularly wet down haulage access tracks, work sites and laydown areas.	Contractor	Construction
	Work and construction vehicles will drive at lower speeds to minimise dispersal of dust and soil during vehicle movements.	Contractor	Construction
Vehicle emissions	Trips and trip distances will be controlled and reduced where possible, for example by coordinating delivery and removal of materials to avoid unnecessary trips.	Contractor	Construction
	Minimise engine idling and ensure vehicle engines are switched off when stationary or parked within ancillary facilities or construction zones.	Contractor	Construction

6.8.4 Residual impacts

The proposed activity has the potential to cause only minor air quality impacts, and the likelihood of any impacts to air quality would be reduced with implementation of the safeguards identified in Table 6-12. There are no sensitive receivers near the proposed activity that could be impacted by adverse air quality.

6.9 Noise and vibration

6.9.1 Existing environment

The acoustic environment of the proposed activity is characterised by the ambient environmental noise of Millewa Forest. Ambient noise levels would be generally consistent with typical day/night patterns in a remote and isolated noise environment. Anthropogenic sources of noise are infrequent and mainly restricted to those vehicles and machinery engaged in park operations and vehicles of recreational visitors.

There are no residential or urban sensitive receivers located within five kilometres of the proposed activity. The closest noise-sensitive receivers to the proposed activity would be users of Millewa Forest (including recreational users and workers) and receivers at agricultural properties bordering Murray Valley National Park.

There are three camp sites/fishing areas located within five kilometres of the proposed activity on the Victorian side of the Murray River:

- Great Riverside Camp, located about 1.2 kilometres south-west of the proposed activity
- Lupmans Camp, located about 3.8 kilometres south-east of the proposed activity
- Black Engine Camp, located about 4.6 kilometres south-east of the proposed activity.

6.9.2 Impacts

6.9.2.1 Construction

Sources of noise and vibration during construction of the proposed activity would include:

- Plant and equipment generating intermittent noise and vibration e.g., excavators, compressors, trucks etc
- Key construction activities including demolition works and earthworks
- Traffic noise associated with the movement of construction vehicles to and from the work site.

Noise and vibration impacts from these activities would be localised, temporary, non-continuous, only experienced for short periods, and in-line with the *Draft Construction Noise Guidelines* 2020 (Environment Protection Authority, 2020). No sensitive receivers would be impacted by construction noise due to the remote location of the proposed works.

Given the short duration, small area and relatively minor nature of the proposed construction works, any noise and vibration impacts would be temporary, localised and minor. As there are no sensitive receivers nearby and Millewa River Road would be temporarily shut to through traffic at the construction site, no sensitive receivers are likely to experience adverse noise and vibration impacts during the construction phase. Any adverse impacts will be managed through the preparation and implementation of a CEMP and environmental safeguards listed in Table 6-13.

6.9.2.2 Operation

Noise and vibration generated during operation of the proposed activity would primarily be traffic noise from vehicles used to access the replacement inlet regulator to carry out infrequent

operational and maintenance tasks. There may be occasional ad-hoc noise and vibration from carrying out operational and maintenance tasks, mostly associated with the use of hand tools. The operational and maintenance requirements of the replacement inlet regulator would be no greater than those of the existing inlet regulator and, therefore, operational noise and vibration impacts are expected to be low and no greater than those associated with the existing inlet regulator.

6.9.3 Safeguards

Measures proposed to avoid, minimise or manage potential noise and vibration impacts as a result of the proposed activity are detailed in Table 6-13.

Table 6-13 Safeguards for noise and vibration impacts

Impact	Safeguard	Responsibility	Timing
Construction noise and vibration	Provide community information regarding potential impacts from increases in heavy traffic during construction, including potential noise impacts.	NSW DCCEEW	Construction
	Public access should be excluded from the construction zone, including associated laydown and stockpile areas.	Contractor	Construction
	Unless otherwise approved by NSW DCCEEW through an out of hours application process, construction hours will be limited to: • Monday to Friday: 7 am to 6 pm • Saturday: 8 am to 5 pm • No construction work on Sundays or public holidays.	Contractor	Construction
	All site personnel are to be made aware of noise issues and mitigation measures through induction processes.	Contractor	Construction
	All machinery shall be well maintained and in good working order. All vehicles and equipment will be fitted with silencing devices, where applicable.	Contractor	Construction

6.9.4 Residual impacts

The proposed activity has the potential to cause only minor noise and vibration impacts, and the likelihood of any impacts would be reduced with implementation of the safeguards identified in Table 6-13. There are no sensitive receivers near the proposed activity that could be impacted by noise and vibration.

6.10 Traffic and access

6.10.1 Existing environment

The road network within Murray Valley National Park and Regional Park is infrequently travelled, particularly outside of the peak summer holiday period.

Millewa River Road is the nearest public road to the proposed activity. The construction footprint covers about 40-50 metres of this road where it crosses the existing inlet regulator. Millewa River Road is unsealed and has very low traffic volumes.

The closest highway accessible to the proposed activity is the Cobb Highway, which is located about 10 kilometres to the west. The Cobb Highway follows a north-south direction and connects Echuca to Deniliquin, and then continues north to connect to the Barrier Highway near Wilcannia. The Cobb Highway passes along the western boundary of Murray Valley National Park and Regional Park. Access between the highway and the parks is provided via Jones Street in Mathoura.

6.10.2 Impacts

6.10.2.1 Construction

Construction would generate heavy vehicle movements associated with the transportation of construction machinery and equipment to and from the site, the delivery of materials to the site, and the removal of demolition and construction waste and surplus materials from the site. This would include 12.5-metre semi-trailer trucks, concrete agitator and pumping trucks, a Franna crane, and various smaller trucks. Construction plant that would need to be transported on a float truck to the work site includes an excavator (20-30 tonne) (refer to Section 3.3).

The construction access route to the work site has been selected in consultation with NPWS. Construction vehicles would access the site via Toupna Crossing Road and would then turn east onto Millewa River Road. Maintenance of these roads is proposed to occur prior to construction of the proposed activity starting. These maintenance works are the subject of a separate planning approval. No new roads or access tracks are proposed for the proposed activity.

Temporary closure of Millewa River Road would be required during construction of the proposed activity. A detour would be established via East Road, Seven Mile Road and 46 Road. The works are proposed to occur outside of the peak summer holiday period, which would minimise the number of users of Millewa River Road inconvenienced by its temporary closure and the need to use the detour. The staging and timing of the proposed activity would be developed in coordination with NPWS field staff to minimise disruptions to park operations. The detour would not prevent access to any private property.

Construction vehicles would park within the construction footprint or along Millewa River Road. It is estimated that construction vehicle movements would peak at about 10 heavy vehicle and 20 light vehicle return trips to and from the work site per day. The maximum daily heavy vehicle movements are considered likely to occur during the demolition works and earthworks associated with haulage of spoil and clean fill material. The contractor will produce a traffic management plan to describe

how management of vehicle movements will occur during construction. The plan will be developed in consultation with NPWS and where required, Murray River Council.

All access tracks proposed to be used during construction have the capacity to accommodate these vehicle movements, with the additional vehicles passing through the surrounding road network considered likely to have a negligible impact on the performance of the road network.

The proposed activity would also require delivery of oversized pieces of equipment and materials, such as prefabricated environmental regulator gates and precast box culverts. It is estimated that oversized deliveries would involve a maximum of about five heavy vehicle movements associated with mobilisation and demobilisation of the crane and delivery of prefabricated elements of the proposed replacement inlet regulator. The timing and route of these deliveries would be undertaken in consultation with NPWS and in line with the traffic management plan to be developed by the contractor.

The proposed activity would not impact maritime activities or boating access.

6.10.2.2 Operation

There would be no potential traffic and access impacts associated with operation of the proposed replacement Bullatale inlet regulator. Access to the replacement inlet regulator for operation and maintenance would be the same as the existing inlet regulator.

6.10.3 Safeguards

Measures proposed to avoid, minimise or manage potential traffic and access impacts as a result of the proposed activity are detailed in Table 6-14.

Table 6-14 Safeguards for traffic and access impacts

Impact	Safeguard	Responsibility	Timing
Construction traffic	A construction traffic management plan will be prepared as part of the CEMP. The plan will include: • A driver code of conduct • Confirmation of haulage routes and access locations • Measures to maintain access and capacity to existing roads where possible • Traffic control measures including signage at appropriate locations to notify road users of increased traffic volumes and construction vehicles • Management of oversized vehicles • A response plan for any construction-related traffic incidents.	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	Consultation with NPWS and Murray River Council will be undertaken to minimise the impacts to the surrounding road network during construction including temporary access tracks or road closures. Any agreed traffic management measures will be incorporated into the construction traffic management plan.	Contractor	Construction

6.10.4 Residual impacts

During the construction phase, there would be localised and short-term increases in traffic on the surrounding road network from construction vehicles. Temporary closure of Millewa River Road would be required during removal of the existing bridge over the supply channel and construction of the new bridge and replacement inlet regulator. A detour would be provided via existing access tracks.

The traffic and access impacts during construction of the proposed activity are considered negligible due to the remote location of the work site, small number of construction vehicles required, small number of vehicles required to follow the detour and the safeguards detailed in Table 6-14.

The operation of the proposed activity would not result in any change to the traffic and access impacts to those associated with operation of the existing regulator.

6.11 Visual

6.11.1 Existing environment

The existing visual amenity at the construction footprint is typical of a natural floodplain and bushland environment. The existing inlet regulator has a low profile and is largely concealed when there is flow in the inlet and supply channels. The primary viewpoint at the location is from vehicles on Millewa River Road. The existing inlet regulator is not visible from this viewpoint because the inlet is located underneath the road and the twin pipelines and outlet are covered by fill material.

6.11.2 Impacts

6.11.2.1 Construction

There would be negligible public visibility of the construction work site during the construction phase because Millewa River Road would be temporarily closed to through traffic at this location.

Construction traffic travelling through Murray Valley National Park would be seen by recreational users of the park. This would be minor and short-term impact that would have a negligible impact on their use of the park.

6.11.2.2 Operation

The replacement inlet regulator would be located underneath Millewa River Road and, therefore, not visible from vehicles using the road.

The channel cut through the existing fill material to connect the downstream end of the regulator to Bullatale supply channel would be visible from Millewa River Road. This channel and its banks would be shaped and planted so that it is indistinguishable from the existing supply channel downstream. This new section of channel would become more natural in appearance over time as the planted vegetation grows.

The desilted inlet channel would also be visible from Millewa River Road and would be most noticeable immediately following the commencement of operation if the channel is dry and the bed exposed.

Due to the small footprint of the works and the dominance of existing trees in the viewpoint, the overall visual impact of the replacement inlet regulator would be negligible. If any users of the park were walking in the area, they would observe a structure similar in appearance to those found elsewhere in the park.

6.11.3 Safeguards

Measures proposed to avoid, minimise or manage potential visual amenity impacts as a result of the proposed activity are detailed in Table 6-15.

Table 6-15 Safeguards for visual amenity impacts

Impact	Safeguard	Responsibility	Timing
Visibility of construction elements	During construction, all equipment, materials and temporary facilities, such as site offices and portable toilets, will be located within the designated construction footprint for the works.	Contractor	Construction
	The construction work site will be clearly demarcated and maintained in an orderly manner.	Contractor	Construction
	All construction equipment will be removed from the park as soon as it is not required, including any material and refuse related to the works.	Contractor	Construction
Revegetation	A site rehabilitation plan will be prepared as part of the CEMP. The site rehabilitation plan will detail how the work sites will be stabilised and revegetated once the new infrastructure is built. A draft site rehabilitation plan will be provided to NPWS for comment and any comments provided will be addressed in the final version of the plan. Rehabilitation of the construction footprint including revegetation will be carried out as soon as practicable.	NSW DCCEEW, Contractor	Construction

6.11.4 Residual impacts

Given the remote location, small scale of the proposed activity and safeguards detailed in Table 6-15, the proposed activity is considered to have a negligible impact on visual amenity or landscape character at Millewa Forest during both construction and operation.

6.12 Hazard

6.12.1 Existing environment

6.12.1.1 Bushfire risk

The proposed activity is located on land which has been classed as a designated bush fire prone area. The vegetation category for the construction footprint is Vegetation Category 1 which is considered to be the highest risk for bush fire. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production.

As discussed in Section 4.2.2, the proposed activity is located in the Mid Murray Zone Bush Fire Management Committee area. The bush fire risk management plan prepared by the committee in 2009 identifies the bush fire season for the area as running from October/November to March/April. Fire weather conditions for the area are described as being usually associated with winds from the west around to the north accompanied by high daytime temperatures and low relative humidity. Dry lightning storms occur frequently during the bush fire season and often start forest and grass fires. The area has on average 250 bush/grass fires per year, of which six to 10 on average can be considered to be major fires. The main sources of ignition in the area are lightning strikes, unattended campfires, power lines, machinery and traffic, escaped agricultural burns and the use of cutting and welding equipment. Potential major risk seasons follow significant periods of high vegetation growth from high winter rainfall which allow the build-up of fine fuels and creates the potential for a major fire season across the whole of the Mid-Murray Zone when this material cures (Mid Murray Zone Bush Fire Management Committee, 2009).

NPWS adopts a strategic approach to managing fires in parks and reserves including research, planning, hazard reduction, rapid response firefighting crews and community alerts. NPWS, in consultation with the community and other organisations, develop fire management strategies outlining plans of action for use in the event of a fire. The plans cover the protection and conservation of wildlife and property and extend across all NSW national parks. The type of strategy developed for each park varies according to the complexity of the park's fire management issues.

The NPWS fire management strategy relevant to the proposed activity is the *Murray Valley National and Regional Parks (Millewa, Moira and Gulpa Islands Precincts) Fire Management Strategy* (NPWS, 2012). The strategy identifies two types of fire trail category: essential (category 1) and important (category 2). Of relevance to the proposed activity is that Millewa River Road, Poverty Point Road, Porters Creek Road, Narrows Road, Little Edwards Road, Edward River Road and Tuppal Road are all essential fire trails. The strategy defines fire thresholds for vegetation communities to conserve biodiversity. Fire thresholds are assigned with consideration of fire history including the time since areas of the park were last burnt and the recent frequency of burning. The strategy recognises four

fire management zones at the park, with most of the park including all of the proposed activity sites being land management zones. The objectives of this zone are to conserve biodiversity and protect cultural and historic heritage and to manage fire consistent with the applicable fire thresholds.

6.12.1.2 Flooding

The proposed activity is within the flood planning area identified in the Murray Local Environmental Plan 2011. Section 4.1.6.1 outlines the provisions of the plan in relation to development within the flood planning area.

6.12.1.3 Safety and security

The existing inlet regulator is old, dilapidated, in poor repair, and fails to meet contemporary safety standards.

6.12.2 Impacts

6.12.2.1 Construction

6.12.2.1.1 Bushfire risk

Construction activities for the proposed activity would pose an increased risk of bush fire due to the potential for sparks from machinery (i.e., jack hammers, rock saws, and angle grinders), vehicles (i.e., vehicle exhaust systems when traversing over dry vegetation) and hot works if not appropriately managed. There is also the potential for increased bushfire risk should waste vegetation from vegetation clearing and pruning be left in-situ and/or stockpiled onsite. Fuel leaks and spills from plant and equipment and temporary storages of small quantities of flammable materials, such as fuel, could also provide a fuel source for bush fires or cause a bush fire if ignited.

6.12.2.1.2 Flooding

Construction of the proposed activity would be scheduled when there are low flows in the Murray River and there would be no or minimal flow in the inlet and supply channels. Temporary cofferdams would be used to create dry in-stream work sites. Therefore, there is low potential for flooding of the work site. If a flood event were to occur during the construction phase that is sufficiently large to overtop the cofferdams it is expected that the readily available information on flows in the Murray River upstream of the work site would provide ample time to move plant and equipment to higher ground and clear the work site so as to minimise the damage that inundation of the site could cause. The construction works would have a negligible impact on local flood patterns.

6.12.2.1.3 Safety and security

The contractor would be responsible for the safety of their staff and subcontractors working at the construction site and any visitors to the site. The contractor would require all people attending the site to complete a safety induction that informs them of the safety procedures being implemented during the construction works.

6.12.2.2 Operation

6.12.2.2.1 Bushfire risk

The operation of the proposed activity would have no impact to bushfire risk and would not increase the occurrence of bushfires or threat to life in an emergency bushfire event.

6.12.2.2.2 Flooding

As outlined in Section 6.3, the replacement inlet regulator would be operated so that flows in Bullatale supply channel do not exceed the bank full capacity of the supply channel. It is expected that Bullatale Creek Water Trust would close the gates on the replacement inlet regulator in advance of high flows in the Murray River that are expected to overtop the banks of the river, similar to how they close the gates on the existing inlet regulator ahead of high flow events. Therefore, no changes to inundation of Millewa Forest are expected to occur as a result of the operation of the proposed activity.

6.12.2.2.3 Safety and security

Safety in design workshops have incorporated safety considerations into the design of the replacement inlet regulator for the benefit of members of the public and the Trust members who would operate and maintain the structure. The replacement inlet regulator has been designed in accordance with contemporary health and safety standards and would be easier and more efficient to operate than the existing inlet regulator.

6.12.3 Safeguards

The proposed timing of the construction phase between April and June 2023 would decrease the bush fire risks associated with the construction works, because the critical wildfire season generally occurs from October/November to March/April. The risk is further reduced given the proposed activity would take place where existing infrastructure is already present and the proposed temporary laydown area would be located in a previously cleared area above the twin pipes of the existing inlet regulator.

The bush fire hazard associated with construction of the proposed activity would be managed through equipment selection, appropriate access arrangements, safety protocols during periods of high fire risk and the implementation of an emergency response plan as detailed in the *Murray Valley National and Regional Parks (Millewa, Moira and Gulpa Islands Precincts) Fire Management Strategy*. As per NPWS policy, the park may be closed to the public during periods of extreme fire danger, wildfire suppression operations or prescribed burning operations, and this closure would extend to the contractor.

Measures proposed to avoid, minimise or manage potential hazard impacts as a result of the proposed activity are detailed in Table 6-16.

Table 6-16 Safeguards for hazards

Impact	Safeguard	Responsibility	Timing
Bushfire risk during construction	The following controls will be implemented to mitigate potential for fires and increased bush fire risk during construction: • No stockpiling or burning of waste vegetation to occur onsite • Daily weather checks will be undertaken during the pre-start meeting to note for potential fire danger • Any notices erected, displayed or issued by NPWS regulating the use of fire in the park will be complied with • Hot works and machinery which may result in sparking or ignition must not be used on a Total Fire Ban Day without an exemption from the NSW Rural Fire Service • Fuel and other similar flammable materials, such as gas cylinders and paint, will be stored in appropriate fire-resistant storage containers • Appropriate firefighting equipment (e.g., water pump, extinguisher and hand tools) should be available on site along with trained staff • Stationary plant will be parked in cleared areas • No smoking on site in accordance with section 19 of the NPW Regulation.	Contractor	Construction
	All works will be undertaken in accordance with the operational guidelines under the *Murray Valley National and Regional Parks (Millewa, Moira and Gulpa Islands Precincts) Fire Management Strategy* which includes provisions pertaining to operation of earthmoving equipment and visitor management.	Contractor	Construction
Emergency response	Emergency contacts and response procedures will form part of the CEMP and site inductions.	Contractor	Construction

6.12.4 Residual impacts

Carrying out the construction works outside the critical wildfire season and implementing the safeguards and mitigation measures in Table 6-16 would result in the proposed activity having minimal bushfire risk during the construction phase. The operation of the proposed activity has negligible bushfire risk.

Carrying out the construction works when there is low flow in the Murray River would minimise the potential flooding of the work site. The operation of the replacement inlet regulator would not alter local flooding patterns.

The proposed activity would provide a replacement inlet regulator that is safer and easier to operate than the existing inlet regulator.

6.13 Socio-economic

6.13.1 Existing environment

The proposed activity is located within the Murray River Council local government area. As per the 2021 census, 5,834 people were reported as being in the local government area's labour force. Of these, 55.8 per cent were employed full time, 33.5 per cent were employed part-time and 3.1 per cent were unemployed. The most common occupations included managers (22.2 per cent), professionals (14.4 per cent), technicians and trade workers (13.6 per cent) and labourers (12.6 per cent). The population of the surrounding area is sparse, with few towns in the region. The nearest towns within the region include Mathoura with a population of 1,002 people and Tocumwal with a population of 2,862 people.

The Yorta Nation and Bangerang Nation are the traditional custodians of Millewa Forest. Barmah-Millewa Forest has been the heartland of both nations for over 60,000 years providing a rich abundance of food, medicinal and cultural resources and their ongoing connection to the landscape is evident in creation stories and traditional ecological knowledge. The Yorta land use and occupancy map demonstrates an ongoing connection to the forest, with known occupancy and harvest sites for plant, wood, earth, invertebrates, fish, reptile, bird and mammal resources (Murray-Darling Basin Authority, 2012).

Barmah-Millewa Forest is a popular destination for recreation and tourism, with most visitors attracted to the rivers and their surroundings. Barmah-Millewa Forest receives about 100,000 visitor days per year (Abel and O'Connell, 2006). Rivers and lakes are important for boating and fishing, bait collection, picnicking, and canoeing. Scenic driving, 4WD driving, trail bike riding, cycling, bushwalking, orienteering and camping are other popular recreational uses of the forest (Abel and O'Connell, 2006). The strong interest for nature studies, including activities such as birdwatching, highlights the abundance of wildlife in the area and the importance of the environment for recreational users of the forest.

6.13.2 Impacts

6.13.2.1 Construction

6.13.2.1.1 Business, employment and social infrastructure

Construction of the proposed activity would provide temporary benefits to local and regional businesses, particularly in industries that provide goods and services to support construction activities. Businesses in hospitality, accommodation and trades at Moama, Mathoura and Deniliquin and other local towns in the region are the most likely to benefit.

Local businesses could also see a short-term benefit with increased revenue from sourcing of local supplies and construction workforce spending. Although local procurement will be prioritised where possible, it is likely that some of the workforce would need to be sourced from outside the local region, due to the technical requirements of the proposed activity and the limited availability of local workers with the necessary skills and experience. This non-resident workforce would contribute to increased spending locally during construction.

Construction of the proposed activity is not expected to negatively impact or significantly increase demand on social infrastructure, health services or accommodation in the region due to the low numbers of workers required and relatively short duration.

6.13.2.1.2 Recreational users

The proposed activity is unlikely to significantly affect local tourism or recreational usage within the area. Local amenity impacts from construction noise and dust are unlikely to impact park visitors due to the temporary closure of Millewa River Road at the work site.

Key stakeholders including NPWS, Bullatale Creek Water Trust, park visitors and commercial operators within the park would be notified in advance of construction commencing and would be updated on the progress of the works during the construction phase so impacts can be avoided where possible.

6.13.2.2 Operation

The improved efficiency and safety of operation of the replacement inlet regulator compared to the existing inlet regulator may make environmental watering of Millewa Forest easier and result in improved environmental outcomes for the forest, potentially increasing the diversity and quality of vegetation and habitat within the forest. If this benefit is realised it would contribute to making the forest a more attractive place for visitors, with potential flow-on benefits for the local region's economy.

6.13.3 Safeguards

No specific socio-economic safeguards are proposed as the proposed activity would have negligible adverse socio-economic impacts. Ongoing consultation will be carried out with key stakeholders regarding the timing of works and notification to any temporarily disrupted users such as park visitors and commercial operators.

6.13.4 Residual impacts

Construction of the proposed activity would likely provide temporary benefits to local and regional businesses, including businesses that provide hospitality, accommodation, trades, and goods and services to support construction. The proposed activity is unlikely to significantly affect local tourism or recreational usage within the area given it is located in a remote area of Millewa Forest that is infrequently accessed by the public.

Operation of the proposed activity would have no adverse socio-economic impacts.

6.14 Waste, contamination and hazardous materials

6.14.1 Existing environment

A review of the Environment Protection Authority's contaminated land record of notices under section 58 of the *Contaminated Land Management Act 1997* and the list of NSW contaminated sites notified to the Environment Protection Authority under section 60 of the Act did not reveal the construction footprint to be a registered contaminated land site.

The construction footprint is neither a premises currently regulated by an environment protection licence under the POEO Act nor is it a premises that is no longer required to be licensed under the POEO Act. Pursuant to section 4.6 of State Environmental Planning Policy (Resilience and Hazards) 2021 there is no apparent reason to consider that the land proposed to be developed would be contaminated and, as such, no further contamination investigation is required. A search of the National Pollutant Inventory for the 2021/2022 reporting period did not identify any sources for air polluting substances near the proposed activity.

6.14.2 Impacts

6.14.2.1 Construction

6.14.2.1.1 Waste and hazardous materials

The construction of the proposed structure would generate spoil from earthworks, demolition waste from the removal of the existing structure and construction waste from installation of the replacement inlet regulator. General waste would also be generated by construction personnel. Waste streams would include:

- Green waste from cleared vegetation
- Concrete, timber, metal and rock riprap materials from removal of the existing structure
- Excess spoil material from excavation to accommodate the replacement inlet regulator, create a channel to connect the replacement inlet regulator to the supply channel, and desilting of the inlet channel
- Oil, grease, and other liquid waste from the maintenance of construction plant and equipment
- Dried surplus concrete and minor quantities of other surplus construction materials such as scrap metal, paints, glues and other incidental chemicals used in construction
- Minor quantities of general wastes and sewage from ancillary facilities.

6.14.2.1.2 Natural resources

The proposed activity would not involve significant wastage, destruction or depletion of natural resources including water, fuels, timber, or extractive materials. Furthermore, if the environmental site managers use the replacement inlet regulator for environmental watering of Millewa Forest, the proposed activity has the potential to contribute to the sustainable and efficient use of water resources over the long-term.

6.14.2.1.3 Contamination

As the construction activities are proposed within waterways there is the potential for contamination impacts to sensitive aquatic environments. However, the works are proposed to occur when there are low flows in the Murray River and no or minimal flow in the inlet and supply channels. Cofferdams would be installed to isolate the works from upstream and downstream environments, which would minimise the risk of contamination or sedimentation impacts to downstream waterways.

Localised contamination from accidental spills or leaks of fuels, oils and chemicals (such as hydraulic oils) from construction plant and vehicles during construction is considered unlikely but possible and the risk would be managed with suitable safeguards. Minimal quantities of fuel would be stored at the construction site, with all refuelling activities to occur in a designated area at least 20 metres away from the inlet and supply channels.

6.14.2.2 Operation

Operation and maintenance of the replacement inlet regulator would generate negligible quantities of waste and is anticipated to pose a low contamination risk.

6.14.3 Safeguards

Waste management for the proposed activity would be based on the waste management hierarchy established by the objectives of the *Waste Avoidance and Resource Recovery Act 2001*. This includes reducing the amount of waste produced as much as possible, maximising waste reuse, and disposing waste as the last option and doing so appropriately. Crushed rock fill material would be required for the construction of the proposed structure. This material would likely be sourced off site, with some material such as rock riprap from demolition of the existing structure being reused where appropriate. All waste including surplus fill material will be classified in accordance with the *Waste Classification Guidelines* (Environment Protection Authority, 2014a), with appropriate records and disposal dockets retained for audit purposes. The proposed activity would further minimise construction waste through:

- Sustainable selection of construction materials
- Detailed estimation and accurate ordering of quantities of materials required
- Prefabricated and precast materials including environmental regulator gates would be preferentially used to minimise onsite construction waste and optimise material usage.

All suitable excavated material will be reused onsite to backfill around the abutments of the new environmental regulator and/or for the construction of cofferdams where feasible. Any materials that cannot be reused onsite would be removed and recycled or disposed of at a suitably licensed facility.

Measures proposed to avoid, minimise or manage potential waste, contamination and hazardous materials impacts as a result of the proposed activity are detailed in Table 6-17.

Table 6-17 Safeguards for waste, contamination and hazardous materials impacts

Impact	Safeguard	Responsibility	Timing
Spoil generation	Where feasible, suitable excavated spoil material will be reused onsite as backfill and/or for construction of cofferdams.	Contractor	Construction
Beneficial re-use onsite	Cleared vegetation suitable for use in the rehabilitation works (e.g., fallen logs that could provide habitat) will be retained on site for later reuse in accordance with the site rehabilitation plan. Other cleared vegetation will be mulched and either disposed off-site at a suitably licenced waste facility or, if requested by and agreed with NPWS, made available for NPWS to reuse within Murray Valley National Park and Regional Park.	Contractor	Construction
	Earth removed that is surplus to the requirements of the site where it was excavated and which can be classified as virgin excavated natural material or excavated natural material could be used for other works proposed in Millewa Forest as part of the Millewa Forest Supply Project, or otherwise disposed off-site at an appropriately licenced waste facility.	Contractor	Construction
Hazardous materials	All hazardous materials will be stored in accordance with existing or agreed NPWS procedures.	Contractor	Construction
Accidental spill	All contractors and staff will be appropriately trained through a site induction and toolbox talks to prevent, minimise and manage accidental spills.	Contractor	Construction
	Machinery will be inspected daily to ensure no oil, fuel or lubricants are leaking from the machinery. Machines will be maintained as per manufacturers specifications.	Contractor	Construction
	To avoid release to the environment, all hazardous materials (fuels, lubricants, herbicides, etc.) will be disposed of off-site in accordance with Environment Protection Authority guidelines.	Contractor	Construction
	Spill response procedures will follow existing or agreed NPWS procedures.	Contractor	Construction
	Mobile spill kits fully stocked with adequate spill prevention and absorbent materials (including absorbent pads, granular absorbent and disposal bags) will be maintained onsite and on construction vehicles carting hazardous materials.	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	Refuelling of all vehicles and mobile equipment will occur at least 20 metres away from any drainage lines or waterways.	Contractor	Construction
Soil contamination	If suspected soil contamination is encountered, the suspect materials should be segregated and placed in a designated bunded stockpile covered in plastic sheeting to prevent rainfall infiltration and/or soil migration during windy conditions.	Contractor	Construction
Generation of construction waste	All waste material generated will be handled and disposed of carefully to minimise the risk of pollution.	Contractor	Construction
	All construction and demolition materials able to be recycled shall be separated and recycled at approved facilities or reused onsite.	Contractor	Construction
	All demolition material and waste materials will be removed from the site in a timely manner and disposed of at a suitability-licenced waste disposal facility.	Contractor	Construction
	Records of waste classification and disposal dockets will be maintained.	Contractor	Construction
Material usage	Preferential use of fabricated and precast materials will be integrated into the detailed design to minimise onsite construction waste and optimise material usage.	NSW DCCEEW	Detailed Design

6.14.4 Residual impacts

During the construction phase, only small quantities of construction waste (i.e., concrete, timber and metal) primarily from demolition works and green waste from vegetation clearing would be generated.

There is the potential for accidental spills or leaks from vehicles, plant and equipment to cause localised soil and water contamination impacts during construction. If not adequately managed, this is a risk for the proposed activity given significant ecological value and sensitivity of receiving waters. However, given the works would occur in dry waterways and quantities of hydrocarbon are anticipated to be minimal, the risk is considered to be low.

Therefore, potential waste and contamination impacts associated with the construction of the proposed activity are considered likely to have a low impact due to the small scale of the proposed works and safeguards detailed above. The potential waste and contamination impacts associated with the operation of the proposed activity are considered likely to be negligible due to the small quantities of waste generated, minor contamination risks and safeguards detailed above.

6.15 Cumulative impacts

6.15.1 Existing environment

The proposed activity forms part of the Millewa Forest Supply Project, which, together with the Yanga National Park Supply Project, forms the Murray and Murrumbidgee Valley National Parks SDL Adjustment Supply Measure Project. The other works proposed as part of the Millewa Forest Supply Project include replacement of Pinchgut and Nestrons regulators, refurbishment of Moira regulator and Little Edward River offtake regulator, and the decommissioning of Pigsty culvert. The closest of these structures to the proposed activity, Pinchgut regulator, is located about eight kilometres to the west of the construction footprint.

The Millewa Forest Supply Project would be completed in parallel with the Yanga National Park Supply Project, located at Yanga National Park, near Balranald. The two proposed measures have been developed under a single business case, which passed Phase 2 of the SDLAM assessment process outlined in the Intergovernmental Agreement on Implementing Water Reform in the Murray-Darling Basin. Given the large distance between Yanga National Park and Millewa Forest, it has been considered appropriate that separate planning approvals be obtained for the two projects.

Juwi Renewable Energy Pty Ltd is proposing to construct Southdown Solar Farm about 35 kilometres north-west of the proposed activity. The proposed Southdown Solar Farm is a utility-scale renewable energy project of up to 130 megawatts output. Based on preliminary design work, Juwi anticipate deploying about 335,000 photo-voltaic modules. The anticipated construction workforce for the project includes up to 200 full-time equivalent employees who would be located largely in Deniliquin. Access to the site during construction and operation is expected to be from Cal Col Road. At the time of writing, the environmental impact statement for this project was being prepared.

There are no other known major projects near the proposed activity.

6.15.2 Impacts

6.15.2.1 Construction

Given the minor environmental impacts associated with the proposed activity, and the remote locations of the proposed activity and the other works proposed as part of the Millewa Forest Supply Project, any potential cumulative impacts during construction would be negligible. NSW DCCEEW, as the proponent of the Millewa Forest Supply Project, is able to manage the delivery of the works to avoid or minimise adverse cumulative impacts. Ongoing consultation would be carried out with NPWS and other project stakeholders regarding the timing of works and interface with other projects within the area.

6.15.2.2 Operation

The proposed works under the Millewa Forest Supply project, including the proposed activity, have been designed as a package to optimise environmental outcomes for Barmah-Millewa Forest. The works would have an overall positive impact on the safety and efficiency of environmental watering

of the forest and would create opportunities for the site environmental water managers to achieve some ecological outcomes more easily than with the existing environmental regulators in the forest.

No cumulative impacts are anticipated between the proposed activity and the Yanga National Park Supply Project or the Southdown Solar Farm project during operation.

6.15.3 Safeguards

Measures proposed to avoid, minimise or manage potential cumulative impacts as a result of the proposed activity are detailed in Table 6-18.

Table 6-18 Safeguards for cumulative impacts

Impact	Safeguard	Responsibility	Timing
Cumulative impacts	Construction of the various components of the Millewa Forest Supply Project would be coordinated by NSW DCCEEW to minimise any potential cumulative impacts.	NSW DCCEEW	Construction

6.15.4 Residual impacts

Given the minor environmental impacts associated with the proposed activity, and the remote locations of the proposed project elements, any potential cumulative impacts during construction would be negligible.

7 Matters of national environmental significance under the EPBC Act

Table 7-1 EPBC factors for consideration

	Applicable?	Residual Impact level	Reasons	Safeguards/mitigation measures
Is the proposed activity likely to impact on matters of national environmental significance as follows:				

	Applicable?	Residual Impact level	Reasons	Safeguards/mitigation measures
Listed threatened species or ecological communities	Yes	Low	The proposed activity would have negligible impacts on most threatened species and ecological communities. The proposed activity would require the removal of a maximum of 0.42 hectares of vegetation. This impact is expected to be minor as the construction area is linear, narrow, and pre-disturbed, and is considered marginal habitat in relation to the surrounding suitable habitat and contiguous riparian vegetation. Negligible indirect impacts associated with operational noise and light spill could also disturb species within the immediate surrounding area. The proposed activity is unlikely to have a significant impact on threatened hollow dependent bat species, as it will see the removal of only a small area of suitable habitat (0.42 hectares). The Yellow-bellied Sheathtail-bat would potentially suffer a small reduction in extent of foraging habitat from the proposed activity. However, the proposed activity is unlikely to reduce the population size or decrease the reproductive success of this species. The proposed activity also has a low potential of significant impacts on the Superb Parrot and the Koala as the impacts associated with the proposed activity are minimal in the context of the available habitat located within Murray Valley National Park and Regional Park and Barmah National Park.	Refer to Section 6.4.3 and Section 6.5.3 for safeguards for potential impacts to listed threatened species or ecological communities.

	Applicable?	Residual Impact level	Reasons	Safeguards/mitigation measures
Listed migratory species	Yes	Low	While migratory bird species do use the habitats within the locality, the construction footprint would not be classed as an 'important habitat' as defined under the EPBC Act *Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment, 2013), in that the construction footprint does not contain: • Habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species • Habitat used by a migratory species which is at the limit of the species range • Habitat within an area where the species is declining. Based on the above considerations, the proposed activity is unlikely to have a significant effect on any of the listed migratory species predicted to occur within the locality.	Refer to Section 6.4.3 for safeguards for potential impacts to listed migratory species.
Wetland of international importance (Ramsar wetland)	Yes	Negligible	The proposed activity is located within the NSW Central Murray Forests Ramsar site in NSW, and adjacent to the Barmah Forest Ramsar site in Victoria. The proposed activity would not have significant impacts on the NSW Central Murray Forests Ramsar site because: • The area of direct impact is small and previously disturbed • The area of direct impact is ground that is characterised by modified and regrowth vegetation with a simple structure, low species diversity and no mature elements such as old growth trees or logs • There would be minimal hydrological change because Bullatale Creek Water Trust would operate the replacement Bullatale inlet regulator	Refer to Section 6.4.3 for safeguards for wetlands of international importance.

	Applicable?	Residual Impact level	Reasons	Safeguards/mitigation measures
			in accordance with an operational management plan that would require the maximum daily volume of water allowed to pass the structure to be no more than the bank full capacity of the supply channel of about 79 megalitres per day, or a water level in the supply channel that does not exceed 99.75 metres AHD • Water quality would be protected by carrying out the works when there are low flows in the Murray River and using cofferdams to create dry work sites • The operation of the proposed activity would result in Bullatale inlet regulator no longer creating a blockage to native fish passage, and thereby open up fish movement along about 60 kilometres of waterway between the Murray River and the Edward River via Bullatale Creek • The proposed fishway would not enable invasive species to become established or spread to areas that they cannot already access when Millewa Forest is inundated when there are high flows in the Murray River.	
World heritage values of world heritage properties	No	Nil	There are no world heritage areas in proximity to the proposed activity.	N/A
The national heritage values of national heritage places	No	Nil	There are no national heritage places in proximity to the proposed activity.	N/A

8 Summary of impacts

In accordance with sections 5.5 and 5.7 of the EP&A Act, the significance of impacts against each environmental factor listed in section 171(2) of the EP&A Regulation have been considered in Table 8-1 to assess the likely impacts of the proposed activity on the environment.

Table 8-1 Compliance with section 171(2) of the EP&A Regulation

Environmental factor	Impact	Where addressed
(a) the environmental impact on the community	The proposed activity would benefit members of the Bullatale Creek Water Trust by improving the reliability of water supply to their properties. It would also benefit the site environmental water managers by providing them with more flexibility in how they can operate Bullatale inlet regulator to achieve environmental watering outcomes for Millewa Forest. The proposed activity would have negligible socio-economic impacts.	Section 6.13
(b) the transformation of the locality	The proposed activity would not result in the transformation of the locality at and surrounding Bullatale inlet regulator. During operation, the location would have a more natural appearance due to the fill material surrounding the twin pipes of the existing inlet regulator being replaced with a channel that connects the replacement inlet regulator to Bullatale supply channel. The potential visual impacts of the proposed activity have been assessed and were found to be negligible.	Section 6.11
(c) the environmental impact on the ecosystems of the locality	A comprehensive biodiversity assessment considering terrestrial and aquatic biodiversity has been completed and found that the proposed activity is unlikely to have a significant impact on threatened species, populations, ecological communities and migratory species, and residual biodiversity impacts are low.	Section 6.4 and Section 6.5
(d) reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	This REF comprehensively assesses potential environmental impacts of the proposed activity and has found them to be primarily positive. Potential adverse environmental impacts are minor or insignificant.	Chapter 6

Environmental factor	Impact	Where addressed
(e) the effects on any locality, place or building that has— (i) aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or (ii) other special value for present or future generations	Potential impacts to Aboriginal heritage and historic heritage as a result of the proposed activity have been assessed and are anticipated to be negligible.	Section 6.6 and Section 6.7
(f) the impact on the habitat of protected animals, within the meaning of the *Biodiversity Conservation Act 2016*	A comprehensive biodiversity assessment considering terrestrial and aquatic biodiversity has been completed and found that the proposed activity is unlikely to have a significant impact on threatened species, populations, ecological communities and migratory species, and residual biodiversity impacts are low.	Section 6.4 and Section 6.5
(g) the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air		
(h) long-term effects on the environment	This REF comprehensively assesses the potential environmental impacts of the proposed activity and has found them to be primarily positive. Potential adverse environmental impacts are minor or insignificant.	Chapter 6
(i) degradation of the quality of the environment		
(j) risk to the safety of the environment	The proposed activity involves modernising infrastructure that is old, in poor repair, and doesn't meet contemporary safety standards. Safety in design workshops have incorporated safety considerations into the design of the replacement inlet regulator for the benefit of members of the public and the Trust members who would operate and maintain the structure.	Section 3.2

Environmental factor	Impact	Where addressed
(k) reduction in the range of beneficial uses of the environment	An objective of the proposed activity is to remove constraints to the movement of water across the floodplain and reopening pathways for native fish. The proposed activity is not expected to significantly affect land use in the region. The proposed activity is replacing existing infrastructure at the site.	Section 2.1
(l) pollution of the environment	There is a low potential for minor impacts to water quality due to erosion and sedimentation during construction. This risk is readily managed by standard construction practices and additional safeguards outlined in Table 6-2.	Section 6.2
(m) environmental problems associated with the disposal of waste	Waste management during construction of the proposed activity is a minor risk and would be readily controlled by construction practices and safeguards outlined in Table 6-17.	Section 6.14
(n) increased demands on natural or other resources that are, or are likely to become, in short supply	Concrete and steel quantities used for construction of the flow control structures are widely available and would deliver long-term beneficial environmental outcomes by operation of the proposed activity. Re-use of materials is discussed in Section 6.14.	Section 6.14
(o) the cumulative environmental effect with other existing or likely future activities	Given the minor environmental impacts associated with the proposed activity, and the remote locations of the proposed project elements, any potential cumulative impacts during construction would be negligible.	Section 6.15
(p) the impact on coastal processes and coastal hazards, including those under projected climate change conditions	N/A	N/A
(q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	The proposed activity is a water supply system under section 2.159 of the Transport and Infrastructure SEPP and therefore development consent from council is not required. The proposed activity is to be assessed under Division 5.1 of the EP&A Act with NSW DCCEEW being the determining authority.	Section 4.1.4.1
(r) other relevant environmental factors.	This REF comprehensively assesses potential environmental impacts of the proposed activity, including potential socio-economic impacts, and has found them to be primarily positive. Potential adverse environmental impacts are minor or insignificant.	Chapter 6

9 Environmental management

9.1 Construction environmental management

Safeguards have been proposed in this REF to avoid, minimise or manage potential environmental impacts of the proposed activity. Should the proposed activity proceed, these safeguards will be incorporated into the detailed design and applied during construction and operation of the proposed activity.

The CEMP would include the safeguards identified in Chapter 6 of this REF and any additional measures required by licences, permits or approvals that are required to construct the proposed activity. The CEMP would provide a framework for establishing how the safeguards would be implemented and who would be responsible for their implementation. It would include a procedure for managing and reporting environmental incidents where there is a breach of the requirements contained in the safeguards. The CEMP would be prepared prior to commencement of construction. The CEMP would include the following subplans:

- Erosion and sediment control plan
- Construction soil and water management plan
- Biodiversity management plan
- Site rehabilitation plan
- Construction traffic management plan.

A draft of the CEMP would be provided to NPWS for comment and any comments provided would be addressed in the final CEMP. The CEMP would be a working document that is subject to ongoing change and updates as necessary during the construction phase.

The key objective of the CEMP would be to deliver and implement the environmental commitments made in the REF throughout the construction period, together with conditions imposed by any licences and approvals. The CEMP would include the following information:

- Details of key project personnel and their contact details
- An audit and reporting program to ensure all of the safeguards are implemented
- Training requirements, including site induction requirements to ensure that all personnel understand the principles of environmental management
- Emergency and incident response procedures
- List of approvals to be obtained before construction commences
- Consultation requirements (government and community) and a complaint handling procedure
- Actions for meeting environmental objectives based on the safeguards identified in this REF and any statutory or regulatory obligations
- Details of the personnel responsible for the implementation of each safeguard.

9.2 Operational environmental management

An operational and maintenance framework is currently being developed for the proposed activity in consultation with key stakeholders, however, is not available at the time of preparing this REF.

9.3 Summary of safeguards

A summary of all measures proposed to avoid, minimise, or manage potential environmental impacts of the proposed activity, as identified throughout Chapter 6, are detailed in Table 9-1.

Table 9-1 Summary of safeguards

Impact	Safeguard	Responsibility	Timing
Topography, geology and soils			
Erosion and sediment	An erosion and sediment control plan will be prepared as part of the contractor's CEMP. Site specific erosion and sediment control measures will be designed, implemented and maintained in accordance with relevant sections of *Managing Urban Stormwater: Soil and Construction Volume 1* (Landcom, 2004) (the Blue Book). The erosion and sediment control plan will provide details of the cofferdams to be installed upstream and downstream of instream work sites and the strategies that will be implemented to stabilise soils during the construction phase.	Contractor	Construction
Surface water and drainage			
Impact of construction activities and mobilising sediment	Erosion and sediment control measures will be implemented to stabilise ground surfaces disturbed during the construction phase and will include but not be limited to: • Sediment fences along the clearing boundary • Stockpiling materials on site for the shortest time feasible • Contouring disturbed areas of the supply channel's bed and banks to reinstate natural contours or otherwise in accordance with the design drawings	Contractor	Detailed design Construction

Impact	Safeguard	Responsibility	Timing
	• Covers on truck loads when transporting loose material • Covers on (or watering of) stockpiles. Where feasible, these control measures will be in place before any vegetation clearing or earthwork starts and will remain in place throughout the construction phase until the site rehabilitation plan has been fully implemented.		
Instream works	The construction soil and water management plan will include contingency measures in the event of high flows in the Murray River during the construction works.	Contractor	Construction
	Control measures to manage potential pollution or sedimentation impacts from instream works will include but not be limited to: • Cofferdams to create dry sites for instream works • Undertake work when flows in the inlet channel are low/dry for a suitable duration to complete work • Develop contingencies for unexpected moderate to high flows in the Murray River during instream works. Control measures will be in place prior to commencement of any instream works.	Contractor	Detailed design Construction
Spills and leaks	• An emergency spill response procedure will be prepared in accordance with NSW DCCEEW's incident management protocols to minimise the impact of accidental spillages of fuels, chemicals and fluids during construction • Hazardous materials such as oils, chemicals and refuelling activities will occur in bunded areas and as far	Contractor	Detailed design Construction

Impact	Safeguard	Responsibility	Timing
	from the inlet channel and Bullatale supply channel as feasible.		
Concrete works	• Bunded receptacles for concrete waste including concrete slurries and washout water will be provided at the work site to capture, contain and appropriately dispose of any concrete waste at a suitably licenced waste facility. These will be located as far from the inlet channel and Bullatale supply channel as feasible • Concrete elements of the replacement inlet regulator will be prefabricated, where practicable.	Contractor	Detailed design Construction
Dewatering site within temporary dry works areas	The construction soil and water management plan will outline procedures (as per the Blue Book) and water quality standards (ANZG, 2018) to be achieved prior to discharging water to the supply channel.	Contractor	Detailed design Construction
Water quality monitoring	Visual monitoring of local water quality e.g., turbidity, hydrocarbon spills/slicks will be carried out daily during construction to identify any potential spills or deficient erosion and sediment controls. Should a change in water quality appear evident samples will be collected and analysed.	Contractor	Construction
Hydrology and groundwater			
Cessation of flow downstream of the inlet regulator during construction	If Bullatale Creek Water Trust requires water during the construction phase while cofferdams are in place that block flow into the inlet channel that would otherwise have reached the existing inlet regulator an equivalent flow in the supply channel would be created using a bypass pump. The following controls would be implemented during bypass pumping: • The inlet to the bypass pump will be fitted with a fish screen	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	• Flow would discharge into a bunded area to avoid scouring of the channel bed and capture any coarse sediment in the flow. The bunded area will be sized so that water spills from the bunded area back into the creek at low velocity.		
Groundwater ingress into the work site during construction	Any groundwater that enters excavations within the work site will be tested and, if suitable, pumped into Bullatale supply channel or otherwise pumped into a treatment pond and treated before being discharged into the supply channel. If a treatment pond is proposed it must be located within the construction footprint and its location, size and proposed use must be documented in the construction soil and water management plan. The construction soil and water management plan will include water quality criteria for any water to be discharged into the supply channel.	Contractor	Construction
Overtopping of the banks of Bullatale supply channel during operation	Subject to suitable flows in the Murray River, and based on NSW DCCEEW's hydrology analysis, the position of the gates of the replacement inlet regulator will be trialled during commissioning of the replacement inlet regulator to establish a gate position that produces a flow less than the bank full capacity of Bullatale supply channel and that will enable Bullatale Creek Water Trust to extract their entitlement over an optimal range of Murray River flow rates.	NSW DCCEEW in conjunction with Bullatale Creek Water Trust	Commissioning
Terrestrial biodiversity			
Impact to surrounding vegetation	The approved construction footprints will be accurately and clearly marked out by a surveyor using flagging tape and signage prior to the start of works. The signage will prohibit any access or construction work outside the construction footprints.	Contractor	Prior to construction

Impact	Safeguard	Responsibility	Timing
	The biodiversity management plan will specify the type of flagging and signage required to delineate the approved construction footprints.		
	The vegetation clearing boundary will be accurately and clearly marked out using flagging tape prior to the start of works. The clearing boundary must not extend outside the approved construction footprint. The biodiversity management plan will specify the type of flagging required to delineate the clearing boundary. If there are opportunities to not clear the entire approved construction footprint, preference should be given to avoiding clearing of areas containing established trees (including hollow-bearing trees) and good quality native vegetation and instead concentrate clearing to areas of the footprints that are subject to previous disturbance. To assist in this process, the biodiversity management plan will include figures of the approved construction footprints showing the locations of hollow-bearing trees, vegetation communities; important flora and fauna habitat areas; and locations where threatened species, populations or ecological communities have been recorded.	Contractor	Prior to construction
	Materials, plant, equipment, work vehicles and stockpiles will be stored, parked or placed as applicable within the clearing boundary or on existing access tracks at or leading to the work site that are temporarily closed to traffic and as a result are available for the sole use of the contractor.	Contractor	Construction
	Where feasible, materials, plant, equipment, work vehicles and stockpiles will be stored, parked or placed as applicable away from the driplines of trees that are outside the clearing boundaries or that are within	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	the clearing boundaries but proposed for retention.		
	If any damage occurs to vegetation outside the approved construction footprint it is to be reported and managed as an environmental incident in accordance with the environmental incident management procedure contained in the CEMP. NSW DCCEEW and NPWS will be notified so that appropriate remediation strategies can be developed and implemented.	Contractor, NSW DCCEEW	Construction
	Construction personnel will be informed of the environmentally sensitive aspects of the construction footprint, including being shown plans of directly impacted and adjoining areas that identify vegetation communities; important flora and fauna habitat areas; and locations where threatened species, populations or ecological communities have been recorded.	Contractor	Construction
Impact to native plants and animals including threatened species	A pre-clearing inspection will be undertaken 48 hours prior to any native vegetation clearing by a suitably qualified ecologist and the Contractor's Environmental Manager (or delegate). The pre-clearing inspection will include, as a minimum: • A check of the physical demarcation of the clearing boundary and construction footprint • Identification of trees that are just outside the marked clearing boundary that require protection to avoid unintended damage during the clearing and subsequent construction works • Identification of hollow bearing trees that need to be removed in accordance with the hollow-bearing tree removal procedure	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	• Identification of other habitat features that need to be relocated outside the clearing boundary • Identification of any threatened flora and fauna • Implementation of the erosion and sediment control plan for the worksite, including erosion control structures. The completion of the pre-clearing inspection will form a hold point requiring sign-off from NSW DCCEEW.		
	Trees within the construction footprint that do not require felling will be protected during the construction phase in accordance with Australian Standard 4970-2009 *Protection of Trees on Development Sites*.	Contractor	Construction
	If hollow-bearing trees require removal the following procedure will be followed: • Non-hollow bearing trees and vegetation surround a hollow-bearing tree will be removed first. Trees should be felled into the construction footprint to avoid damaging adjacent vegetation • Leave the hollow-bearing tree standing for at least one night after other clearing to allow any fauna using the hollows to leave • An NPWS ranger or suitably qualified ecologist is to be present during felling of hollow-bearing trees • Before felling a hollow-bearing tree, tap along the trunk using an excavator or loader to scare fauna from the hollows. Repeat several times • After felling a hollow-bearing tree check its hollows and surrounds to ensure no fauna have become	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	trapped or injured. Any fauna found should be safely located to nearby habitat by the attending NPWS ranger or ecologist • If a hollow-bearing tree is removed in stages the non-hollow-bearing branches should be removed before the hollow-bearing branches are removed. In consultation with NPWS, felled hollow-bearing trees should be cut into sections and the sections with hollows prioritised for placement into the surround forest to provide additional potential habitat for ground dwelling fauna such as reptiles and small mammals.		
	The biodiversity management plan will include a procedure for dealing with the presence of native fauna species within the construction footprint during the construction works. The procedure will require construction work at the site of the find to immediately cease and the subject animal allowed to leave the construction footprint without being harassed. If an animal needs to be relocated to outside the construction footprint, the contractor is to notify NSW DCCEEW and they will in turn notify NPWS to agree on appropriate mitigation measures (including relocation measures). The contractor will only restart work at the subject site when authorised by NSW DCCEEW.	Contractor	Construction
	Construction and worker vehicles and machinery will be checked at the start and end of each workday to ensure fauna are not entrapped.	Contractor	Construction
	Construction during the Superb Parrot breeding period (September to January) will be avoided if possible. If this cannot be achieved, this species will be	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	considered during pre-clearing surveys to ensure that no impacts will occur.		
	The following mitigation measures will be implemented to ensure any resident wombats are removed prior to construction: • Inspect the burrow for activity/occupation (monitor and inspect burrows for at least three days and rake entrances to allow for identification of fresh tracks) • Coordinate removal and/or relocation efforts with NPWS to provide on-site assistance in safely deterring wombats from the burrow and finding them a new home, checking the wombat for any signs of 'mange' (a deadly disease if untreated in wombats) and/or in the event of injury to any animals • An ecologist will be present to assist with the relocation of any resident wombats if requested by NPWS Once the burrow is determined to be empty, collapse the entrance to prevent re-burrowing.	Contractor	Construction
Impacts to habitat features	Relocation of habitat features (e.g., fallen timber, hollow logs) from within the clearing boundary will occur in accordance with an approved project-specific procedure to be included in the biodiversity management plan.	Contractor	Construction
Impacts from introduction and spread of weeds	Weed management will be undertaken in consultation with NPWS in areas affected by construction prior to any clearing works in accordance with the *Biosecurity Act 2015* to ensure weeds are not spread to the surrounding environment; including during transport of waste off-site to a licenced waste disposal facility.	Contractor	Construction
	All weeds, propagules, other plant parts and/or excavated topsoil material that	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	is likely to be infested with weed propagules will be treated on site or bagged, removed from site, and disposed of at a suitably licensed waste facility. If pesticide use is proposed it must occur in accordance with NPWS's requirements including the *Pesticide Use Notification Plan* (NPWS, 2022).		
Impacts from introduction and spread of plant pathogens	All vehicles and machinery engaged in earthworks and vegetation clearance activities will follow the Myrtle Rust hygiene protocol for vehicles and heavy machinery in Table 5 of the *Hygiene Guidelines* (Department of Planning, Industry and Environment, 2020).	Contractor	Construction
Wildlife impacts from vehicle strike	Drivers must stay vigilant for fauna during machinery operation and vehicle movements.	Contractor	Construction
Aquatic biodiversity			
Interactions with fauna during construction	A pre-construction survey will be undertaken in areas that will be enclosed by cofferdams.	Contractor	Prior to construction
	A fish screen will be installed on pumps to prevent entrainment of fish into pumps during dewatering.	Contractor	Construction
	The biodiversity management plan will include a procedure for dealing with the presence of native fauna species within the construction footprints during the construction works. The procedure will require construction work at the site of the find to immediately cease and the subject animal allowed to leave the construction footprint without being harassed. Where assistance is required to relocate an animal, the contractor is to notify NSW DCCEEW and they will in turn notify NPWS to agree on appropriate mitigation measures (including relocation measures). The contractor will only restart work at the subject site when authorised by NSW DCCEEW.	Contractor	Prior to construction

Impact	Safeguard	Responsibility	Timing
Removal of snags, riparian and instream vegetation	Large woody debris and snags and native aquatic vegetation will be relocated (where possible outside the breeding season of spring and summer) from instream work sites (including at cofferdams if required) to a suitable downstream location in Bullatale supply channel in consultation with a qualified ecologist, NPWS and NSW DCCEEW.	NSW DCCEEW, Contractor	Construction
	Rehabilitation of disturbed areas of riparian and instream vegetation will be undertaken as soon as practicable, progressively and in accordance with a site rehabilitation plan prepared as part of the CEMP and in consultation with NPWS. Where possible, woody debris, snags and native instream vegetation that was relocated downstream to make way for the instream work site will be used in the rehabilitation works.	Contractor	Construction
	Rehabilitation in the construction footprint will involve replacing and stabilising topsoil and re-planting native trees and plants.	Contractor	Construction
Sediment build-up in the fishway	Inspections and maintenance of the fishway will be carried out on a regular basis to ensure that fish passage is not obstructed.	Bullatale Creek Water Trust	Operation
Use of fishway during operation and surrounding habitat	Existing aquatic species monitoring at Millewa Forest as part of The Living Murray initiative will document impacts/benefits on the aquatic ecosystem due to the replacement inlet regulator.	NPWS, in liaison with Arthur Rylah Institute for Environmental Research	Operation
Invasive species	An ongoing management response should be adopted to mitigate movement and proliferation of invasive aquatic species in the floodplain environments.	NPWS	Operation
Aboriginal heritage			
Unexpected finds	Unexpected Aboriginal cultural heritage finds will be managed in accordance with NPWS's *Unexpected*	Contractor/NSW DCCEEW	Construction

Impact	Safeguard	Responsibility	Timing
	Finds Protocol - Aboriginal Cultural Heritage. Key steps are summarised below. **Aboriginal objects** If an Aboriginal object is discovered during construction, all works in this location must stop and no further harm must occur to the area. The find must be left in place and protected from any further harm. Notify the NSW DCCEEW Project Manager of the find, who in turn will notify NPWS, and the Environment Line (13 15 55) and arrange for a qualified archaeologist and representatives of the registered Aboriginal parties to inspect the find. If they confirm that the find is an Aboriginal object, the item will be recorded on AHIMS, agreement reached on its management, and an application made for an Aboriginal heritage impact permit. **Aboriginal human/ancestral skeletal remains** If Aboriginal human/ancestral skeletal remains are discovered, all work in the vicinity of the remains must stop. Notify the NSW DCCEEW Project Manager of the find, who in turn will notify NSW Police if the material is determined to be of human origin and less than 100 years old, or NPWS Aboriginal Partnerships and Heritage Unit, and Heritage NSW if the remains are believed to be Aboriginal. If in doubt or required by NSW Police, NSW DCCEEW will obtain specialist advice from a forensic anthropologist or bioarchaeologist to confirm that the bones are human, their age and whether they are Aboriginal or not. The remains must be left in place and protected from further harm or damage		

Impact	Safeguard	Responsibility	Timing
	or unauthorised access until further advice states otherwise. If the remains are confirmed to be Aboriginal, NSW DCCEEW will notify the RAPs. Aboriginal ancestral remains will be recorded in a culturally appropriate manner in collaboration with Heritage NSW and the registered Aboriginal parties. Work will not recommence at the location until authorised in writing by Heritage NSW if the remains are considered by the NSW Police and Heritage NSW to be Aboriginal.		
Historic heritage			
Unexpected finds	If historical archaeological relics are discovered during construction, all work will cease in the area. The contractor will notify the NSW DCCEEW Project Manager, who in turn will notify NPWS. A historical archaeologist will be engaged to assess the item's significance.	Contractor/NSW DCCEEW	Construction
Air quality			
Dust generation during construction	Works methods will be modified during high wind conditions if excessive dust is generated.	Contractor	Construction
	All vehicles on-site will be confined to a designated route.	Contractor	Construction
	Reduce vehicle speeds to minimise dust emissions.	Contractor	Construction
Impacts on air quality during construction	Visual monitoring for dust will be implemented during the works. Where required, a hose or water cart would be used to regularly wet down haulage access tracks, work sites and laydown areas.	Contractor	Construction
	Work and construction vehicles will drive at lower speeds to minimise dispersal of dust and soil during vehicle movements.	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
Vehicle emissions	Trips and trip distances will be controlled and reduced where possible, for example by coordinating delivery and removal of materials to avoid unnecessary trips.	Contractor	Construction
	Minimise engine idling and ensure vehicle engines are switched off when stationary or parked within ancillary facilities or construction zones.	Contractor	Construction
Noise and vibration			
Construction noise and vibration	Provide community information regarding potential impacts from increases in heavy traffic during construction, including potential noise impacts.	NSW DCCEEW	Construction
	Public access should be excluded from the construction zone, including associated laydown and stockpile areas.	Contractor	Construction
	Unless otherwise approved by NSW DCCEEW through an out of hours application process, construction hours will be limited to: • Monday to Friday: 7 am to 6 pm • Saturday: 8 am to 5 pm No construction work on Sundays or public holidays.	Contractor	Construction
	All site personnel are to be made aware of noise issues and mitigation measures through induction processes.	Contractor	Construction
	All machinery shall be well maintained and in good working order. All vehicles and equipment will be fitted with silencing devices, where applicable.	Contractor	Construction
Traffic and access			
Construction traffic	A construction traffic management plan will be prepared as part of the CEMP. The plan will include: • A driver code of conduct	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	• Confirmation of haulage routes and access locations • Measures to maintain access and capacity to existing roads where possible • Traffic control measures including signage at appropriate locations to notify road users of increased traffic volumes and construction vehicles • Management of oversized vehicles • A response plan for any construction-related traffic incidents.		
	Consultation with NPWS and Murray River Council will be undertaken to minimise the impacts to the surrounding road network during construction including temporary access tracks or road closures. Any agreed traffic management measures will be incorporated into the construction traffic management plan.	Contractor	Construction
Visual			
Visibility of construction elements	During construction, all equipment, materials and temporary facilities, such as site offices and portable toilets, will be located within the designated construction footprint for the works.	Contractor	Construction
	The construction work site will be clearly demarcated and maintained in an orderly manner.	Contractor	Construction
	All construction equipment will be removed from the park as soon as it is not required, including any material and refuse related to the works.	Contractor	Construction
Revegetation	A site rehabilitation plan will be prepared as part of the CEMP. The site rehabilitation plan will detail how the work sites will be stabilised and revegetated once the new infrastructure is built.	NSW DCCEEW, Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	A draft site rehabilitation plan will be provided to NPWS for comment and any comments provided will be addressed in the final version of the plan. Rehabilitation of the construction footprint including revegetation will be carried out as soon as practicable.		
Hazards			
Bushfire risk during construction	The following controls will be implemented to mitigate potential for fires and increased bush fire risk during construction: • No stockpiling or burning of waste vegetation to occur onsite • Daily weather checks will be undertaken during the pre-start meeting to note for potential fire danger • Any notices erected, displayed or issued by NPWS regulating the use of fire in the park will be complied with • Hot works and machinery which may result in sparking or ignition must not be used on a Total Fire Ban Day without an exemption from the NSW Rural Fire Service • Fuel and other similar flammable materials, such as gas cylinders and paint, will be stored in appropriate fire-resistant storage containers • Appropriate firefighting equipment (e.g., water pump, extinguisher and hand tools) should be available on site along with trained staff • Stationary plant will be parked in cleared areas • No smoking on site in accordance with section 19 of the NPW Regulation.	Contractor	Construction
	All works will be undertaken in accordance with the operational	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	guidelines under the *Murray Valley National and Regional Parks (Millewa, Moira and Gulpa Islands Precincts) Fire Management Strategy* which includes provisions pertaining to operation of earthmoving equipment and visitor management.		
Emergency response	Emergency contacts and response procedures will form part of the CEMP and site inductions.	Contractor	Construction
Waste, contamination and hazardous materials			
Spoil generation	Where feasible, suitable excavated spoil material will be reused onsite as backfill and/or for construction of cofferdams.	Contractor	Construction
Beneficial re-use onsite	Cleared vegetation suitable for use in the rehabilitation works (e.g., fallen logs that could provide habitat) will be retained on site for later reuse in accordance with the site rehabilitation plan. Other cleared vegetation will be mulched and either disposed off-site at a suitably licenced waste facility or, if requested by and agreed with NPWS, made available for NPWS to reuse within Murray Valley National Park and Regional Park.	Contractor	Construction
	Earth removed that is surplus to the requirements of the site where it was excavated and which can be classified as virgin excavated natural material or excavated natural material could be used for other works proposed in Millewa Forest as part of the Millewa Forest Supply Project, or otherwise disposed off-site at an appropriately licenced waste facility.	Contractor	Construction
Hazardous materials	All hazardous materials will be stored in accordance with existing or agreed NPWS procedures.	Contractor	Construction
Accidental spill	All contractors and staff will be appropriately trained through a site induction and toolbox talks to prevent, minimise and manage accidental spills.	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	Machinery will be inspected daily to ensure no oil, fuel or lubricants are leaking from the machinery. Machines will be maintained as per manufacturers specifications.	Contractor	Construction
	To avoid release to the environment, all hazardous materials (fuels, lubricants, herbicides, etc.) will be disposed of off-site in accordance with Environment Protection Authority guidelines.	Contractor	Construction
	Spill response procedures will follow existing or agreed NPWS procedures.	Contractor	Construction
	Mobile spill kits fully stocked with adequate spill prevention and absorbent materials (including absorbent pads, granular absorbent and disposal bags) will be maintained onsite and on construction vehicles carting hazardous materials.	Contractor	Construction
	Refuelling of all vehicles and mobile equipment will occur at least 20 metres away from any drainage lines or waterways.	Contractor	Construction
Soil contamination	If suspected soil contamination is encountered, the suspect materials should be segregated and placed in a designated bunded stockpile covered in plastic sheeting to prevent rainfall infiltration and/or soil migration during windy conditions.	Contractor	Construction
Generation of construction waste	All waste material generated will be handled and disposed of carefully to minimise the risk of pollution.	Contractor	Construction
	All construction and demolition materials able to be recycled shall be separated and recycled at approved facilities or reused onsite.	Contractor	Construction
	All demolition material and waste materials will be removed from the site in a timely manner and disposed of at a suitability-licenced waste disposal facility.	Contractor	Construction

Impact	Safeguard	Responsibility	Timing
	Records of waste classification and disposal dockets will be maintained.	Contractor	Construction
Material usage	Preferential use of fabricated and precast materials will be integrated into the detailed design to minimise onsite construction waste and optimise material usage.	NSW DCCEEW	Detailed Design
Cumulative impacts			
Cumulative impacts	Construction of the various components of the Millewa Forest Supply Project would be coordinated by NSW DCCEEW to minimise any potential cumulative impacts.	NSW DCCEEW	Construction

10 Conclusion

10.1 Justification

From the 1930s, the Millewa Forest water channel network has been manipulated by the installation of many banks and regulators and, in some cases, construction of artificial channels. These management interventions influenced the movement of water on the floodplain largely to optimise floodplain forestry. Further infrastructure was constructed during the 1990s to assist with river operations in the Murray and Edward River systems. Many of these structures, including the existing inlet regulator, are now old, in poor repair, fail to meet contemporary safety standards and were not designed to optimise fish movement.

The proposed replacement of the existing inlet regulator would provide a modern structure that meets contemporary health and safety standards and would include a fishway that enables bi-directional fish movement past the structure. The fishway would open up fish movement along about 60 kilometres of waterway between the Murray River and the Edward River via Bullatale Creek.

The improvement in the efficiency of operation of the replacement inlet regulator compared to the existing inlet regulator would contribute to the 45 gigalitre per annum water saving targeted by the Acceleration Programme.

Potential environmental impacts of the proposed activity have been identified and assessed in Chapter 6 and found to be minor or insignificant. Required native vegetation removal would be limited and disturbed areas of the construction footprint not occupied by new infrastructure would be revegetated in accordance with a rehabilitation plan prepared as part of the CEMP. The proposed activity is unlikely to significantly impact threatened species, populations, ecological communities or migratory species.

Safeguards specific to the proposed activity have been developed to avoid, minimise or manage these potential impacts. The minor potential environmental impacts of the proposed activity are outweighed by the broader, long-term benefits of the proposed activity and the proposed activity is considered to be in the public interest.

10.2 Ecologically sustainable development

Ecologically sustainable development is development that improves the total quality of life, both now and in the future. Section 193 of the EP&A Regulation identifies four principles of ecologically sustainable development that are presented in Table 10-1. The table also identifies how the proposed activity aligns with each of the principles.

Table 10-1 Consideration of the EP&A Regulation principles of ecologically sustainable development

EP&A Regulation principles of ecologically sustainable development	Proposed activity response
The precautionary principle This principle states: 'if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.'	A key objective of the proposed activity is to remove constraints to the movement of water across the floodplain and reopen pathways for native fish which would improve environmental (in particular fish passage) outcomes for Bullatale supply channel and the broader system, as described in Section 2.1.
Intergenerational equity This principle states: 'the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.'	This REF comprehensively assesses the potential environmental impacts of the proposed activity, including potential socio-economic impacts, and has found them to be primarily positive. Potential adverse impacts are minor or insignificant.
Conservation of biological diversity and ecological integrity This principle states: 'the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival.'	Comprehensive biodiversity assessments considering aquatic and terrestrial biodiversity has been completed (refer to Section 6.4 and Section 6.5 and Attachment A and Attachment B) and found that the proposed activity is unlikely to have a significant impact on threatened species, populations, ecological communities and migratory species, and residual biodiversity impacts are low.
Improved valuation, pricing, and incentive mechanism This principle is defined as: 'Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as: i. polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, ii. the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, iii. environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best	As discussed in Section 2.5, an options evaluation framework was developed to assess the advantages and disadvantages of a range of potential options and alternatives considered. The preferred option was selected due to the ability to avoid the operation and maintenance risks and costs and environmental impacts associated with some of the alternatives considered.

EP&A Regulation principles of ecologically sustainable development	Proposed activity response
placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems'.	

10.3 Conclusion

The proposed activity outlined herein is subject to assessment under Division 5.1 of the EP&A Act. As per Chapters 6 and 8 of this REF, all matters affecting or likely to affect the environment by reason of the proposed activity have been examined and taken into account to the fullest extent possible.

The site selection, options assessment and concept design development of the proposed activity aimed to minimise environmental impacts, and the proposed activity as described in this REF best meets the project objectives. However, the proposed activity would still have some minor environmental impacts as identified in this REF including clearing of up to 0.42 hectares of native vegetation, removal of at least one of the two hollow-bearing trees within the construction footprint, and temporary traffic, noise and air quality impacts during the construction phase. Safeguards outlined in this REF would avoid, minimise or manage known or likely impacts, ensuring residual risks as identified in Chapter 6 will remain low.

The proposed activity would remove constraints to the movement of water across the floodplain and reopen pathways for native fish and, on balance, the proposed activity is considered justified.

The proposed activity is unlikely to cause a significant impact on the environment. Therefore, an environmental impact statement and approval from the NSW Minister for Planning under Division 5.2 of the EP&A Act is not required. As NSW DCCEEW has not opted under section 7.8(3)(b) of the BC Act to prepare a biodiversity development assessment report and the proposed activity will not have a significant impact on threatened entities under that Act, or the FM Act, a species impact statement is also not required.

The proposed activity is unlikely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the Commonwealth EPBC Act and a referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water has confirmed that the proposed activity is not a controlled action.

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12 Terms and abbreviations

Term	Description
AHD	Australian height datum
AHIMS	Aboriginal Heritage Information Management System
BC Act	*Biodiversity Conservation Act 2016*
BC Regulation	Biodiversity Conservation Regulation 2017
Biodiversity and Conservation SEPP	State Environmental Planning Policy (Biodiversity and Conservation) 2021
Bullatale inlet regulator	Bullatale supply channel inlet regulator
CEMP	Construction Environmental Management Plan
DPI	Department of Primary Industries
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2021
FM Act	*Fisheries Management Act 1994*
IBRA	Interim Biogeographic Regionalisation for Australia
Murray Valley SoMI	*Statement of Management Intent: Murray Valley National Park and Murray Valley Regional Park* (NPWS, 2014)
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
OEH	Office of Environment and Heritage
PCT	Plant community type
POEO Act	*Protection of the Environment Operations Act 1997*

Term	Description
Proposed activity, the	The Bullatale inlet regulator replacement project
REF	Review of environmental factors
SDL	Sustainable diversion limit
SDLAM	NSW Sustainable Diversion Limit Adjustment Mechanism Program
SEPP	State environmental planning policy
Site environmental water managers	Stakeholders with an interest in and/or responsibility to carry out environmental watering of Millewa Forest are: • NPWS, as the icon site manager for The Living Murray • The Biodiversity and Conservation Division of the Environment and Heritage Group of the Department of Climate Change, Energy, the Environment and Water, which manages the Barmah-Millewa water account • The Commonwealth Environmental Water Office and the Murray-Darling Basin Authority, which hold the water entitlement for The Living Murray. While all these stakeholders are involved in the management of environmental watering of Millewa Forest, for practical reasons NPWS has assumed day-to-day responsibility for carrying out environmental watering of the forest. For simplicity, environmental watering of the forest is discussed in this REF as the responsibility of 'the site environmental water manager'.
Transport and Infrastructure SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
WM Act	*Water Management Act 2000*

Attachment A Biodiversity assessment report

Attachment B Aquatic ecology and water quality assessment report

Attachment C Hydrological effects of the replacement Bullatale inlet regulator

Attachment D Aboriginal cultural heritage assessment report

Attachment E Historical heritage assessment report