



Biodiversity Assessment Report

**Bullatale Inlet Regulator Replacement
Millewa Forest Supply Project**



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Glossary of terms

Term	Definition
Bioregion	Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. They capture the large-scale geophysical patterns across Australia. These patterns in the landscape are linked to fauna and flora assemblages and processes at the ecosystem scale.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Direct impact	An impact on biodiversity values that is a direct result of vegetation clearance and loss of habitat for a development. It is predictable, usually occurs at or near the construction area and can be readily identified during the planning, design, construction, and operational phases of a development.
Ecological community	An ecological community is a naturally occurring group of native plants, animals and other organisms living in a unique location. Ecological communities can be listed as threatened under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) and/or the New South Wales (NSW) <i>Biodiversity Conservation Act 2016</i> (BC Act).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population, or ecological community, including any biotic or abiotic component.
Indirect impact	An impact on biodiversity values that occurs when development related activities affect threatened species, threatened species habitat, or ecological communities in a manner other than direct impact. Compared to direct impacts, indirect impacts often: <ul style="list-style-type: none"> ▪ Occur over a wider area than just the site of the development ▪ Have a lower intensity of impact in the extent to which they occur compared to direct impacts ▪ Occur off site ▪ Have a lower predictability of when the impact occurs ▪ Have unclear boundaries of responsibility.
Locality	This is defined as the area within a 10 kilometre radius surrounding the Bullatale Inlet Regulator.
Local population	The population that occurs in the construction area. In cases where multiple populations occur in the construction area and/or a population occupies part of the construction area, impacts on the entirety of each population must be assessed separately.
Matters of National Environmental Significance (MNES)	MNES are protected by a provision of Part 3 of the EPBC Act.
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils, and broad vegetation types, mapped at a scale of 1: 250,000.
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality.
Plant community type	A NSW plant community type identified using the plant community type (PCT) classification system. The PCT classification was created in 2011 by consolidating two existing community-level classifications: the NSW Vegetation

Term	Definition
	Classification and Assessment database; and the Biometric Vegetation Types database used in NSW regulatory programs. The PCT classification is now maintained in the BioNet Vegetation Classification application. It is a way to classify vegetation types.
Population	A group of organisms, all of the same species, occupying a particular area.
Target species	A species that is the focus of a study or intended beneficiary of a conservation action or connectivity measure.
Threatened Biodiversity Data Collection	Part of the BioNet database, accessible from the BioNet website at www.bionet.nsw.gov.au .
Threatened species	A species listed under the BC Act, NSW <i>Fisheries Management Act 1994</i> (FM Act) or EPBC Act.
Threatened ecological community	A community of different species associated with one another and sharing the same habitat, that is listed under the BC Act, FM Act and EPBC Act. Threatened ecological communities are listed as endangered or critically endangered under the BC Act, or may be listed as vulnerable, endangered, or critically endangered under the EPBC Act.

Abbreviations

Abbreviation	Definition
AOBV	Areas of Outstanding Biodiversity Value
BAR	Biodiversity Assessment Report
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Strategy
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Federal)
DEWHA	Department of the Environment, Water, Heritage and the Arts (Federal)
DoE	Department of Environment (Federal)
DoEE	Department of the Environment and Energy (Federal)
DPE	Department of Planning and Environment (NSW)
DPIE	Department of Planning, Industry and Environment (NSW)
DPI	Department of Primary Industries (NSW)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Federal)
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
HBT	Hollow Bearing Tree
IBRA	Interim Biogeographically Regionalisation of Australia
KFH	Key Fish Habitat
KTP	Key Threatening Process
MNES	Matters of National Environmental Significance
NPWS	National Parks and Wildlife Service
REF	Review of Environmental Factors
PCT	Plant community type
SIS	Species Impact Statement
sp.	Species (singular)
spp.	Species (plural)
subsp.	Subspecies
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
VIS	Vegetation Information System (BioNet Vegetation Classification)
WINSW	Water Infrastructure NSW

Table of Contents

1.	Introduction.....	1
1.1	The proposal.....	1
1.2	Location and background of the proposal	2
1.3	Purpose and scope of this report	3
2.	Legislative and policy framework.....	5
2.1	Commonwealth legislation	5
2.1.1	Environment Protection and Biodiversity Conservation Act 1999.....	5
2.2	NSW state legislation	5
2.2.1	Environmental Planning and Assessment Act 1979	5
2.2.2	Biodiversity Conservation Act 2016.....	5
2.2.3	Biosecurity Act 2015.....	6
2.2.4	Fisheries Management Act 1994.....	6
3.	Methodology	8
3.1	Personnel	8
3.2	Background research and data sources.....	8
3.3	Threatened and migratory species likelihood of occurrence.....	9
3.4	Field assessment.....	9
3.4.1	Vegetation and habitat survey.....	10
3.4.2	Threatened flora survey.....	12
3.4.3	Threatened fauna survey	12
3.4.4	Aquatic environment and habitat survey	12
3.5	Significance assessments	12
3.6	Limitations	13
4.	Existing environment	14
4.1	Environmental context.....	14
4.1.1	IBRA bioregion and sub-region	14
4.1.2	NSW (Mitchell) landscapes	14
4.1.3	Topography, geology and soils	14
4.2	Native vegetation.....	14
4.2.1	Vegetation communities and assemblages	14
4.2.2	Threatened ecological communities.....	16
4.3	Threatened species and their habitat.....	16
4.3.1	Threatened flora species	16
4.3.2	Threatened fauna species	16
4.4	Aquatic habitat.....	18
4.5	Groundwater dependent ecosystems.....	19
4.6	Areas of outstanding biodiversity value.....	19
4.7	Weeds of National Significance, Priority Weeds and High Threat Weeds.....	19
4.8	Matters of National Environmental Significance.....	22
4.8.1	Wetlands of international importance (Ramsar wetlands).....	22
4.8.2	Threatened flora	22

4.8.3	Threatened fauna	22
4.8.4	Migratory species	23
5.	Impacts	24
5.1	Loss of vegetation and habitat	24
5.2	Threatened biodiversity	24
5.2.1	Threatened flora	24
5.2.2	Threatened fauna	25
5.3	Wildlife connectivity and habitat fragmentation	25
5.4	Edge effects.....	25
5.5	Injury and mortality	26
5.6	Proliferation of weeds.....	26
5.7	Pests and pathogens.....	27
5.7.1	Pests.....	27
5.7.2	Pathogens	27
5.8	Noise, vibration and dust.....	27
5.9	Erosion, sedimentation and waterways.....	28
5.10	Ramsar wetlands and nationally important wetlands	28
5.11	Significance assessments	28
6.	Avoid, minimise and mitigate impacts	30
6.1	Avoidance and minimisation.....	31
6.2	Mitigation measures	31
7.	Conclusion	36
8.	References	37
Appendix A. Likelihood of occurrence assessment		40
Appendix B. Assessment of significance.....		63
Appendix C. EPBC Act Protected Matters Search Tool		76

Figures

Figure 1-1 Modelled inundation from Bullatale Supply Channel with the proposed replacement inlet regulator when operated to achieve a flow of 80 megalitres per day down the channel under flow of 10,000 megalitres per day in the Murray River.....	2
Figure 1-2 The proposal	4
Figure 4-1 Ecological features within and surrounding the proposal area	21

Tables

Table 3-1 Personnel, role and qualifications	8
Table 3-2 Likelihood of occurrence assessment criteria	9
Table 3-3 General vegetation and habitat condition assessment criteria	11
Table 4-1 Threatened fauna species with a moderate to high likelihood of occurring within the proposal area..	17
Table 4-2 Ramsar Wetlands identified within the proposal area locality.....	22
Table 5-1 Weed species recorded in the proposal area and their control methods.....	26
Table 5-2 Summary findings of the BC Act test of significance for the proposal area	29
Table 5-3 Summary findings of the EPBC Act significance assessments for the proposal area	30
Table 6-1 Recommended mitigation measures during pre-construction and construction	32

1. Introduction

1.1 The proposal

This biodiversity assessment pertains to the concept design prepared on behalf of Water Infrastructure NSW (WINSW) for the proposed replacement of the existing Bullatale Inlet Regulator (the 'proposal'), which is located within Millewa Forest on land adjacent to Murray Valley National Park.

Bullatale Inlet Regulator is used to manage the flow of water from the Murray River into Bullatale supply channel (also referred to as Lower Toupna Creek). The supply channel transfers inflows from the Murray River to private land north of Murray Valley National Park and eventually to Bullatale Creek.

The proposal would involve removing the existing inlet regulator and installing a new inlet regulator and connecting it to Bullatale supply channel. A fishway would be installed at the new inlet regulator. The proposal also includes removing silt that has built up in the inlet channel between the Murray River and the upstream side of the replacement inlet regulator.

The key works proposed during the construction phase of the proposal are:

- Installing the replacement inlet regulator
- Desilting the channel upstream of the replacement inlet regulator to the Murray River using a two-tonne excavator working from within the channel
- Decommissioning the existing inlet regulator by excavating and removing two buried pipelines and the fill material overlying these pipelines, and removing the penstock gates and headwalls of the structure
- Cutting and shaping a channel that approximately follows the alignment of the removed pipelines to connect the replacement inlet regulator to Bullatale supply channel downstream
- A temporary construction phase laydown area with dimension of about 16-metres by 35-metres is proposed in a cleared area above the buried pipelines. Once the replacement inlet regulator is constructed this cleared area would be excavated to reopen the channel in the final stages of construction.

The proposed desilting work in the inlet channel between the Murray River and the upstream side of the replacement inlet regulator would restore the historical commence to flow rate in Bullatale supply channel at the Murray River, which occurs at about 4,000 megalitres per day. This would result in a greater depth of water in the inlet channel but no change in the water level. The expected change in the depth of water in the inlet channel is not considered an adverse impact given historical commence to flow rates would be achieved.

The main operational impact of the replacement inlet regulator is that it would allow fish passage past the structure in both the upstream and downstream directions, which is not possible at the existing inlet regulator. The replacement inlet regulator would be operated so that deliveries occur through the fishway in the first instance, with other gates being opened when more flow is required.

The replacement inlet regulator would be operated by Bullatale Creek Water Trust in accordance with an operational management plan that would require the maximum daily volume of water allowed to pass the structure to be the same as that which currently passes the existing inlet regulator, and no more than the bank-full capacity of the channel of about 80 megalitres per day. This would ensure that overflow from the channel into the forest is avoided.

Error! Reference source not found. provides mapping from the hydrology modelling carried out for the proposed action and it shows that flow through the replacement inlet regulator of 80 megalitres per day would be contained within the channel.

There would be no change to flows in the supply channel downstream of the replacement inlet regulator except during the shoulder irrigation season, more commonly in the autumn months, when the reinstatement of the historical commence to flow rate in Bullatale supply channel upstream of the replacement inlet regulator would enable Bullatale Creek Water Trust to create downstream flows that are not possible with the existing inlet regulator. In these instances the operational extent of the proposal would extend downstream along the supply channel to Bullatale Creek, with the impact reducing downstream of where the Trust extracts water. Any flow in Bullatale supply channel and Bullatale Creek during the shoulder irrigation season is not considered an adverse impact to the waterway when compared to the existing absence of flows at these times due to the silt built-up on the supply channel upstream of the existing inlet regulator.

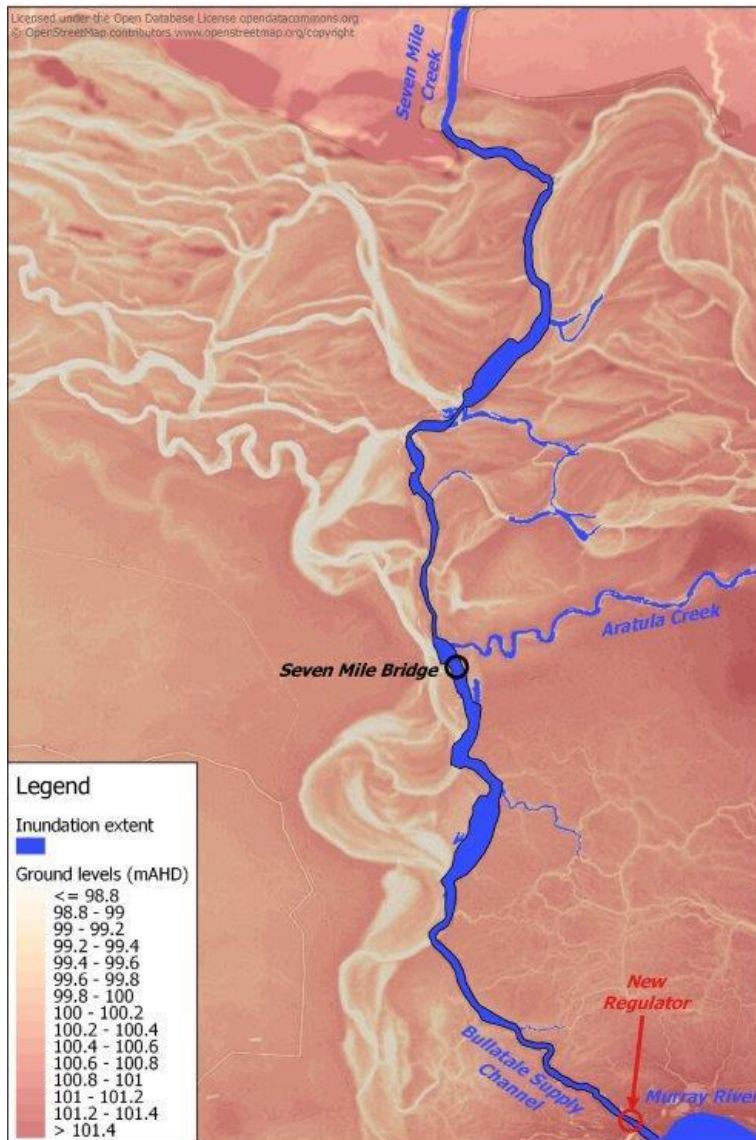


Figure 1-1 Modelled inundation from Bullatale Supply Channel with the proposed replacement inlet regulator when operated to achieve a flow of 80 megalitres per day down the channel under flow of 10,000 megalitres per day in the Murray River

The proposal is part of the Millewa Forest Supply project, which in turn is part of the Murray and Murrumbidgee Valley National Parks Sustainable Diversion Limits Adjustment Mechanism Project. The proposal is aligned with the aim of this project to modernise ageing infrastructure and reopen pathways for native fish.

The proposal site, key works and temporary laydown area is displayed on **Figure 1-2** and are collectively referred to as the 'proposal area' throughout this report.

1.2 Location and background of the proposal

The proposal is located in Millewa Forest, which covers an area of about 38,000 hectares, mostly in Murray Valley National Park. The Barmah Forest is located in Victoria immediately south of the Millewa Forest. Collectively, the Millewa Forest and Barmah Forest are referred to as the Barmah-Millewa Forest and function as a single eco-hydrological system.

The Bullatale supply channel flows south to north, from the Bullatale offtake regulator (also referred to as the Lower Toupna regulator) on the Murray River. It delivers stock, domestic and irrigation water to private landholders to the north of Murray Valley National Park and eventually to Bullatale Creek. The channel is artificial but co-opts natural creeks in some sections, disrupting the movement of water on the Millewa

floodplain. The channel has been operated by the Bullatale Creek Water Trust for around 100 years and has an estimated capacity of 170 to 300 megalitres per day.

1.3 Purpose and scope of this report

3Rivers on behalf of WINSW has prepared this biodiversity assessment report (BAR) to inform a Review of Environmental Factors (REF) of the potential ecological impacts of the proposal. The purpose of the REF is to assess the potential environmental impacts of the proposal to satisfy the requirements of Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and considers the factors listed in clause 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Reg).

This BAR details the methods and results of a biodiversity survey and assessment to identify the distribution and abundance of threatened species, populations and ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), NSW *Fisheries Management Act 1994* (FM Act) and Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in the area of the proposal to assess the extent and magnitude of ecological impacts associated with the proposal. Additionally, the report addresses the requirements for assessment of significance under the EP&A Act, BC Act, FM Act and EPBC Act. Mitigation measures to ameliorate ecological impacts arising from the proposal are also provided. The aims of the biodiversity assessment are to:

- Describe the characteristics and ecological condition of the vegetation communities and habitats within the proposal area
- Determine the occurrence, or likelihood of occurrence of threatened species, populations and communities listed under the BC Act and EPBC Act within the proposal area
- Describe the potential impacts as a result of the proposal on biodiversity within the proposal area
- Undertake a test of significance for threatened species and communities that are confirmed or considered likely to occur within the proposal area in accordance with section 7.3 of the BC Act to determine whether the proposal is likely to significantly affect threatened species
- Undertake assessments in accordance with the *Matters of National Environment Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment (DoE), 2013) to consider impacts to nationally listed threatened species, ecological communities and migratory species
- Propose measures to avoid and mitigate impacts on ecological values.

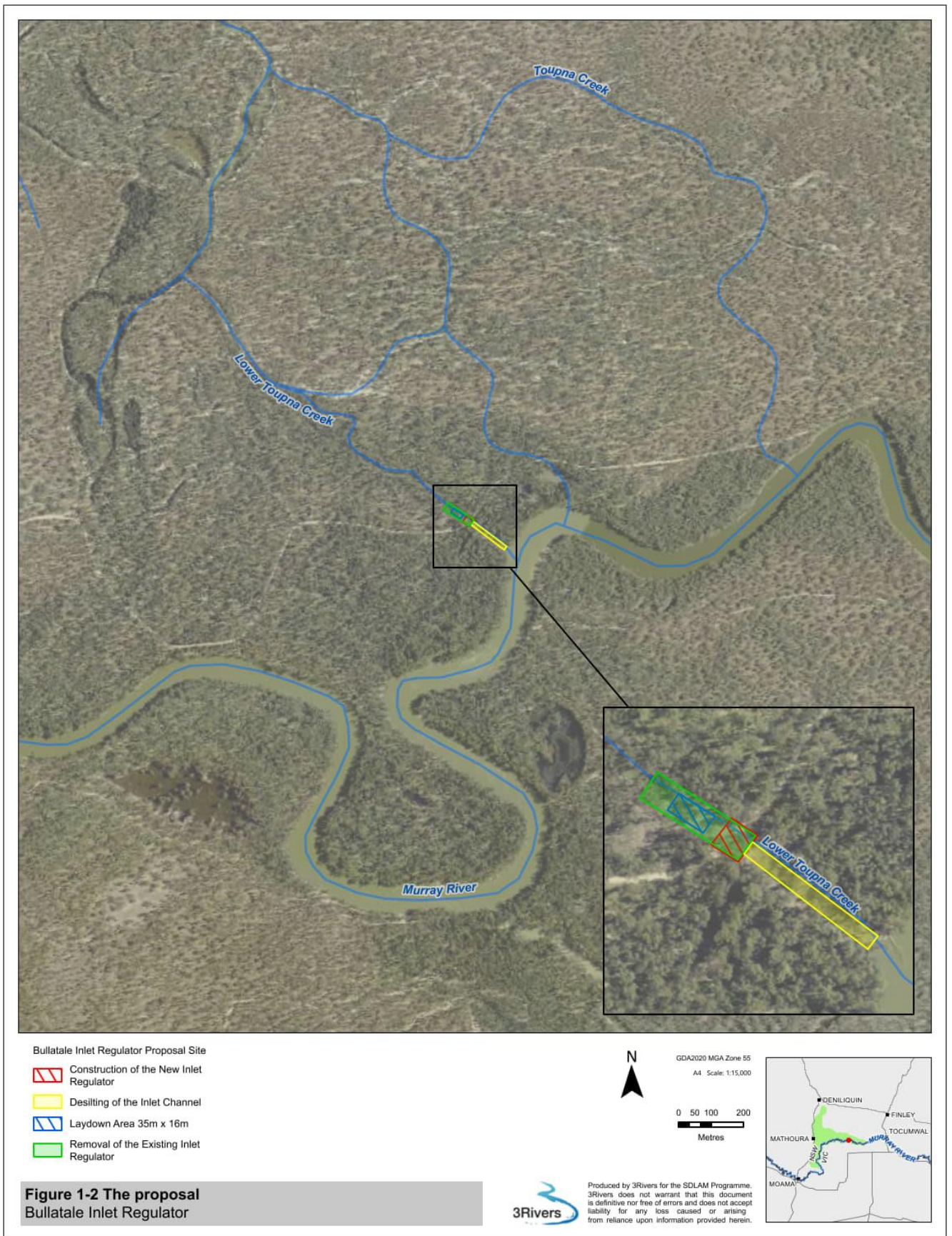


Figure 1-2 The proposal

2. Legislative and policy framework

2.1 Commonwealth legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on MNES undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment.

The EPBC Act identifies MNES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Listed threatened species and ecological communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act has been addressed in this assessment through:

- Desktop review to determine the applicable MNES that have been previously recorded within the locality and hence could occur in the proposal area, subject to the habitats present.
- Desktop assessment and field surveys to describe the environment of the proposal area.
- Targeted field surveys for threatened species and ecological communities, and migratory species.

2.2 NSW state legislation

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the system of environmental planning and assessment in NSW. Land use planning requires that environmental impacts are considered as part of the assessment of development, including impacts on biodiversity.

This report has been prepared to inform an REF that assesses the environmental impacts of the proposal. The REF satisfies the requirements of Division 5.1 of the EP&A Act and considers the factors listed in clause 171(2) of the EP&A Reg to comply with sections 5.5 and 5.7 of the EP&A Act.

Under section 111(1) of the EP&A Act, determining authorities must 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity'. This report addresses the ecological components of the environment to assist WINSW to address the requirements of section 111(1) of the EP&A Act.

2.2.2 Biodiversity Conservation Act 2016

The BC Act seeks to conserve biological diversity and promote ecologically sustainable development, to prevent extinction and promote recovery of threatened species, populations and ecological communities and to protect Areas of Outstanding Biodiversity Value (AOBV).

The BC Act sets out the environmental impact assessment framework for threatened species, Threatened Ecological Communities (TECs) and AOBV. The BC Act lists a number of threatened species, populations or ecological communities to be considered in deciding whether a development or activity is "likely to significantly affect threatened species". A development or an activity is likely to significantly affect threatened species if:

- a) 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
- b) the development exceeds the Biodiversity Offsets Scheme (BOS) threshold if the BOS applies to the impacts of the development on biodiversity values, or
- c) it is carried out in a declared AOBV.

The BOS does not apply to development that is an activity subject to environmental impact assessment under Division 5.1 of the EP&A Act unless the proponent chooses to opt into the BOS. WINSW has not opted into the BOS for the proposal area. As such, the test of significance detailed in section 7.3 of the BC Act must be used to determine whether the proposal is likely to significantly affect threatened species and trigger a BDAR.

The BC Act has been addressed in this 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 (KTPs) relevant to the proposal area
- 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.

2.2.3 Biosecurity Act 2015

The *Biosecurity Act 2015* has replaced the *Noxious Weeds Act 1993*, which has provided regulatory controls and powers to manage noxious weeds in NSW. The primary object of this Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. *The Biosecurity Act 2015* streamlines and modernises the way weeds are managed in NSW as it:

- Embeds the principle of shared responsibility for biosecurity risks (including weeds) across government, community and industry
- Applies equally to all land in the State, regardless of whether it is publicly or privately owned
- Is premised on the concept of risk, so that weed management investment and response is appropriate to the risk
- Supports regional planning and management for weeds, as recommended by the *Review of Weeds Management in NSW, Submission to the Natural Resources Commission* (Invasive Species Council, Australian Association of Bush Regenerators, Greening Australia, National Parks Association of NSW and Nature Conservation Council of NSW, 2013).

The *Biosecurity Act 2015* identifies priority weeds and assigns strategies for their containment, removal or management. Occupiers of land have responsibility under the Act for taking appropriate action for priority weeds on the land they occupy.

Further discussion on weeds listed under the *Biosecurity Act 2015* is outlined in **Section 4.7**. Suitable mitigation measures have been provided to appropriately manage these weeds in accordance with the Act (see **Chapter 0**).

2.2.4 Fisheries Management Act 1994

The FM Act provides for the protection of threatened fish and marine vegetation and is administered by NSW Fisheries which is part of the Department of Primary Industries (DPI). The FM Act, in conjunction with the BC Act, aims to conserve, develop and share fisheries resources and conserve marine species, habitats and diversity. The objectives of the FM Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. It provides for:

- The listing of threatened species, populations and ecological communities, with endangered species, populations and communities listed under Schedule 4, critically endangered species and communities listed under Schedule 4A, vulnerable species and communities listed under Schedule 5
- The listing of 'Key Threatening Processes' under Schedule 6
- Diseases affecting fish and marine vegetation under Schedule 6B
- Noxious fish and noxious marine vegetation under Schedule 6C
- The preparation and implementation of Recovery Plans and Threat Abatement Plans
- Requirements or otherwise for the preparation of a Species Impact Statement (SIS).

One of the objectives of the FM Act is to 'conserve key fish habitats' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. These include marine vegetation such as mangroves, seagrass beds and saltmarsh. To assist in the protection of Key Fish Habitat (KFH), DPI has produced the *Policy and guidelines for fish habitat conservation and management* (2013 update) (DPI, 2013). This policy applies to the following developments, works or activities, each of which can impact on KFH:

- Dredging or reclamation
- Impeding fish passage
- Damaging marine vegetation
- De-snagging.

Further, the *Policy and guidelines for fish habitat conservation and management* (2013 update) (DPI, 2013) outlines the mitigation and compensation measures in place to redress any adverse environmental impacts to aquatic or estuarine systems. The guideline states that "to ensure "no net loss" of aquatic habitats, NSW DPI requires that proponents should, as a first priority, aim to avoid impacts upon KFH. Where avoidance is impossible or impractical, proponents should then aim to minimise impacts. Any remaining impacts should then be offset with compensatory works".

The FM Act has been addressed in this assessment through:

- Desktop review to determine the threatened species, populations or ecological communities that have been previously recorded within the locality of the proposal area and hence could occur subject to the habitats present
- Assessment of potential impacts on aquatic habitats with potential to be impacted, including identification of KTPs, impacts on KFH and fish passage
- Identification of suitable impact mitigation and environmental management measures to avoid or mitigate impacts on the aquatic environment.

3. Methodology

3.1 Personnel

This biodiversity assessment was undertaken and prepared by appropriately qualified and experienced ecologists as outlined in **Table 3-1**.

Table 3-1 Personnel, role and qualifications

Name	Role	Qualifications
Chris Thomson	Principal Ecologist – Field surveys, technical lead	Graduate Certificate in Natural Resources Bachelor of Applied Science (Environmental Management) Accredited under Section 6.10 of the Biodiversity Conservation Act 2016 as a Biodiversity Assessment Method Assessor (No. BAAS18058)
Jon Carr	Senior Ecologist – Field surveys, reporting, GIS	Bachelor of Environmental Science and Management Accredited under Section 6.10 of the BC ACT as a Biodiversity Assessment Method Assessor (No. BAAS18009)
Julia Bayada	Ecologist – Reporting and GIS	Bachelor of Environmental Science and Management (Ecosystems and Biodiversity)

3.2 Background research and data sources

A desktop assessment was conducted to assess the known biodiversity values of the proposal area and assess the likelihood of the proposal area to support threatened species, populations or TECs, and their habitats. The review focused on identifying and listing the threatened flora and fauna species, populations and ecological communities previously recorded from a 10-kilometre radius of the proposal area. Information sources used in this assessment are listed below.

Vegetation communities and flora

- Available vegetation mapping for the Riverina (VIS_ID 4469) (DPE, 2016)
- BioNet Vegetation Classification Database (DPE, 2022a)
- NSW WeedWise – Riverina Region (DPI, 2022c)
- Riverina Regional Strategic Weed Management Plan 2017-2022 (Riverina Local Land Services, 2017)
- NSW PlantNet (Royal Botanic Gardens and Domain Trust, 2022).

Threatened species, populations and communities

- EPBC Act Protected Matters Search Tool - Commonwealth Department of Environment (DCCEEW, 2022c)
- BioNet - Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (EESG, 2022)
- Species Profile and Threats (SPRAT) database (DCCEEW, 2022d)
- Fisheries Spatial Data Portal (DPI, 2022a)
- Threatened Biodiversity Values Map and Threshold Tool (DPE, 2022d).

Landscape features and habitat

- Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and sub-region mapping (DoEE, 2018)
- Directory of Important Wetlands in Australia (DCCEEW, 2022a)
- Aerial photographs (current and historic) and topographic maps (NSW Spatial Services, 2022)
- NSW Wetlands Mapping (DPE, 2011)
- Soils, geology and topography (DPE, 2022c)
- Mitchell Landscapes Mapping (DPE, 2017).

3.3 Threatened and migratory species likelihood of occurrence

The likelihood of threatened species, populations and migratory species occurring in the proposal area was assessed against the criteria outlined below in **Table 3-2**. The species subject to the likelihood of occurrence assessments were those identified from the background desktop assessment, field based investigations and/or considered likely to occur within the proposal area in the professional opinion of contributors to this assessment. Furthermore, the likelihood of threatened species to occur within the proposal area was determined through a habitat assessment during field surveys, identifying suitable habitat and habitat requirements. The results of the likelihood of occurrence assessment is provided in **Appendix A**.

Table 3-2 Likelihood of occurrence assessment criteria

Likelihood	Criteria
Recorded	A species was observed in the proposal area during field surveys.
High	A species has a high likelihood of occurrence if it fits one or more of the following criteria: <ul style="list-style-type: none"> ▪ The proposal area contains suitable habitat and habitat types present in the proposal area are abundant and/or in good condition ▪ Important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are likely to be present ▪ The species has been recorded recently and/or frequently in similar habitat in the proposal area and locality ▪ The proposal area is likely to support a resident population or to contain habitat that is visited by the species during regular seasonal movements or migration.
Moderate	A species has a moderate likelihood of occurrence if it fits one or more of the following criteria: <ul style="list-style-type: none"> ▪ The proposal area contains or is likely to contain potential habitat, habitat types and resources present in the proposal area may be poor or modified in condition ▪ Important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are likely to be present ▪ The species has not been recently recorded in similar habitat within the locality or has been recorded infrequently in the locality ▪ The proposal area is unlikely to support a resident population or to contain habitat that is visited by the species during regular seasonal ▪ Movements or migration but is likely to be used opportunistically on an infrequent basis during seasonal movements and/or dispersal ▪ Are cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	A species has a low likelihood of occurrence if it fits one or more of the following criteria: <ul style="list-style-type: none"> ▪ Have not been recorded previously in the proposal area and surrounds and for which the proposal area is beyond the current distribution range ▪ Relies on specific habitat types or resources that are not present in the proposal area ▪ Are considered locally extinct ▪ Are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
Unlikely	A species has an unlikely likelihood of occurrence if it fits one or more of the following criteria: <ul style="list-style-type: none"> ▪ Species highly restricted to certain geographical areas not within the proposal area ▪ Specific habitat requirements are not present in the proposal area.

3.4 Field assessment

A field survey was undertaken on the 29 March 2022 to ground truth the results of the background research and habitat assessment for threatened species likely to occur within the proposal area.

The likely presence of threatened species was determined through habitat assessment, taking a precautionary approach likely to include species that are difficult to detect (i.e. cryptic species). A species was assumed to be present if suitable habitat was observed in the proposal area, and if that species was known to occur regionally. No detailed floristic plot surveys or targeted threatened fauna surveys were undertaken.

Habitat features for fauna species were identified and demarcated, including hollow bearing trees, stag trees, decorticating bark, burrows, bird nests, dense shrub layers and aquatic emergent vegetation. The characteristics of hollow bearing trees recorded included: Diameter at breast height (DBH), species of tree, number of hollows, height above ground to the closet hollow and the approximate dimensions of hollows. This method assists in determining the likelihood of fauna species suitable in occupying hollows. In addition to this, indirect evidence of faunal activity, such as opportunistic observations, scats, scratches and other signs were recorded. No targeted fauna survey techniques such as mammal trapping, spotlighting or call playback, or standardised diurnal bird surveys were undertaken.

3.4.1 Vegetation and habitat survey

The vegetation and floristic diversity of the proposal area and possible presence of threatened species, populations and ecological communities were assessed using a combination of random meanders and a quantitative plot in representative Plant Community Types (PCTs). Plots followed the Biodiversity Assessment Method (Department of Planning, Industry and Environment (DPIE), 2020a) and vegetation was mapped based on the relevant PCT and broad condition class. This process included:

- Broad scale vegetation mapping and aerial imagery was used to initially identify the extent of native vegetation. The initial vegetation mapping was then ground-truthed in the field
- Traverses using a hand-held tablet containing ArcGIS Field Maps to record boundaries of, and variation within stratification units not apparent from aerial imagery within the proposal area and surrounds
- Collection of data from visual assessment to obtain information on vegetation community structure, composition and landscape position, soil, and past land uses/disturbance history, to accurately assign to a PCT according to the BioNet Vegetation Classification Database (DPE, 2022a).
- Assessing vegetation condition as 'high', 'moderate', 'low' or 'very low' condition
- Determination of TECs listed under the EPBC Act and BC Act
- The identified PCT and its extent were mapped across the proposal area.

The criteria used to evaluate the condition of vegetation and habitat values are outlined in **Table 3-3**.

Table 3-3 General vegetation and habitat condition assessment criteria

Condition	Characteristics	Patch size/connectivity	Naturalness	Floristic diversity	Groundcover	Habitat feature	Weed abundance
High	Vegetation still retains the majority of native species and structural characteristics of the pre-European equivalent. Such vegetation is usually in a near natural state and displays resilience to weed invasion due to intact ground cover, shrub and canopy layers and lack of soil disturbance. Some limited weed cover is present in edge habitats.	>2 hectares and well connected to other areas of vegetation outside the proposal area	Remnant woodland / forest	High	Intact	Habitat for threatened fauna, mature trees abundant and tree hollows, dead trees and natural logs	Low
Moderate	Vegetation generally still retains most of its structural integrity but has been partially disturbed and has lost some component of its original species complement. Weed invasion varies from slight to high.	>2 hectares and tentative links to other vegetation outside the proposal area	Disturbed woodland / forest	Moderate	Intact with few or no invasive grasses	Some habitat for threatened fauna, mature trees low density, few hollows and logs	Moderate - High
Low	Modified areas where most of the native diversity and vegetation structure has been lost. Environmental weeds are often co-dominant with the original indigenous species, particularly invasive grasses.	< 1-2 hectares and with fragmented connectivity with areas of habitat outside the proposal area	Ground layer and shrub layer largely absent with remnant regrowth trees	Low-Moderate	Partial with high proportion of invasive grasses	Limited habitat for threatened fauna, mature trees absent, no hollows or logs	High - Moderate
Very Low	Includes cleared paddock areas and clearings dominated by exotic species including high threat weeds. Some regenerating shrubs and native groundcovers may be present in low abundance.	< 1-2 hectares and isolated from other areas of habitat outside the proposal area	Exotic pasture and cleared areas	Low	None dominated by invasive grasses	No quality habitat for threatened fauna, mature trees absent, no hollows or logs	High

3.4.2 Threatened flora survey

An assessment of the likelihood of occurrence of listed threatened species was undertaken using the criteria shown in **Table 3-2**. The likelihood of occurrence of a threatened flora species was based on a review of previous recorded sightings in the locality and the assessment of potential for suitable habitat within the proposal area. A site assessment was undertaken to ground truth the desktop assessment and focused on non-cryptic flora species. Threatened flora species searches were considered in terms of the likely associated PCT, topographic, soil and geological preferences, microhabitats (e.g. damp areas), and disturbance regime of the habitat in the proposal area. This was done so that survey effort was targeted in the most suitable habitat for the species. The threatened flora survey results are discussed in **Section 4.3.1** and the likelihood of occurrence assessment results is presented in **Appendix A**.

3.4.3 Threatened fauna survey

Opportunistic observations supplemented by fauna habitat assessments were carried out, incorporating a hollow-bearing tree and large woody debris survey. Indirect evidence of faunal activity, such as scats, scratches and other signs were observed. The focus of the habitat assessment was to identify the suitability and condition of the habitat for threatened fauna species previously recorded in the locality. The threatened fauna survey results are discussed in **Section 4.3.2** and the likelihood of occurrence assessment results is presented in **Appendix A**.

Fauna habitat assessments were completed to assess the likelihood of threatened fauna occurring in the proposal area. Fauna habitats were assessed by examining characteristics such as the structure and floristics of the canopy, understorey and ground vegetation; the structure and composition of the litter layer; and other habitat attributes important for feeding, roosting and breeding.

No targeted fauna survey techniques such as mammal trapping, microchiropteran bat (microbat) surveys, spotlighting or call playback, or standardised diurnal bird surveys were undertaken.

3.4.4 Aquatic environment and habitat survey

The Fisheries Spatial Data Portal (DPI, 2022a) was consulted to identify aquatic habitat features relevant to the proposal area, such as KFH and freshwater threatened fish species before undertaking the field survey. All waterways within the proposal area were inspected during the field survey for the presence of suitable aquatic habitats. The habitat assessment was visual only and no fish surveys or macroinvertebrate surveys were conducted as part of this assessment. Habitat sensitivity was assessed against the DPI *Policy and Guidelines for Fish Habitat Conservation and Management* (2013) guidelines as well as the following considerations:

- KFH (DPI, 2022a)
- Waterway Classification (Fairfull and Witheridge, 2003)
- Threatened aquatic species under FM Act and EPBC Act
- Groundwater and surface water dependent vegetation and fauna communities listed under the EPBC Act and BC Act
- Areas that contribute to aquaculture and commercial fishing
- *State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021*.

Aquatic habitats were assessed by examining characteristics such as the structure and floristics of aquatic vegetation, channel width, the presence of surface water, water flow, water depth, turbidity, visible pollutants, erosion, the presence of shelter (rocks, submerged vegetation and woody debris), and channel substrate. The aquatic environment survey results are discussed in **Section 4.4** and the likelihood of occurrence assessment results is presented in **Appendix A**.

3.5 Significance assessments

Section 7.3 of the BC Act outlines the 'test of significance' that is to be undertaken to assess the likelihood of significant impact upon threatened species or ecological communities listed under the BC Act. These tests of significance have been undertaken in accordance with the *Threatened Species Test of Significance Guidelines* (OEH, 2018), which outlines a set of guidelines to help applicants/proponents of a development or activity with interpreting and applying the factors of the assessment process. These guidelines were used in preparing these tests of significance and in determining whether there is likely to be a significant impact to a threatened species,

population or ecological community listed under the BC Act. Full details of the BC Act test of significance assessments are presented in **Appendix B**.

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* (DoE, 2013). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts (DoE, 2013). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility (DoE, 2013). This advice has been considered while undertaking the assessments. Full details of the EPBC Act significance assessments are presented in **Appendix B**.

3.6 Limitations

The list of flora and fauna species recorded from this assessment should not be seen to be fully comprehensive, but rather an indication of the species present at the time of the survey. A period of several seasons or years is often needed to identify all the species present in an area, especially as some species are only apparent at certain times of the year e.g. orchids or migratory birds and require specific weather conditions for optimum detection, e.g. frogs. The conclusions of this report are therefore based upon available data and the field surveys and are therefore merely indicative of the environmental condition of the proposal area at the time of the survey. It should be recognised that site conditions, including the presence of threatened species, can change with time. A precautionary approach was used with regards to presence of threatened species in areas of suitable habitat where there is insufficient evidence to discount the presence of the species due to seasonal limitations or other constraints.

It is important to note that database information, particularly wide-scale vegetation mapping, should be used only as an indication of what may be present in an area of concern, wide-scale vegetation mapping is based on modelling that considers factors such as geology, soil and elevation to predict a community type, and such is often subject to error. Likewise, records of threatened species can be submitted by any member of the public and hence cannot be confidently verified. Threatened species records are often subject to geographical error and may not have been recorded where the point exists. These information sources typically provide a preliminary review of what is likely to be on a site to direct the survey methods of on-site investigations.

The habitat assessment was completed from ground level. As such, all observations were recorded from that visual range. It is possible some other trees possess hollows that were not observable from the ground, or hollows identified are shallow.

4. Existing environment

4.1 Environmental context

4.1.1 IBRA bioregion and sub-region

The proposal area is located within the Riverina Interim Biogeographic Regionalisation for Australia (IBRA) bioregion (DCCEEW, 2020a) and the Murray Fans IBRA sub-region (DCCEEW, 2020b). The Riverina IBRA bioregion extends from Ivanhoe in the Murray Darling Depression bioregion south to Bendigo, and from Narrandera in the east to Balranald in the west (National Parks and Wildlife Service (NPWS), 2003).

4.1.2 NSW (Mitchell) landscapes

The proposal area is located within the Murray Channels and Floodplains NSW (Mitchell) landscape (DPE, 2016). The Murray Channels and Floodplains landscape includes parts of four land systems: Canally, Murrumbidgee, Riverland and Wentworth. The primary features of this landscape include active channels and seasonally inundated floodplains of the Murray streams on quarternary alluvium with associated billabongs, swamps, channels, levees and source bordering dunes (DECC, 2002).

4.1.3 Topography, geology and soils

Characteristic landforms of the Murray Fans IBRA sub-region includes a relatively confined alluvial fan constrained by sediments from northern Victorian rivers, the Murrumbidgee fan and the Cadell fault. The geology and geomorphology is dominated by river channels, floodplains, backplains, swamps, lakes and lunettes on Quaternary alluvial sediments, clay and sand. Lake beds are covered by grey cracking clays and the eastern margins of most lakes have wellformed sandy beaches and crescent-shaped dunes or lunettes up to 25 metres high and composed of fine cemented quartz sand with some layers of pelleted clay. Soils typically comprise red brown earths, grey clays and deep sands (NPWS, 2003).

4.2 Native vegetation

4.2.1 Vegetation communities and assemblages

The State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469 (DPE, 2016) was reviewed to determine the baseline vegetation classification within the proposal area. The vegetation occurring within the proposal area is representative of the PCT referred to as 'River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW' (PCT 2).

PCT 2 occurs on black to grey silty-loam-clay alluvial (often self-mulching) soils in frequently flooded sites bordering stream channels, ox-bows and in nearby low-lying areas including intermittent lakes. Characteristically it is a very tall open forest dominated by *Eucalyptus camaldulensis* (River Red Gum) in the upper stratum and can grow over 30 m high. Shrubs within the middle stratum are typically absent and may include *Acacia stenophylla* (River Cooba) and *Amyema miquelii* (Box Mistletoe). The ground stratum may be sparse though is usually dominated by sedges such as *Eleocharis acuta*, *Eleocharis pusilla*, *Cyperus exaltatus*, *Carex inversa* (Knob Sedge), *Cyperus gymnocaulos*, *Carex gaudichaudiana* and *Carex tereticaulis* along with rushes such as *Juncus amabilis* and *Juncus flavidus*. Grass species include *Pseudoraphis spinescens* (Spiny Mudgrass), *Lachnagrostis filiformis* (Blown Grass) and *Paspalidium jubiflorum* (Warrego Grass). Forb species include *Centipeda cunninghamii* (Common Sneezeweed), *Persicaria prostrata* (Creeping Knotweed), *Rumex brownii* (Swamp Dock), *Alternanthera denticulate* (Lesser Joyweed), *Senecio quadridentatus* (Cotton Fireweed), *Centipeda minima* var. *minima*, *Stellaria angustifolia* (Swamp Starwort) and aquatic plants *Triglochin procerum* (Water Ribbons) and *Myriophyllum crispatum*. Common weed species may include *Bromus hordeaceus* (Soft Brome), *Hypochaeris radicata* (Catsear), *Hypochaeris glabra* (Smooth Catsear), *Paspalum distichum* (Water Couch), *Aster subulatus* (Wild Aster), *Cirsium vulgare* (Spear Thistle), *Conyza bonariensis* (Flaxleaf Fleabane), *Sonchus oleraceus* (Common Sowthistle) and *Phyla canescens* (DPE, 2022a).

The shrub and ground layer vegetation is largely absent within the proposal area due to previous earthworks and a constructed embankment over the existing culvert within Lower Toupna Creek (refer to **Photo 1**). Therefore this PCT has been classed as low condition vegetation. The upper stratum of this PCT within the proposal area was open with a dominance of regrowth *Eucalyptus camaldulensis* (River Red Gum) up to

20 metres tall. Within the channel of Lower Toupna Creek and northern end of the proposal area regrowth *Eucalyptus camaldulensis* (River Red Gum) and *Acacia dealbata* (Silver Wattle) dominated, with occurrences of *Bolboschoenus* sp. within the lower stratum (refer to **Photo 2**). Fringing aquatic vegetation species such as *Bolboschoenus* sp. and *Phragmites australis* (Common Reed) were present within the channel of Lower Toupna Creek at the northern end of the proposal area (refer to **Photo 3**). Dominant weeds included *Xanthium spinosum* (Bathurst Burr) and *Hypericum perforatum* (St. John's Wort). Additionally, fifteen hollow bearing trees were recorded during the field survey, of which two hollow stags were recorded within the proposal area containing two 30 centimetre hollows (refer to **Photo 4**).

Approximately 0.42 hectares of PCT 2 occurs within the proposal area. The mapped extent of native vegetation (PCT 2), hollow bearing trees and weed species within and surrounding the proposal area are displayed on **Figure 4-1**.



Photo 1. Shrub and ground layer vegetation largely absent on the constructed embankment within the proposal area



Photo 2. Young regrowth *Eucalyptus camaldulensis* (River Red Gum) and *Acacia dealbata* (Silver Wattle) with occurrences of *Bolboschoenus* sp. within the channel of Lower Toupna Creek



*Photo 3. Fringing aquatic vegetation (*Bolboschoenus* sp. and *Phragmites australis* (Common Reed)) occurring within the channel of Lower Toupna Creek at the northern end of the proposal area*



Photo 4. Hollow stag recorded within proposal area to be avoided

4.2.2 Threatened ecological communities

There are no PCTs in the proposal area associated with a TEC listed under the EPBC Act or BC Act.

4.3 Threatened species and their habitat

4.3.1 Threatened flora species

On the basis of regional records, reports and modelled habitat, a total of 13 threatened flora species have been previously recorded or listed as having potential to occur in the locality (see **Appendix A**). No threatened flora species are considered likely to occur within the proposal area. No threatened flora species were detected during field surveys.

4.3.2 Threatened fauna species

On the basis of regional records, reports and modelled habitat, a total of 27 threatened fauna species have been previously recorded or listed as having potential to occur in the locality (see **Appendix A**). This includes 18 birds, six mammals, two frogs and one insect. Of these, eight threatened fauna species are considered as having a moderate to high likelihood of occurring within the proposal area (refer to **Table 4-1**). No threatened fauna species were detected during field surveys.

The riparian woodland habitat present within the proposal area would provide suitable habitat for the identified threatened terrestrial fauna species. Bird species would be expected to utilise vegetation for nesting and roosting and to forage on flowering trees, whereas bat species, such as the Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*), may roost in hollow bearing trees within the proposal area. Importantly, there were no culverts present within the proposal area suitable for bat species.

Mature and old hollow bearing trees offer other valuable resources. Mature trees provide more flowers, nectar, fruit and seeds than younger trees, and a complex substrate that supplies diverse habitats for invertebrate

populations. When hollow-bearing trees collapse or shed limbs they also provide hollow logs that serve as important foraging substrates and shelter sites. The tree hollows would provide roosting opportunities for threatened fauna species, such as the Superb Parrot (*Polytelis swainsonii*), which require hollows greater than five centimetres in diameter and have a DBH greater than 30 centimetres or at least four meters from the ground. All hollow bearing trees and logs will be avoided by the proposal.

The proposal would remove medium sized and understorey riparian vegetation, resulting in the loss or disturbance of habitat suitable for the Koala (*Phascolarctos cinereus*). No hollow bearing trees will be removed, and as Koalas prefer mature *Eucalyptus* this indicates that the trees with highest habitat value for this species will be retained. Potential impacts of the proposal are considered to be minor due to the large contiguous adjacent vegetation, providing suitable habitat for this threatened species. Furthermore, the works will be largely restricted to the existing regulator site. The Koala uses a range of vegetation community types within the locality of the proposal. Fresh scats were observed in areas with Eucalypt woodland during field surveys.

Table 4-1 Threatened fauna species with a moderate to high likelihood of occurring within the proposal area

Threatened fauna species	EPBC Act	BC Act	FM Act	Recommended survey timing	Likelihood of occurrence
Birds					
Dusky Woodswallow (<i>Artamus cyanopterus</i>)	-	V	-	N/A	High
Varied Sittella (<i>Daphoenositta chrysoptera</i>)	-	V	-	N/A	High
Hooded Robin (south-eastern form) (<i>Melanodryas cucullata cucullata</i>)	-	V	-	N/A	Moderate
Scarlet Robin (<i>Petroica boodang</i>)	-	V	-	N/A	High
Superb Parrot (<i>Polytelis swainsonii</i>)	V	V	-	September – November	High
Diamond Firetail (<i>Stagonopleura guttata</i>)	-	V	-	N/A	Moderate
Mammals					
Koala (<i>Phascolarctos cinereus</i>)	E	E	-	January – December	Moderate
Yellow-bellied Sheathtail-bat (<i>Saccolaimus flaviventris</i>)	-	V	-	October – March	Moderate

Key: E = Endangered, V = Vulnerable

A wombat burrow was identified during field surveys within the proposal area (refer to **Photo 5** and **Photo 6**). The wombat burrow is presumed to be currently occupied by a resident wombat as evidenced by fresh wombat footprints surrounding the burrow. There are two wombat species in NSW, the Bare-nosed Wombat (also known as the Common Wombat) (*Vombatus ursinus*) and the Southern Hairy-nosed Wombat (*Lasiorhinus latifrons*) which is listed as Endangered under the BC Act. Additionally, the Northern Hairy-nosed Wombat is listed as extinct in NSW under the BC Act and Endangered under the EPBC Act. No wombat species records occur within the locality. Mitigation measures to ensure safe relocation of any resident wombats have been included in **Section 6.2**. The approximate location of the wombat burrow is displayed on **Figure 4-1**.



Photo 5. Wombat burrow (side view) with dead tree branches covering part of the burrow opening



Photo 6. Wombat burrow opening (frontal view)

4.4 Aquatic habitat

The proposal area is situated within the channel of Lower Toupna Creek on the floodplain of the Murray River. Lower Toupna Creek is a tenth order stream (Strahler) originating at the Murrumbidgee River and flowing south-east to Toupna Creek. Lower Toupna Creek is mapped as KFH (DPI, 2022a) (refer to **Figure 4-1**). Within the proposal area Lower Toupna Creek is considered to be either a Class 3 (minimal fish habitat) or Class 4 (unlikely fish habitat) waterway (Fairfull and Witheridge et al. 2003), due to a low density of permanent freshwater aquatic vegetation, snags, logs and other important fish habitat attributes required to sustain populations.

On the basis of regional records, reports and modelled habitat, a total of eight threatened aquatic species have been previously recorded or listed as having potential to occur in the locality (see **Appendix A**). Three aquatic species are mapped within the proposal area based on the Fisheries Spatial Data Portal (DPI, 2022a) (refer to **Appendix A**). However, 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 proposal area. No threatened aquatic species were detected during field surveys. Nevertheless, the proposal aims to benefit aquatic ecosystems and as such the installation of a fishway will provide improved longitudinal access within Lower Toupna Creek, increasing movement and potential recolonisation of native and threatened aquatic species (if present) in the local extent.

During the field survey, Lower Toupna Creek was observed as having little to no flow, with some fringing aquatic vegetation (*Bolboschoenus* sp. and *Phragmites australis* (Common Reed)) occurring within the channel of at the northern end of the proposal area. The riparian vegetation along Lower Toupna Creek was mostly dominated by *Eucalyptus camaldulensis* and *Acacia dealbata* in the canopy layer, with *Bolboschoenus* sp. and *Phragmites australis* fringing the waterway (refer to **Photo 2** and **Photo 3** in **Section 4.2.1**).

There are no Coastal Wetlands listed under the Resilience and Hazards SEPP. The proposal is located within the NSW Central Murray Forests Ramsar site in NSW, and adjacent to the Barmah Forest Ramsar site in Victoria. In addition to this, the proposal area is located within Millewa Forest which is listed as an important wetland under the Directory of Important Wetlands in Australia. The proposal will not affect the ecology of these Ramsar wetlands.

The aquatic habitat is not considered important for threatened frog species such as the Southern Bell Frog (*Litoria raniformis*) and Sloane's Froglet (*Crinia sloanei*), due to there being no records of this species in Millewa Forest, despite targeted frog surveys during 2000-06 (Ward, 2001, 2002, 2003, 2004, 2006), various Goulburn-Broken Catchment Management Authority acoustic monitoring programs in Barmah-Millewa Forest since 2014 and more recent frog monitoring (Howard et al., 2019 – 2021). Habitat limitation of the proposal area includes the depth of water, high flow environment, and the general absence of shallow water with emergent aquatic vegetation.

4.5 Groundwater dependent ecosystems

The Atlas of GDEs (Bureau of Meteorology, 2022) identifies a portion within the proposal area as containing groundwater dependent terrestrial vegetation (moderate potential GDE).

PCT 2 is potentially representative of terrestrial GDEs. However, this PCT may not be an obligate GDE (i.e., not entirely dependent on groundwater). These PCTs are likely to be an opportunistic facultative GDE that may depend on the subsurface presence of groundwater, (often accessed via the capillary fringe – subsurface water just above the water table) in some locations but not in others. This capillary water may be accessed by the plants where an alternative source of water (i.e., rainfall) cannot be accessed to maintain ecological function. As the plants within this PCT may at times rely on capillary water in the soil that rises from the water table, any lowering of the water table may result in a reduction in groundwater availability and declining vegetation health during low rainfall periods.

4.6 Areas of outstanding biodiversity value

There are no AOBV within or near the proposal area.

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

Under Schedule 4, Division 5 of the BC Act, a process is eligible for listing as a Key Threatening Process (KTP) if, in the opinion of the Scientific Committee –

- It adversely affects threatened species or ecological communities, or
- It could cause species or ecological communities that are not threatened to become threatened
- The regulations may prescribe criteria for the determination of matters under Schedule 4, Division 5 of the BC Act.

Weeds compete with native plant species for nutrients, water, sunlight and space. They can form dense areas of vegetation that shade and smother native species and may alter key environmental events such as the frequency of fire. There are no weeds within the proposal area which area identified as a KTP by the BC Act.

Additionally, under the EPBC Act, a process can be listed as a KTP if it could:

- Cause a native species or ecological community to become eligible for inclusion in a threatened list (other than the conservation dependent category); or
- Cause an already listed threatened species or threatened ecological community to become more endangered; or
- Adversely affect two or more listed threatened species or threatened ecological communities.

Weeds of National Significance

Under the National Weeds Strategy, 32 introduced plants have been identified as Weeds of National Significance (WoNS). A list of 20 was endorsed in 1999 and a further 12 were added in 2012. These weeds are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts (DPI, 2022c). There were no WoNS identified within the proposal area from field surveys.

Priority Weeds

Priority weeds are plants that have the potential to pose a biosecurity risk to human health, the economy and the environment. In NSW, the administration of priority weed control is a State Government responsibility under the *Biosecurity Act 2015*. The Riverina Regional Strategic Weed Management Plan (LLS, 2017) sets out management plans for State level determined priority weed species, as set by NSW DPI, as well as regionally determined priority weeds, as determined by the rigorous weed prioritisation and expert review process outlined in the Riverina Regional Strategic Weed Management Plan (LLS, 2017). Additionally, LLS (2017) identified weeds of concern which were recognized by the Riverina Regional Weeds Committee in consultation with the community. These are species for which a consistent and/or collaborative approach to management will provide the best outcome across the region. Within the proposal area, *Xanthium spinosum* (Bathurst Burr) and *Hypericum perforatum* (St. John's Wort) are listed as weeds of concern in the Riverina Regional Strategic Weed

Management Plan (LLS, 2017) and *Xanthium spinosum* (Bathurst Burr) is listed as a Priority Weed under the *Biosecurity Act 2015* for the Riverina region (LLS, 2021).

High Threat Weeds

High threat weeds (HTW) refer to plant cover composed of vascular plants that, if not controlled, will invade and outcompete native plant species. They reduce the biodiversity values achieved from management actions and are considered difficult to manage effectively. Plants considered to be HTW are listed on the HTW list published in the Biodiversity Assessment Method Calculator. Within the proposal area, a total of one HTW was identified, *Xanthium spinosum* (Bathurst Burr).

Summary of weed species

Proliferation of weed and pest species is an indirect impact (i.e. not a direct result of proposal activities). Proliferation of weeds is likely to occur during the construction phase, where impacts would be greatest due to vegetation clearing. The most likely causes of weed dispersal and importation associated with the proposal include earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. Disturbance of native vegetation patch edges may also influence weed proliferation. The construction area contains weed growth and, as such, weeds must be managed prior to and during construction. Mitigation measures to limit the spread and germination of weeds are provided in **Chapter 0**.

Two weed species were recorded within the proposal area comprising:

- *Hypericum perforatum* (St. John's Wort)
- *Xanthium spinosum* (Bathurst Burr).

Two of the identified weed species are listed as weeds of concern, where one is listed as a HTW (refer to **Section 5.6**). There were no weeds recorded within the proposal area listed as Regional or State Priority weeds or WoNS.

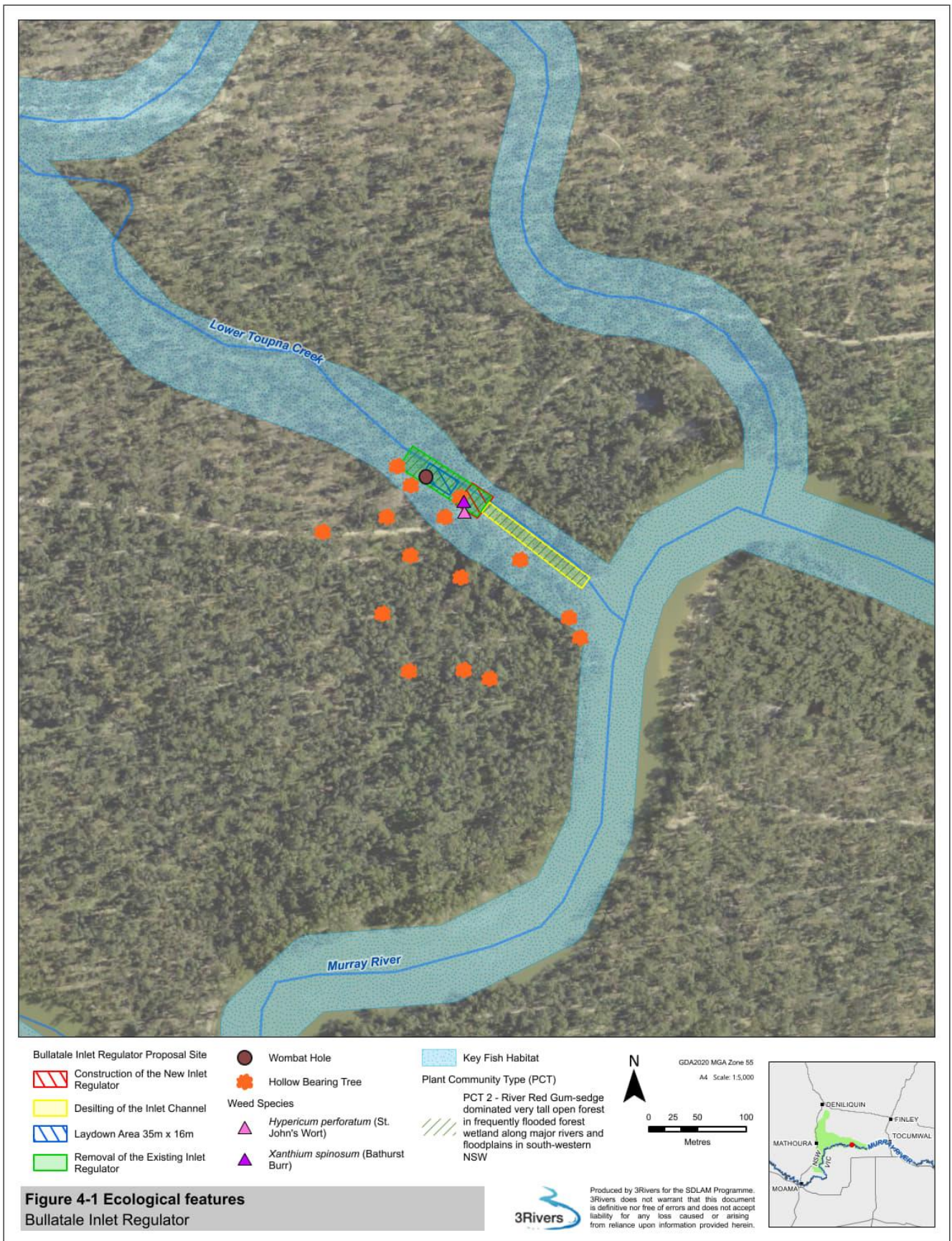


Figure 4-1 Ecological features within and surrounding the proposal area

4.8 Matters of National Environmental Significance

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on ‘matters of national environmental significance’ undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that ‘has, will have or is likely to have a significant impact on a matter of national environmental significance’ is deemed to be a ‘controlled action’ and may not be undertaken without prior approval from the Australian Minister for the Environment.

This section identifies the MNES that are of relevance to the proposal area. An assessment of significance for each of these is provided in **Appendix B**. The following discussion considers relevance of MNES.

4.8.1 Wetlands of international importance (Ramsar wetlands)

Ramsar Wetlands are rare or unique wetlands that are important for conserving biological diversity. These are listed under the Convention on Wetlands of International Importance (Ramsar Convention). The PMST (DCCEEW, 2022c) indicated seven Wetlands of International Importance (Ramsar Wetlands) as occurring within the locality of the proposal area (refer to **Table 4-2**). The Ramsar Wetlands of NSW (DPE, 2012) mapping was also used to delineate the boundaries of the Ramsar Wetlands in the locality of the proposal area. In addition to this, the proposal area is located within Millewa Forest which is listed as an important wetland under the Directory of Important Wetlands in Australia (DoEE, 2017). No significant impacts are predicted to occur from the proposal on the listed Ramsar Wetlands in **Table 4-2** below.

Table 4-2 Ramsar Wetlands identified within the proposal area locality

Ramsar Wetlands	Proximity within locality
Banrock Station Wetland Complex	400 – 500 kilometres upstream from Ramsar site
Barmah Forest	This Ramsar site is located approximately 130 metres from the proposal area across the Murray River in the south
Gunbower Forest	50 – 100 kilometres upstream from Ramsar site
Hattah-Kulkyne Lakes	200 – 300 kilometres upstream from Ramsar site
NSW Central Murray Forests	The proposal area is within this Ramsar site
Riverland	400 – 500 kilometres upstream from Ramsar site
The Coorong, and Lakes Alexandrina and Albert Wetland	400 – 500 kilometres upstream from Ramsar site

4.8.2 Threatened flora

There are no threatened flora species listed under the EPBC Act that are considered likely to occur within the proposal area.

4.8.3 Threatened fauna

Two threatened fauna species listed under the EPBC Act are considered moderately to highly likely to use the habitats in the proposal area, this includes the Koala (listed as Endangered) and Superb Parrot (listed as Vulnerable).

The Koala inhabits eucalypt woodlands and forests. Populations are generally found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. They primarily feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size. The proposal area contains River Red Gum (*Eucalyptus camaldulensis*) which is a primary feed tree for this species.

The Superb Parrot inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. This species nest in the hollows of large trees, mainly in tall riparian River Red Gum Forest and Woodland. The Superb Parrot nests in small colonies, often with more than one nest in a single tree. The Superb Parrot has been recorded sporadically around Lower Toupnal Creek and could be expected to utilise vegetation and to forage on flowering trees throughout the proposal area. The proposal area contains two hollow bearing trees, consisting of River Red Gum, which is considered breeding and foraging habitat for the Superb Parrot. The Superb Parrot requires living or dead Eucalyptus trees with hollows greater than five centimetres in diameter and be greater than four metres above ground or trees with a DBH of greater than 30 centimetres. Tree hollows within the proposal area largely meet the required parameters for this species (refer to **Section 5.1**).

4.8.4 Migratory species

A total of 12 migratory bird species, are predicted to occur in the locality based on the EPBC Act PMST (DCCEEW, 2022c) and NSW Bionet Atlas database (EESG, 2022) (see **Appendix A**). Some migratory species that would not use the proposal area (i.e. marine birds) have been excluded from the assessment. 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 proposal area. No migratory species were detected during field surveys.

While migratory bird species do use the habitats within the locality, the proposal area would not be classed as an 'important habitat' as defined under the EPBC Act *Policy Statement 1.1 Significant Impact Guidelines* (DoE, 2013), in that the proposal area does not contain:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- Habitat utilised 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 proposal is unlikely to have a significant effect on any of the listed migratory species predicted to occur within the locality.

5. Impacts

5.1 Loss of vegetation and habitat

The proposed design will result in the removal of a maximum of 0.42 hectares of native vegetation, comprising low condition PCT 2. The loss of vegetation is considered a conservative worst-case scenario and has been calculated to remove all vegetation, associated with PCT 2, within the proposal area. The extent of vegetation and habitat feature removal, to the nearest two decimal places, is summarised as follows:

- 0.42 hectares of PCT 2
- Removal of small to medium non-hollow bearing trees and groundcover.

The construction will occur predominantly within previously disturbed areas at the existing regulator site which requires minimal direct vegetation removal. The proposed location of the temporary laydown area will avoid hollow bearing trees and logs. The location for the laydown area was incorporated into the proposal area. Where excavations are undertaken, all vegetation layers would be removed. This has the potential to disturb or remove any threatened flora species present above ground or in the seed bank, if present.

The proposed vegetation to be impacted currently provides suitable foraging and nesting habitat for various fauna species, particularly woodland birds. The canopy species (River Red Gums and Silver Wattle), generally provide summer food resources, however, can flower opportunistically throughout the year. Due to minimal habitat being removed and the adjacent contiguous riparian vegetation, it is unlikely the vegetation being removed would be important or preferred habitat for local or migratory species.

Avoidance of vegetation removal, particularly of hollow bearing trees, will be implemented, therefore the two hollow bearing trees will be retained. Any species using the trees and habitat to be removed would be displaced. However, 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 are considered minor.

5.2 Threatened biodiversity

The predicted impacts on riparian and aquatic environments would be minimal considering the following:

- The proposal will remove vegetation that may represent a dispersal or foraging resource from within areas containing large contiguous patches of similar habitat
- The extent of the vegetation removal in the context of the broader area will not significantly disrupt the lifecycle of threatened species due to the available similar habitat within the locality
- Some of the species considered readily move through the landscape and undertake seasonal migration, while others are sedentary but capable of short distance dispersal
- The proposal area exists largely within currently disturbed areas, therefore the works will not further fragment or isolate habitat, species or populations
- While the habitat to be removed is considered important to threatened species, the area of vegetation to be removed is not considered important to the survival or recovery of any identified species
- The proposal does not significantly contribute to a key threatening process for the identified terrestrial species
- While the predicted impacts could be considered part of a key threatening process for threatened species, the proposal is considered unlikely to result in significant impacts, given the limited extent and short duration of the construction works.

Overall, impacts to ecological communities and species, as a result of the proposal, are considered to be temporary and relatively minor in relation to extensive areas of suitable adjacent habitat.

Mitigation measures are provided in **Chapter 6** to reduce the impacts on species, including pre-clearing surveys and procedures for unexpected finds.

5.2.1 Threatened flora

The proposal will remove about 0.42 hectares of habitat, consisting of low condition PCT 2. The vegetation to be removed is likely to contain suitable habitat for the Floating Swamp Wallaby-grass (*Amphibromus fluitans*)

may occur within the proposal area. However, the vegetation to be removed has been previously disturbed and is unlikely to contain suitable habitat for threatened flora species. No threatened flora species were detected during surveys.

Due to previous disturbance within the proposal area and the extent of these threatened species regionally, the local populations that will remain after construction is considered unlikely to be placed at further risk of extinction and the populations (if present) would remain viable.

5.2.2 Threatened fauna

Predicted impacts to threatened fauna species will consist of the removal of foraging habitat. There were no threatened fauna species detected during surveys. Native vegetation within the proposal area 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.

5.3 Wildlife connectivity and habitat fragmentation

The extent of vegetation clearing is generally minor and isolated to discreet locations of the regulator replacement and associated laydown. As this clearing is isolated, it would not separate the existing woodland into two patches or impact the existing vegetation connectivity along Lower Toupna Creek. The extent of the clearing is considered minor and 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.

During construction, the temporary blocking of fish passage and flow of waterways would occur during the desilting works.

During operation, the replaced regulator will provide improved movement of native fish along Lower Toupna Creek.

The proposed desilting work in the inlet channel between the Murray River and the upstream side of the replacement inlet regulator would restore the historical commence to flow rate in Bullatale supply channel at the Murray River, which occurs at about 4,000 megalitres per day. This would result in a greater depth of water in the supply channel upstream of the replacement inlet regulator, but no change in the water level. The expected change in flows in this section of the channel is not considered an adverse impact given historical commence to flow rates would be achieved. There would be no change to flows in the supply channel downstream of the replacement inlet regulator except during the shoulder irrigation season, more commonly in the autumn months, when the reinstatement of the historical commence to flow rate in Bullatale supply channel upstream of the replacement inlet regulator would enable Bullatale Creek Water Trust to create downstream flows that are not possible with the existing inlet regulator. In these instances the operational extent of the proposal would extend downstream along the supply channel to Bullatale Creek, with the impact reducing downstream of where the Trust extracts water. Any flow in Bullatale supply channel and Bullatale Creek during the shoulder irrigation season is not considered an adverse impact to the waterway when compared to the existing absence of flows at these times due to the silt built-up on the supply channel upstream of the existing inlet regulator.

The replacement Bullatale inlet regulator would be operated at the discretion of the site environmental water manager to deliver environmental water to Millewa Forest in line with the same environmental watering protocols and adaptive management processes that are currently followed.

5.4 Edge effects

The term edge effect refers to the indirect impact created during vegetation clearing which, as a result, increases exposure of vegetation patches to disturbances. Edge effects can impact microclimate, vegetation composition, weed spread and distribution, hydrology, dieback, soils, and fauna. The construction area has been designed largely within an area that has been previously disturbed. The area of impact on native vegetation will be confined to small patches adjacent to the existing regulator, to allow access for construction, where vegetation clearance would be minimal, and around a small section of Lower Toupna Creek inlet to allow for desilting works. The area of intact remnant vegetation predicted to be impacted by the proposal would be marginal and is part of a larger patch, and therefore, would not contribute further to fragmentation.

Increased prevalence of weeds is predicted to have the greatest impact as a result of the proposal as the disturbance area would be marginally greater than what currently exists and there would be an increase in ground disturbance. Invasive weed species (including HTW) were noted within the study area. Future weed invasion into adjoining habitats is possible, although, based on observation with the intact areas of woodland, this is predicted to be low. Management measures for weed species are described within this report (see **Chapter 6**) and will assist with preventing further spread of weeds into the surrounding habitat.

5.5 Injury and mortality

During construction and operation, direct impact to fauna by strikes of mechanical equipment or entrapment in equipment and excavations is possible. Direct strikes and associated stress can result in injury and death to fauna. However, this risk is considered negligible as the construction area is small and discrete within an existing disturbed area. Boundary fencing would be installed around the works in early stages of construction to reduce the probability of impacts to fauna.

Fauna injury or death has the greatest potential to occur during the vegetation clearing and the extent of this impact will be proportionate to the extent of vegetation that is cleared. Some mobile species, such as birds, may be able to move away from the path of clearing and may not be greatly affected unless they are nesting. However, other species that are less mobile (e.g. ground dwelling reptiles and mammals), or those that are nocturnal and nest or roost in trees during the day (e.g. arboreal mammals and micro bat species), may find it difficult to move rapidly when disturbed.

Mitigation measures to reduce the impacts on wildlife which are to be implemented during the construction phase are provided in **Chapter 6**.

5.6 Proliferation of weeds

Proliferation of weed species is an indirect impact (i.e. not a direct result of the proposal) that may have cumulative effects. Proliferation of weed species is likely to occur as vegetation is removed, soil is disturbed, and machinery moves about the work site. Areas of bare soil would be exposed for the machinery laydown area providing opportunity for weed establishment. The impacts from weed invasion will likely commence a few months after construction and gradually increase over months and seasons. Proliferation of weed species has the potential to impact on the quality and integrity of the native vegetation within the proposal area including habitat for threatened species.

During construction there is potential to disperse weed seeds and plant material into adjoining areas of moderate to high quality native vegetation where weed species do not currently occur in high density. The most likely causes of weed dispersal are associated with clearing of vegetation and stockpile of contaminated mulch and topsoil during earthworks, and movement of soil and attachment of seed (and other propagules) to construction vehicles and machinery.

Common weed species identified within the proposal area consisted of the following species:

- *Hypericum perforatum* (St. John's Wort)
- *Xanthium spinosum* (Bathurst Burr).

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. These invasive flora species identified within the proposal area are shown in **Table 5-1** with their control requirements.

Table 5-1 Weed species recorded in the proposal area and their control methods

Species	Weed category	Control methods
<i>Hypericum perforatum</i> (St. John's Wort)	<ul style="list-style-type: none"> ▪ Species of concern within the Riverina region (LLS, 2017). 	<ul style="list-style-type: none"> ▪ 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.

Species	Weed category	Control methods
<i>Xanthium spinosum</i> (Bathurst Burr)	<ul style="list-style-type: none"> ▪ High threat weed ▪ Species of concern within the Riverina region (LLS, 2017). 	<ul style="list-style-type: none"> ▪ 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: Repeated cultivation of seedlings after each germination event is effective on arable land. Mechanical slashing should be undertaken before the burrs have formed.

Further mitigation measures, as outlined in **Chapter 6**, would limit the spread and germination of noxious weeds.

5.7 Pests and pathogens

During construction and operation, the movement of plant and equipment has the potential to transfer weeds and pathogens within and out of the study area. Construction and operation of the proposal also has the potential to alter the abundance of pest species within the study area. The following sections elaborate further on these potential impacts.

5.7.1 Pests

The proposal area is likely to provide habitat for a range of pest species including rabbits, foxes and cats. Construction activities have the potential to disperse pest species out of the proposal area across the surrounding landscape due to habitat removal, noise, and human presence during construction and operation of the proposal. However, the proposal is unlikely to significantly increase the value of the habitat for pest species in the proposal area over the long-term. Rabbits tend to colonise more disturbed and modified open habitats, such as the adjacent agricultural landscape, and the proposal is unlikely to contribute to increased levels of predation on native fauna from foxes and cats as construction areas would be typically limited to existing disturbed areas.

5.7.2 Pathogens

Several pathogens known from NSW have potential to impact on biodiversity as a result their movement and infection during construction. Of these, three are listed as a key threatening process (KTP) under either the EPBC Act and/or BC Act including:

- Dieback caused by *Phytophthora* (Root Rot; EPBC Act and BC Act)
- Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis (EPBC Act and BC Act)
- Introduction and establishment of exotic Rust Fungi of the order Pucciniales on plants of the family Myrtaceae (BC Act).

While these pathogens were not observed or tested for in the study area, 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 proposal include earthworks, movement of soil, and attachment of plant matter to vehicles and machinery during all phases (construction and operation) of the proposal. Pathogens would be managed within the construction area in accordance with the *Biosecurity Act 2015*.

5.8 Noise, vibration and dust

Anthropogenic noise can alter the behaviour of animals or interfere with their normal functioning (Bowles 1997). However, considering the existing levels of noise and vibration from the surrounding agricultural development and the temporary impacts during construction, it is unlikely there would be a significant increase in noise and vibration during operation of the proposal that would result in any increased impacts to biodiversity within the construction area. There is however 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 to the construction areas and are not considered likely to have a significant, long-term impact on wildlife populations outside the area of impact. The magnitude of this impact would be low and mitigation measures are not deemed necessary. Additionally, there are no nightworks

expected during construction for this proposal, which eliminates disturbance to fauna residing within or near the proposal area during dusk and dawn periods as well as nocturnal fauna.

In addition to sedimentation impacts of Lower Toupna Creek during the regulator replacement, elevated levels of dust may be deposited onto the foliage of vegetation adjacent to the proposal activities. This has the potential to reduce photosynthesis and transpiration and cause abrasion and radioactive heating resulting in reduced growth rates and decreases in overall health of the vegetation. Consequently, changes in the structure and composition of plant communities, and subsequently the grazing patterns of fauna, may occur (Auerbach et al. 1997; Walker & Everett 1987).

Dust is likely to be generated during the construction of the proposal, although 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.

5.9 Erosion, sedimentation and waterways

Disturbance of groundcover, ground excavations and storage of materials, fuels and chemicals has the potential to pollute Lower Toupna Creek and downstream environments due to erosion and runoff. Soils and contaminated runoff have the potential to enter waterways and cause turbidity, enhanced sedimentation and reduction of water quality. During periods of rainfall, there is the risk of flooding within the construction areas due to higher flows and the fact that the entire site is on a floodplain. Mitigation measures are provided in **Chapter 6**, outlining procedures and implementations to reduce the impacts or runoff and sedimentation.

Without the implementation of erosion and sediment control measures, potential construction impacts to Lower Toupna Creek are high and likely. However, the observation of sufficient management measures to mitigate erosion impacts are considered highly achievable. As such, with the observation of the management measures, impacts are considered unlikely.

5.10 Ramsar wetlands and nationally important wetlands

The proposal is located within the NSW Central Murray Forests Ramsar site in NSW, and adjacent to the Barmah Forest Ramsar site in Victoria. In addition to this, the proposal area is located within Millewa Forest which is listed as an important wetland under the Directory of Important Wetlands in Australia. The proposal will not affect the ecology of these Ramsar wetlands.

5.11 Significance assessments

Section 7.3 of the BC Act outlines the 'test of significance' that is to be undertaken to assess the likelihood of significant impact upon threatened species or ecological communities listed under the BC Act. These tests of significance have been undertaken in accordance with the *Threatened Species Test of Significance Guidelines* (OEH, 2018), which outlines a set of guidelines to help applicants/proponents of a development or activity with interpreting and applying the factors of the assessment process. The guidance provided by the former Office of Environment and Heritage (currently known as the Environment, Energy and Science Group within the DPE) has been used in preparing these tests of significance and in determining whether there is likely to be a significant impact to a threatened species, population or ecological community listed under the BC Act.

The conclusions of the significance assessments under the BC Act are provided in **Table 5-2**. Full details of the assessment of significance under the BC Act are presented in **Appendix B**. Species with similar broad habitat requirements have been grouped together for assessment. The conclusions of the significance assessments indicates that a significant impact is considered unlikely on 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* (DoE, 2013).

Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts (DoE, 2013). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility (DoE, 2013). This advice has been considered while undertaking the assessments.

As a result of the proposal, it is considered that a significant impact is unlikely for any MNES and a referral of the proposal would not be required. The conclusions of the significance assessments under the EPBC Act are provided in **Table 5-3**. Full details of the assessment of significance for threatened species under the EPBC Act are presented in **Appendix B**.

Division 12, Part 7A of the FM Act sets out the factors which must be considered in making determining if an activity is likely to have an impact on threatened aquatic species, known as the 'Assessment of Significance' or '7 part test'. No FM Act listed species were considered likely to occur in the proposal area and therefore no Assessments of Significance have been undertaken under the FM Act.

The proposal would result in the removal of small and medium trees and understorey, totalling approximately 0.42 hectares, as well as short-term disturbance (i.e. noise, human activity, vibration) during the construction phase. Given the localised nature of the impacts in relation to adjacent available habitat, impacts associated with the proposal are expected to be minimal and temporary.

Table 5-2 Summary findings of the BC Act test of significance for the proposal area

Threatened species	Significance assessment questions (BC Act)*					Likely significant impact?
	a	b	c	d	e	
Woodland Birds						
Diamond Firetail (<i>Stagonopleura guttata</i>)	N	X	Y	N	Y	No
Dusky Woodswallow (<i>Artamus cyanopterus</i>)	N	X	Y	N	Y	No
Hooded Robin (south-eastern form) (<i>Melanodyras cucullata cucullata</i>)	N	X	Y	N	Y	No
Scarlet Robin (<i>Petroica boodang</i>)	N	X	Y	N	Y	No
Superb Parrot (<i>Polytelis swainsonii</i>)	N	X	Y	N	Y	No
Varied Sittella (<i>Daphoenositta chrysoptera</i>).	N	X	Y	N	Y	No
Mammals						
Koala (<i>Phascolarctos cinereus</i>)	N	X	Y	N	Y	No
Yellow-bellied Sheathtail-bat (<i>Saccolaimus flaviventris</i>)	N	X	Y	N	Y	No

Key: N = No, Y = Yes, X = not applicable, No = Negligible impact from the proposal

*Threatened Species Test of Significance Guidelines criteria questions (OEH, 2018):

- a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
- b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
 - (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
 - (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,
- c. in relation to the habitat of a threatened species or ecological community:
 - (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
 - (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
 - (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.
- d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),
- e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Table 5-3 Summary findings of the EPBC Act significance assessments for the proposal area

Wetlands of international importance and threatened species	Significance assessment questions (EPBC Act)*									Important population	Likely significant impact?
	1	2	3	4	5	6	7	8	9		
Wetlands of international importance											
NSW Central Murray Forests Ramsar site	N	N	N	N	N	X	X	X	X	Yes	No
Birds											
Superb Parrot (<i>Polytelis swainsonii</i>)	N	N	N	N	N	N	N	N	N	Yes	No
Mammals											
Koala (<i>Phascolarctos cinereus</i>)	N	N	N	N	N	N	N	N	N	Yes	No

Key: N = No, Y = Yes, X = not applicable, No = Negligible impact from the proposal

*EPBC Act Policy Statement 1.1 Significant Impact Guidelines criteria questions (DoE, 2013):

Wetlands of international importance:

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

- 1) areas of the wetland being destroyed or substantially modified
- 2) a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland
- 3) the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected
- 4) a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or
- 5) an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

Vulnerable species:

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- 1) lead to a long-term decrease in the size of an important population of a species
- 2) reduce the area of occupancy of an important population
- 3) fragment an existing important population into two or more populations
- 4) adversely affect habitat critical to the survival of a species
- 5) disrupt the breeding cycle of an important population
- 6) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- 7) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- 8) introduce disease that may cause the species to decline, or
- 9) interfere substantially with the recovery of the species.

Critically endangered and endangered species:

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- 1) lead to a long-term decrease in the size of a population
- 2) reduce the area of occupancy of the species
- 3) fragment an existing population into two or more populations
- 4) adversely affect habitat critical to the survival of a species
- 5) disrupt the breeding cycle of a population
- 6) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- 7) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- 8) introduce disease that may cause the species to decline, or
- 9) interfere with the recovery of the species.

6. Avoid, minimise and mitigate impacts

This chapter outlines the steps that will be taken to avoid and minimise impacts to biodiversity and the measures recommended to manage residual impacts.

6.1 Avoidance and minimisation

All practicable steps to avoid or minimise impacts have been implemented at the design phase, including the avoidance of hollow bearing trees and logs, and construction area is largely restricted to an existing disturbed area.

6.2 Mitigation measures

Mitigation measures will be implemented to further lessen the potential biodiversity impacts of the proposal.

Biodiversity impacts during construction would be managed in accordance with a Construction Environmental Management Plan (CEMP), which includes biodiversity management objectives to maximise workers' awareness of biodiversity values and avoid or minimise potential impacts to biodiversity.

The CEMP also requires the preparation and implementation of a Flora and Fauna Management Plan, including (but not limited to):

- Procedures for the demarcation and protection of retained vegetation, including all vegetation outside and adjacent to the construction area
- Measures to reduce disturbance to sensitive fauna
- Procedures for the clearing of vegetation and the relocation of flora and fauna, including pre-clearing surveys and hollow-bearing tree identification
- Procedures for dealing with unexpected finds of threatened species identified during construction
- Weed management measures in accordance with the *Biosecurity Act 2015*
- Pathogen management measures to prevent introduction and spread of amphibian chytrid fungus, *Phytophthora cinnamomi* and Exotic Rust Fungi
- Inspection and monitoring requirements.

A number of standard precautions and mitigations relevant to the protection of fish habitat are provided in Section 3.3.2 of Fairfull (2003). These should be considered and deployed as relevant. Further recommendations specific to the removal of existing crossing and construction of the bridges and protection of aquatic habitats are also provided in **Table 6-1**.

Table 6-1 Recommended mitigation measures during pre-construction and construction

Item No.	Potential impact	Mitigation Measure
B1	Impact to surrounding vegetation	The limits of the work zone, areas for parking and turning of vehicles and plant equipment would be accurately and clearly marked out prior to commencement of works. These areas would be located so that vegetation disturbance is minimised as much as possible and the drip-line of trees avoided.
B2		Materials, plant, equipment, work vehicles and stockpiles would be placed to avoid damage to surrounding vegetation and will be outside tree drip-lines.
B3		Locate construction parking, compounds, stockpiles and chemical storage away from vegetated areas (including tree protection zones) and in areas which do not necessitate anymore clearing of vegetation than necessary.
B4		Install branch and trunk protection where construction works are in very close proximity to trees.
B5		If any damage occurs to vegetation outside of the nominated work area, DPE will be notified so that appropriate remediation strategies can be developed.
B6		Construction personnel are to be informed of the environmentally sensitive aspects of the construction area, including plans for impacted and adjoining areas showing vegetation communities; important flora and fauna habitat areas; and locations where threatened species, populations or ecological communities have been recorded.
B7		Avoiding all established trees, particularly large hollow-bearing individuals.
B8		Restricting disturbance to existing disturbance areas where possible.
B9	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: <ul style="list-style-type: none"> ▪ Identification of hollow bearing trees or other habitat features ▪ Identification of any threatened flora and fauna ▪ A check on the physical demarcation of the limit of clearing ▪ Implementation of the Erosion and Sediment Control Plan (ESCP) for the worksite, including erosion control structures ▪ The completion of any other pre-clearing requirements required by any project approvals, permits or licences. The completion of the pre-clearing inspection will form a HOLD POINT requiring sign-off from the Contractor's Environmental Manager (or delegate) and a qualified ecologist.
B10		Clearing will follow a two-stage process as follows: <ul style="list-style-type: none"> ▪ Non-habitat trees to be cleared first after sign-off of the pre-clearing inspection; and

Item No.	Potential impact	Mitigation Measure
		<ul style="list-style-type: none"> ▪ Habitat trees to be cleared no sooner than 48 hours after non-habitat trees have been cleared. A suitably qualified ecologist to be present during the clearing of habitat trees. Felled habitat trees to be left on the ground for 24 hours or inspected by the ecologist prior to further processing.
B11		Construction crews will be made aware that any native fauna species encountered must be allowed to leave site without being harassed and a local wildlife rescue organisation must be called for assistance where necessary.
B12		Where possible, hollows will be cut out of hollow-bearing trees and re-established in large trees to mitigate the loss of hollow habitat on fauna. Re-establishing existing hollows into trees is more likely to encourage uptake than use of artificial nest boxes.
B13		A procedure for dealing with unexpected presence of threatened species will be implemented during construction, including cessation of work and notification of the contractors appointed environmental representative and DPE and determination of appropriate mitigation measures (including relevant relocation measures).
B14		Consider avoiding construction in woodland areas during the Superb Parrot breeding period (September - January). If this cannot be achieved, undertake pre-clearing surveys to ensure that no impacts will occur.
B15		<p>Follow the following mitigation measures to ensure any resident wombats have been removed prior to construction:</p> <ul style="list-style-type: none"> ▪ Coordinate removal and/or relocation efforts with NPWS, DPE and other specialist wildlife groups such as The Wombat Protection Society of Australia to provide on site assistance in safely deterring the wombat from the burrow and finding it 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 would be present to assist with the relocation of any resident wombats if necessary ▪ Inspect burrow for activity/occupation (monitor and inspect burrows for at least three days and rake entrances to allow for identification of fresh tracks) ▪ Once burrow is determined as empty, collapse entrance to burrow to prevent re-burrowing.
B16		Implement fencing (where necessary) that is friendly to native wildlife (i.e. visible for fauna and reduces the likelihood of entanglement) to reduce the impacts of habitat destruction by feral species (i.e. pigs, cats and foxes) or livestock.
B17	Impacts from introduction and spread of disease harmful to native animals including threatened species	To avoid introduction and/or spread of Chytrid Fungus clothing and equipment wash down procedures and the sourcing of suitable materials that are not likely to be contaminated with the Chytrid Fungus will be implemented.
B18	Impacts from introduction and spread of disease harmful to native animals including threatened species	Swabbing for the presence of Chytrid Fungus could be completed on native or threatened frog species (if present) within the proposal area utilising Lower Toupna Creek prior to construction of the proposal. If present, a management plan would be prepared prior to construction of the proposal.

Item No.	Potential impact	Mitigation Measure
B19	Impacts to habitat features	Relocation of habitat features (fallen timber, hollow logs) from within construction sites in accordance with an approved project-specific procedure.
B20	Impacts from introduction and spread of weeds	Weed management is to be undertaken in areas affected by construction prior to any clearing works in accordance with the <i>Biosecurity Act 2015</i> to ensure they are not spread to the surrounding environment; including during transport disposal off-site to a licenced waste disposal facility.
B21		All weeds, propagules, other plant parts and/or excavated topsoil material that is likely to be infested with weed propagules that are likely to regenerate will be treated on site or bagged, removed from site, and disposed of at a licensed waste disposal facility.
B22	Impacts form introduction and spread of plant pathogens	<i>Phytophthora cinnamomi</i> can lead to death of trees and shrubs, resulting in devastation of native ecosystems (<i>SOS Hygiene Guidelines</i> , DPE 2020b). All vehicles and machinery during the earthworks and vegetation clearance activities should follow a protocol to prevent the spread or introduction of <i>Phytophthora</i> , Myrtle Rust or Chytrid Fungus, namely vehicles should be cleaned, including the tyres and any equipment used, prior to entering the site.
B23		Minimise work during excessively wet or muddy conditions as pathogens can be spread on footwear, vehicles and machinery, particularly during wet weather or in wet conditions.
B24		A comprehensive erosion and sediment management plan would be developed and implemented as part of the CEMP. The erosion and sediment management plan would be prepared for the proposal with specific control measures outlined for each proposal feature. Sediment control measures may include diversion drains, sediment fencing, coir logs, catch drains and perimeter bunds. If required, siting of sediment basins should consider management of run-off from construction areas and use of captured water for dust suppression. The CEMP would also account for extreme weather or flood conditions during construction.
B25	Impacts to aquatic habitat including Key Fish Habitat	To minimise impacts to creeks, all construction traffic would be restricted to access tracks. Chemicals and fuels would be appropriately stored and banded. Appropriate sediment and erosion control measures would be put in place during the construction process and may include sediment and erosion control curtains to control turbidity generated during the construction and restoration process.
B26		Runoff from stockpiles would be managed to ensure there is no contamination or sediment entering the adjacent watercourse. This would account for extreme weather or flood conditions during construction.
B27		Large woody debris will be retained for creek crossing works where practicable. All large woody debris or snags will be relocated instream with a suitably qualified ecologist present.
B28		Temporary obstruction of fish passage may require a NSW Fisheries Permit, subject to assessment by DPE.

Item No.	Potential impact	Mitigation Measure
B29	Temporary obstruction to fish	<ul style="list-style-type: none"> ▪ Revegetation of the riverbanks will be undertaken as soon as possible. A Rehabilitation Plan (RP) should be included as part of the CEMP. The Rehabilitation Plan would guide the long-term rehabilitation of applicable parts of the proposal. Such areas would include areas disturbed during construction that are not required to be maintained or cleared for the operation of the proposal. ▪ The RP would focus on prevention of soil erosion and re-establishing local endemic plant species. ▪ Restoration of riparian vegetation (i.e. weed control) would be implemented to protect and improve threatened aquatic species habitat, and drought conditions during the establishment phase of the proposal.
B30	Wildlife impacts from vehicle strike	Drivers must stay vigilant for fauna during machinery operation and vehicle movements.
B31		Boundary fencing would be installed around the works in early stages of construction to reduce the probability of impacts to fauna.

7. Conclusion

This BAR has been undertaken for the proposed replacement of Bullatale Inlet Regulator and will inform an REF being prepared for the proposal (DPE, 2022b).

Habitat features, including small and medium trees and native understorey species, will require removal as a result of the proposal. The vegetation within the proposal area was assessed for total clearing, which would require the removal of a total of 0.42 hectares of low condition PCT 2. Impacts to hollow bearing trees will be avoided.

Overall, the temporary short-term impacts of the proposal have a low risk of harm on biodiversity values.

A total of 10 threatened fauna species have the potential to occur based on background research and the presence of suitable habitat within the proposal area. Assessments of significance have been undertaken for the identified threatened species and are provided in **Appendix B**. It was determined that the proposal will not have a significant impact on identified threatened species.

Although efforts have been made to avoid, minimise and mitigate potential ecological impacts from the proposal, some residual impacts would occur. Mitigation measures described in **Chapter 6** would be implemented during the construction and operational phases to lessen the potential ecological impacts of the proposal.

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Appendix A. Likelihood of occurrence assessment

Table A-1 Likelihood of occurrence assessment for threatened flora species

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
<i>Amphibromus fluitans</i> (Floating Swamp Wallaby-grass)	V	V	-	<i>Amphibromus fluitans</i> occurs in southern NSW, Victoria, South Australia and Tasmania. It grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile, and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Flowering time is from spring to autumn or November to March. Disturbance regimes are not known, although the species requires periodic flooding of its habitat to maintain wet conditions.	PMST - Known 9 - BioNet	Low – No suitable habitat present within the proposal area.
<i>Austrostipa wakoolica</i> (A spear-grass)	E	E	-	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South West Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Associated species include <i>Callitris glaucophylla</i> , <i>Eucalyptus microcarpa</i> , <i>E. populnea</i> , <i>Austrostipa eremophila</i> , <i>A. drummondii</i> , <i>Austrodanthonia eriantha</i> and <i>Einadia nutans</i> . Flowers from October to December, mainly in response to rain.	PMST - Likely	Low – No suitable habitat present within the proposal area.
<i>Brachyscome muelleroides</i> (Mueller Daisy)	V	V	-	<i>Brachyscome muelleroides</i> occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). Grows in damp areas on the margins of claypans in moist grassland with <i>Pycnosorus globosus</i> , <i>Agrostis avenacea</i> and <i>Austrodanthonia duttoniana</i> . Also found growing in association with seasonal aquatic plants such as <i>Marsilea</i> species. Also recorded from the margins of lagoons in mud or water, and in association with <i>Calotis anthemoides</i> . Victorian collections have generally come from open positions on the	PMST - Known	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				Murray River floodplain, swampy <i>Eucalyptus camaldulensis</i> Forest and damp depressions.		
<i>Lepidium aschersonii</i> (Spiny Pepper-cress)	V	V	-	Not widespread, occurring in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). In the north of the State recent surveys have recorded a number of new sites including Brigalow Nature Reserve, Brigalow State Conservation Area, Leard State Conservation Area and Bobbiwaa State Conservation Area. Also known from the West Wyalong in the south of the State. Records from Barmedman and Temora areas are likely to be no longer present. Approximately 50% of the total <i>Lepidium aschersonii</i> recorded for Australia occurs in NSW. Found on ridges of gilgai clays dominated by Brigalow (<i>Acacia harpophylla</i>), Belah (<i>Casuarina cristata</i>), Buloke (<i>Allocasuarina luehmannii</i>) and Grey Box (<i>Eucalyptus microcarpa</i>). In the south has been recorded growing in Bull Mallee (<i>Eucalyptus behriana</i>). Often the understorey is dominated by introduced plants. The species grows as a component of the ground flora, in grey loamy clays. Vegetation structure varies from open to dense, with sparse grassy understorey and occasional heavy litter.	PMST – May	Low – No suitable habitat present within the proposal area.
<i>Lepidium monoplocoides</i> (Winged Pepper-cress)	E	E	-	Widespread in the semi-arid western plains regions of NSW. Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 millimetres. Predominant vegetation is usually an open woodland dominated by <i>Allocasuarina luehmannii</i> (Bulloak) and/or eucalypts, particularly <i>Eucalyptus largiflorens</i> (Black Box) or <i>Eucalyptus populnea</i> (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Recorded in a wetland-grassland community comprising <i>Eragrostis australasicus</i> , <i>Agrostis avenacea</i> , <i>Austrodanthonia duttoniana</i> , <i>Homopholis proluta</i> , <i>Myriophyllum crispatum</i> , <i>Utricularia dichotoma</i> and <i>Pycnosorus globosus</i> , on waterlogged grey-brown clay. Also recorded from a <i>Maireana pyramidata</i> shrubland.	PMST - Known	Low – No suitable habitat present within the proposal area.
<i>Maireana cheelii</i> (Chariot Wheels)	V	V	-	Restricted to the southern Riverina region of NSW, mainly in the area between Deniliquin and Hay. Also has a limited distribution in Victoria where very rare. NSW collections have mainly been from the Moulamein, Deniliquin and Hay districts, including Tchelery and Zara	PMST - May	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				Stations. Usually found on heavier, grey clay soils with <i>Atriplex vesicaria</i> (Bladder Saltbush). Recorded on the Hay Plain in <i>Atriplex vesicaria</i> , <i>Maireana aphylla</i> and <i>Acacia homalophylla</i> shrublands. Soils include heavy brown to red-brown clay-loams, hard cracking red clay, other heavy texture-contrast soils. Tends to grow in shallow depressions, often on eroded or scalded surfaces, and does not extend to the higher soils in the habitat. It has been found on the edges of bare, windswept claypans, in shallow depressions of eroded surfaces where rainwater collects and on a "shelf" in the crabhole complex of heavy grey soils. Associated species include <i>Atriplex vesicaria</i> , <i>Maireana pentagona</i> , <i>M. excavata</i> , <i>M. ciliata</i> , <i>Cressa cretica</i> , <i>Avena fatua</i> and <i>Acacia homalophylla</i> . Flowering time is mostly spring to summer. Bears fruits mostly from September to November.		
<i>Myriophyllum porcatum</i> (Ridged Water-milfoil)	V	-	-	The ridged water-milfoil is endemic to Victoria, where it is widely but patchily distributed across the north and north-west of the state. The current number of individuals is unknown, but the population is likely to fluctuate dramatically depending on seasonal rainfall in appropriate habitat. The ridged water-milfoil occurs in shallow, ephemeral and seasonal wetlands, including lakes, swamps, rock pools in granite outcrops, waterholes in claypans, and highly modified habitats including farm dams and drainage lines. It grows and reproduces following autumn and early winter inundation.	PMST - Likely	Unlikely – No suitable habitat present within the proposal area.
<i>Pimelea spinescens</i> subsp. <i>spinescens</i> (Spiny Rice-flower)	CE	-	-	<i>Pimelea spinescens</i> subsp. <i>spinescens</i> is endemic to Victoria, where it occurs in the central west of the state, predominantly in the Victorian Volcanic Plain, Victorian Midlands and Riverina IBRA (Interim Biogeographic Regionalisation for Australia) Bioregions. Populations are now substantially fragmented and depleted due to land clearance for settlement, industry and agriculture. The species occurs in grassland or open shrubland, usually developed on clay soils. Plants from more northerly populations occur on red clay complexes, while plants from southern populations occur on heavy grey-black clay loams derived from basalt. Topography is generally flat but populations may occur on slight rises or in slight depressions prone to temporary inundation. Vegetation is often dominated by <i>Themeda triandra</i> (Kangaroo Grass), with <i>Austrostipa</i> spp. (Speargrass) or <i>Rytidosperma</i> spp. (Wallaby	PMST – May	Unlikely – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				Grass) commonly associated. Co-occurring species often include <i>Acaena echinata</i> (Sheep's Burr), <i>Calocephalus citreus</i> (Lemon beauty-heads), <i>Chrysocephalum apiculatum</i> (Common Everlasting), <i>Eryngium ovinum</i> (Blue Devil), <i>Plantago varia</i> (Variable Plantain), <i>Ptilotus erubescens</i> (Hairy Yails), <i>Schoenus apogon</i> (Common bog-sedge) and <i>Velleia paradoxa</i> (Spur Velleia).		
<i>Sclerolaena napiformis</i> (Turnip Copperburr)	E	E	-	Known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. Confined to remnant grassland habitats on clay-loam soils. Grows on level plains in tussock grassland of <i>Austrostipa nodosa</i> and <i>Chloris truncata</i> , in grey cracking clay to red-brown loamy clay. Sites are roadside travelling stock routes and reserves subject to sheep grazing. Other associated species include <i>Austrodanthonia duttoniana</i> , <i>Enteropogon acicularis</i> , <i>Austrostipa nodosa</i> , <i>Chloris truncata</i> , <i>Lolium rigidum</i> , <i>Swainsona murrayana</i> , <i>S. plagiotropis</i> , <i>S. procumbens</i> , <i>Rhodanthe corymbiflora</i> , <i>Calotis scabiosifolia</i> , <i>Microseris lanceolata</i> , <i>Acacia pendula</i> and various chenopods. Fruiting period is from November to May. Grows in areas with intermittent light grazing. Based on past land use, this regime may promote the growth of the species, or at least not be detrimental to it. Plants grow as low shrubs within an open to mid-dense tussock grassland with herbaceous ground layer. It is known only from a few populations in north-central Victoria in the Echuca-Nathalia area, and between Donald and Stawell in the west. There is anecdotal evidence that the species can tolerate waterlogging in spring, and all known populations occur near a watercourse or swamp.	PMST - Likely	Low – No suitable habitat present within the proposal area.
<i>Senecio behrianus</i> (Stiff Groundsel)	E	Ex	-	<i>Senecio behrianus</i> was endemic to south-eastern Australia, where it once occurred in South Australia, NSW and Victoria. It is presumed extinct in South Australia and NSW, and is now only known only from 5 wild and 2 reintroduced populations in Victoria. Information with herbarium records indicates plants were growing in 'swampy soil' and 'sandy clay' in seasonally inundated areas on flats or banks close to rivers. Remaining populations grow on poorly-drained sedimentary grey clays or sandy clays on or close to floodplains, and on basalt-derived	PMST - May	Unlikely – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				grey cracking clays in periodically flooded depressions. A common feature seems to be that habitats are seasonally inundated, and hydrological regime is probably an important aspect of habitat, although the optimal timing and extent of flooding are unknown. Plant growth appears to be more prolific in areas that are flooded to a depth of 30 cm or more, perhaps due to lack of competition.		
<i>Senecio macrocarpus</i> (Large-fruit Fireweed)	V	-	-	<i>Senecio macrocarpus</i> is endemic to south-eastern Australia, where it was once widely distributed from the southern Flinders Ranges in South Australia through Victoria to north-eastern Tasmania. Records occur in the Murray Darling Depression, Victorian Volcanic Plain, Victorian Midlands and South Eastern Highlands bioregions. The Large-fruit Groundsel occurs in a variety of habitats, including grasslands, sedgeland, shrublands and woodlands, generally on sparsely vegetated sites on sandy loam to heavy clay soils, often in depressions that are waterlogged in winter.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Swainsona murrayana</i> (Slender Darling Pea)	V	V	-	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with low chenopod shrubs (<i>Maireana</i> spp., <i>Atriplex vesicaria</i>), wallaby-grasses (<i>Austrodanthonia</i> spp.), and spear grasses (<i>Austrostipa</i> spp.). Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated.	PMST - Likely	Unlikely – No suitable habitat present within the proposal area.
<i>Swainsona plagiotropis</i> (Red Darling Pea)	V	V	-	Occurs in the upper Murray River valley in the south-western plains of NSW and into Victoria. Most NSW records are from the Jerilderie area, with possible collections from the Louth-Bourke area and a disjunct record in the north-western plains from Buttabone Stud Park 35 kilometres NW of Warren. Also rare in Victoria, restricted to a few sites in the central north, mostly between Bendigo and the Murray River south of Echuca. Grows on flat grassland and in heavy red soil, often on	PMST - Likely	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				roadsides and especially in table drains. Soils are derived from quaternary sediments and are usually red-brown clay-loams. The species is absent from black low-lying soils. Associated species include <i>Austrostipa aristiglumis</i> , <i>A. nodosa</i> , <i>A. setacea</i> , <i>Homopholis proluta</i> , <i>Chloris truncata</i> , <i>Austrodanthonia caespitosa</i> , <i>A. duttoniana</i> , <i>Enteropogon acicularis</i> , <i>Hordeum</i> spp., <i>Lolium rigidum</i> , <i>Rhodanthe corymbiflora</i> , <i>Calotis scabiosifolia</i> , <i>Microseris lanceolata</i> and <i>Chrysocephalum apiculatum</i> .		
Key: CE = Critically Endangered, E = Endangered, Ex = Extinct, V = Vulnerable						

Table A-2 Likelihood of occurrence assessment for threatened fauna species and migratory species

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
Birds						
<i>Anthochaera phrygia</i> (Regent Honeyeater)	CE	CE	-	The Regent Honeyeater that has a patchy distribution between south-east Queensland and central Victoria. It mostly inhabits inland slopes of the Great Dividing Range, in areas of low to moderate relief with moist, fertile soils. It is most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest, but also inhabits riparian vegetation such as sheoak (<i>Casuarina</i> spp.) where it feeds on needle-leaved mistletoe and sometimes breeds. It sometimes utilises lowland coastal forest, which may act as a refuge when its usual habitat is affected by drought. It also uses a range of disturbed habitats within these landscapes including remnant patches in farmland and urban areas and roadside vegetation. It feeds primarily on the nectar of eucalypts and mistletoes and, to a lesser extent, lerps and honeydew; it prefers taller and larger diameter trees for foraging. It is nomadic and partly migratory with its movement through the landscape being governed by the flowering of select eucalypt species. There are four known key breeding areas: three in NSW and one in Victoria. Breeding varies between regions and corresponds with flowering of key eucalypt and mistletoe species. It usually nests in horizontal branches or forks in tall mature eucalypts and Sheoaks.	PMST - May	Low - No suitable habitat present within the proposal area. The closest mapped area of important habitat for the Regent Honeyeater is located near Albury.
<i>Artamus cyanopterus cyanopterus</i> (Dusky Woodswallow)	-	V	-	The Dusky Woodswallow has two separate populations. The eastern population is found from Atherton Tableland, Queensland south to Tasmania and west to Eyre Peninsula, South Australia. The other population is found in south-west Western Australia. The Dusky Woodswallow is found in open forests and woodlands and may be seen along roadsides and on golf courses.	10 - BioNet	High - Multiple records within the locality. Suitable habitat occurs within the proposal area.
<i>Botaurus poiciloptilus</i> (Australasian Bittern)	E	E	-	Occurs from south-east Queensland to south-east South Australia, Tasmania and the south-west of Western Australia. The Australasian Bittern's preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 metres deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and	PMST - Known	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. <i>Phragmites</i> , <i>Cyperus</i> , <i>Eleocharis</i> , <i>Juncus</i> , <i>Typha</i> , <i>Baumea</i> , <i>Bolboschoenus</i>) or cutting grass (<i>Gahnia</i>) growing over a muddy or peaty substrate.		
<i>Climacteris picumnus victoriae</i> (Brown Treecreeper (eastern subsp.))	-	V	-	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Hollows in standing dead or live trees and tree stumps are essential for nesting.	138 - BioNet	Low - No suitable habitat present within the proposal area. This species is endemic to eastern Australia.
<i>Daphoenositta chrysoptera</i> (Varied Sittella)	-	V	-	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Nests in an upright tree fork high in the living tree canopy.	44 - BioNet	High - Multiple records within the locality. Suitable habitat occurs within the proposal area.
<i>Falco hypoleucos</i> (Grey Falcon)	V	E	-	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	PMST – Likely	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
<i>Grantiella picta</i> (Painted Honeyeater)	V	V	-	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of birds, and almost all breeding, occur on the inland slopes of the Great Dividing Range in NSW, Victoria, and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	PMST - Likely	Low – No suitable habitat present within the proposal area.
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	-	V	-	Distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. Habitats occupied by the White-bellied Sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea). It feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion. It generally forages over large expanses of open water; this is particularly true of birds that occur in coastal environments close to the sea-shore. However, they will also forage over open terrestrial habitats (such as grasslands). Nests may be built in a variety of sites including tall trees (especially <i>Eucalyptus</i> spp.), bushes, mangroves, cliffs, rocky outcrops, caves, crevices, on the ground or even on artificial structures.	5 - BioNet	Low – No suitable habitat present within the proposal area. No large stick nests recorded during the field survey.
<i>Lathamus discolor</i> (Swift Parrot)	CE	E	-	The swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter. Whilst on the mainland the swift parrot disperses widely to forage on flowers and psyllid lerps in eucalypt species, with the majority being found in Victoria and NSW. In NSW they forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal Swamp Mahogany (<i>Eucalyptus robusta</i>) and Spotted Gum (<i>Corymbia maculata</i>) woodland when in flower, otherwise often in coastal forests.	PMST - May	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as <i>E. robusta</i> , <i>Corymbia maculata</i> , <i>C. gummifera</i> , <i>E. sideroxylon</i> , and <i>E. albens</i> . Commonly used lerp infested trees include <i>E. microcarpa</i> , <i>E. moluccana</i> and <i>E. pilularis</i> .		
<i>Melanodryas cucullata cucullata</i> (Hooded Robin (south-eastern form))	-	V	-	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than one metre to five metres above the ground.	4 - BioNet	Moderate – suitable habitat present within the proposal area.
<i>Melithreptus gularis gularis</i> (Black-chinned Honeyeater (eastern subsp.))	-	V	-	The Black-chinned Honeyeater has two subsp., with only the nominate (<i>gularis</i>) occurring in NSW. The eastern subsp. extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.	2 - BioNet	Low – No suitable habitat present within the proposal area.
<i>Pachycephala olivacea</i> (Olive Whistler)	-	V	-	The Olive Whistler inhabits the wet forests on the ranges of the east coast. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range.	1 - BioNet	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				Mostly inhabit wet forests above about 500 metres. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground, feeding on berries and insects. Make nests of twigs and grass in low forks of shrubs.		
<i>Pedionomus torquatus</i> (Plains-wanderer)	CE	E	-	The Plains-wanderer has declined greatly since European settlement. Areas where the species was formerly common and is now so reduced in numbers that it is effectively extinct include eastern NSW, south-western Victoria, and south-eastern South Australia. Its current stronghold is the western Riverina of southern NSW. Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species. Habitat structure appears to play a more important role than plant species composition. Preferred habitat of the Plains-wanderer typically comprises 50 per cent bare ground, 10 per cent fallen litter, and 40 per cent herbs, forbs and grasses. Most of the grassland habitat of the Plains-wanderer is <5 centimetres high, but some vegetation up to a maximum of 30 centimetres is important for concealment, as long as grass tussocks are spaced 10-20 centimetres apart. During prolonged drought, the denudation of preferred habitats may force birds into marginal denser and taller grassland habitats that become temporarily suitable.	PMST - Known	Low – No suitable habitat present within the proposal area.
<i>Petroica boodang</i> (Scarlet Robin)	-	V	-	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and re-growth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. This species' nest is built in the fork of tree usually more than two metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	62 - BioNet	High - Multiple records within the locality. Suitable habitat occurs within the proposal area.
<i>Pezoporus occidentalis</i> (Night Parrot)	E	PE	-	The distribution of the Night Parrot has not been well documented, but it is known to be restricted to arid and semi-arid Australia. The Night Parrot is known to occur within Spinifex grasslands in stony or sandy areas and samphire and chenopod associations on floodplains, salt lakes and clay pans. Suitable habitat is characterized by the presence	PMST - May	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				of large and dense clumps of Spinifex, and it may prefer mature spinifex that is long and unburnt.		
<i>Polytelis swainsonii</i> (Superb Parrot)	V	V	-	Found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the bird's nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Key breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5,000 breeding pairs left in the wild.	PMST - Known 81 - BioNet	High - Multiple records within the locality. Suitable habitat occurs within the proposal area.
<i>Rostratula australis</i> (Australian Painted Snipe)	E	E	-	Most records are from south-east Australia, particularly the Murray Darling Basin, with scattered records across northern Australia. They generally inhabit shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass. Breeding habitat requirements may be quite specific; shallow wetlands with areas of bare wet mud and both low cover and canopy cover nearby; nest records nearly all from or near small islands in freshwater wetlands. Has also been recorded nesting in and near swamps, canegrass swamps, flooded areas including samphire, grazing land, among cumbungi, sedges and grasses; one nest has been found in the centre of a cow-pat in a clump of long grass.	PMST - Likely	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
<i>Stagonopleura guttata</i> (Diamond Firetail)	-	V	-	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting.	2 - BioNet	Moderate – suitable habitat present within the proposal area.
Mammals						
<i>Chalinolobus picatus</i> (Little Pied Bat)	-	V	-	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings.	1 - BioNet	Low – No suitable habitat present within the proposal area.
<i>Nyctophilus corbeni</i> (Corben's Long-eared Bat)	V	V	-	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke <i>Allocasuarina luehmannii</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Petaurus norfolcensis</i> (Squirrel Glider)	-	V	-	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites.	1 - BioNet	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
<i>Phascolarctos cinereus</i> (Koala) (combined populations of Queensland, NSW and the Australian Capital Territory)	E	E	-	In NSW, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two hectares to several hundred hectares in size.	PMST - Known 6 - BioNet	Moderate – suitable habitat present within the proposal area.
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	V	V	-	Generally found within 200 kilometres of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 kilometres of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	PMST - Likely	Low – No suitable habitat present within the proposal area.
<i>Saccolaimus flaviventris</i> (Yellow-bellied Sheath-tail-bat)	-	V	-	Wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn, when migrates from tropical habitats. There are scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born.	18 - BioNet	Moderate – suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
Frogs						
<i>Crinia sloanei</i> (Sloane's Froglet)	E	V	-	Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in NSW. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. The preferred habitat of the species is periodically inundated areas of grassland, woodland and disturbed habitats across its range; threatened by land use and high rates of clearing. Often associated with EPBC TECs; Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Grey Box Grassy Woodlands and the Derived Native Grasslands of South-eastern Australia. They will live and breed in temporary and permanent waterbodies (e.g. oxbows, dams, large and small natural wetlands, constructed frog ponds, puddles). Aquatic vegetation essential for breeding includes medium height grasses and reeds with narrow stems (e.g. Couch; Watercouch, Common Spikerush). They have also been recorded in Gilgais, depressions on clay plains, and temporary ponds up to eight kilometres from large rivers. Connection between breeding and refuge habitats is also key to the species survival, often using roadside drains, table drains, irrigation channels and inundated grasslands to move across the landscape. The species was only listed in 2019, hence species specific survey effort targeted to late winter is likely to be limited. The species has the potential to recolonise areas where suitable ecological watering regimes are deployed.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Litoria raniformis</i> (Southern Bell Frog)	V	E	-	The species is currently widespread throughout the Murray River valley and has been recorded from six Catchment Management Areas in NSW: Lower Murray Darling, Murrumbidgee, Murray, Lachlan, Central West and South East. Found mostly amongst emergent vegetation, including <i>Typha</i> sp. (bullrush), <i>Phragmites</i> sp. (reeds) and <i>Eleocharis</i> sp.(sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams. The Southern Bell Frog inhabits areas within or on the edges of permanent water,	PMST - May	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				such as slow-flowing streams, swamps, lagoons and lakes, but also farm dams, irrigation channels, irrigated rice crops and disused quarries. Favoured sites have a large proportion of emergent, submerged and floating vegetation. Breeding is triggered by flooding of ephemeral waterbodies during spring or summer, with the larval period as short as two months. The range of the Southern Bell Frog has declined markedly, with loss of populations resulting a high level of fragmented and a disjunct distribution.		
Insects						
<i>Synemon plana</i> (Golden Sun Moth)	CE	E	-	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses <i>Austrodanthonia spp.</i> Grasslands dominated by wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature for the Golden Sun Moth, as it is typically these areas on which the females are observed displaying to attract males. Habitat may contain several wallaby grass species, which are typically associated with other grasses particularly spear-grasses <i>Austrostipa spp.</i> or Kangaroo Grass <i>Themeda australis</i> .	PMST - May	Low – No suitable habitat present within the proposal area.
Fish						
<i>Bidyanus bidyanus</i> (Silver Perch)	CE	-	V	Once widespread and abundant throughout most of the Murray-Darling river system. They have now declined to low numbers or disappeared from most of their former range. Only one remaining secure and self-sustaining population occurs in NSW in the central Murray River downstream of Yarrawonga weir, as well as several anabranches and tributaries. Silver perch show a preference for faster-flowing water, including rapids and races, and more open sections of river. Hatchery-bred silver perch are also stocked out of their range in a number of impoundments on east coast river systems, where they generally fail to reproduce. However, a self-sustaining population of silver perch occurs	PMST - Known Fisheries Spatial Data Portal	Low – This species is mapped within the proposal area of Lower Toupna Creek which is also mapped as KFH. May occur within the proposal area. However, it typically inhabits deeper flowing waters of the Murray River and larger tributaries.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				in Cataract Dam in the Hawkesbury Nepean System. Silver perch are also bred and grown in aquaculture facilities but these cultured fish are not considered meaningful to survival of silver perch in the wild. Similarly, stocked silver perch appear to make little improvement to the conservation situation of wild silver perch.		Species would be able to recolonise / expand local extent if present.
<i>Craterocephalus fluviatilis</i> (Murray Hardyhead)	E	-	CE	The Murray Hardyhead is endemic to the mid and lower Murray-Darling River system in southeastern Australia (NSW, Victoria and South Australia). The species has been recorded from the Darling River near Wentworth and the Murrumbidgee River at Narrandera (NSW), wetlands near Kerang, Swan Hill and Mildura (Victoria) and in the lower Murray River and its tributaries near Renmark, Swan Reach and the lower lakes near the mouth (South Australia). The Murray Hardyhead occurs in still and slow-flowing waters including billabongs, lakes and margins and backwaters of lowland rivers. The Murray Hardyhead occurs in open-water and amongst aquatic plants such as fringing emergent rushes Cumbungi species and Juncus species, and macrophytes including Ruppia species and Potamogeton species, over silty and sandy substrates, in very shallow to deeper water. Having suffered severe decline due to river regulation, water abstraction, drought and reduced connectivity between wetland habitats, Murray Hardyhead are now restricted to a few isolated saline lakes and wetlands in Victoria and South Australia.	PMST - May	Low - Wetland specialist. Not mapped within the proposal area. Species would be able to recolonise / expand local extent if present.
<i>Euastacus armatus</i> (Murray Crayfish)	-	-	V	The Murray Crayfish is endemic to the southern tributaries of the Murray-Darling Basin. Murray Crayfish prefer cool, flowing water that is well oxygenated. The species is tolerant of water temperatures up to 27°C and moderate salinities, but are intolerant to low dissolved oxygen concentrations. They create burrows that vary in complexity, from deep burrows with multiple entrances to simple burrows under a rock or log. The species prefers deep flowing water habitats proximal to clay banks, however can inhabit pasture-lands to sclerophyll forest, its existence in both large and small streams.	Fisheries Spatial Data Portal	Low – This species is mapped within the proposal area of Lower Toupna Creek which is also mapped as KFH. May occur within the proposal area. However, it prefers deep flowing water habitats proximal to clay banks. Species would benefit be able to

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
						recolonise / expand local extent if present.
<i>Galaxias rostratus</i> (Flathead Galaxias)	CE	-	CE	Flathead Galaxias, also known as Murray Jollytail are a small native fish that are known from the southern part of the Murray Darling Basin. They have been recorded in the Macquarie, Lachlan, Murrumbidgee and Murray Rivers in NSW. Despite extensive scientific sampling over the past 15 years there have been very few recorded sightings of Flathead Galaxias. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie and Lachlan Rivers. The species is now only known from the upper Murray River near Tintaldra and wetland areas near Howlong. Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation.	PMST - Known Fisheries Spatial Data Portal	Low – This species is mapped within the proposal area of Lower Toupna Creek which is also mapped as KFH. May occur within the proposal area. However, it prefers still or slow-moving water bodies such as wetlands and lowland streams. Species would be able to recolonise / expand local extent if present.
<i>Maccullochella macquariensis</i> (Trout Cod)	E	-	E	The Trout Cod is a riverine species, inhabiting a variety of flowing waters in the mid to upper reaches of rivers and streams. Trout Cod use river positions where large cover, in the form of woody debris and boulders, is present in high quantity, close to deeper water and high surface velocity, further from the river bank. At present only two potentially sustainable populations are known; a naturally occurring population in the Murray River (NSW) downstream of the Yarrawonga Weir between Yarrawonga and Barmah and the translocated population in Seven Creeks below Polly McQuinns Weir (Vic). There have been no recent records in the Murray River downstream from Echuca (NSW, SA), Macquarie River (NSW), Murrumbidgee River (NSW, ACT), and the Goulburn, Broken, Campaspe, Ovens, King, Buffalo and Mitta Mitta Rivers (Vic). The wild populations formerly occurring in these rivers are now probably extinct. Trout Cod and Murray Cod translocated into Cataract Dam (Nepean River NSW) have hybridised, and the cod population existing there is composed largely of hybrids.	PMST - Known Fisheries Spatial Data Portal	Low – This species is mapped nearby the proposal area within the Murray River. May occur within the proposal area. However, it is a large-bodied channel specialist that prefers deeper waters of main channels of the Murray River and larger tributaries. Species would be able to recolonise / expand local extent if present.
<i>Maccullochella peelii</i> (Murray Cod)	V	-	-	The Murray Cod occurs naturally in the waterways of the Murray-Darling Basin (ACT, SA, NSW and Vic) and is known to live in a wide	PMST - Known	Low - Large-bodied channel specialist. Prefers

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to contain suitable habitat. Some translocated populations exist outside the species' natural distribution in impoundments and waterways in NSW and Vic which are maintained by the release of hatchery bred fish.		deeper waters of main channel of the Murray River and larger tributaries. Not mapped within the proposal area. Species would be able to recolonise / expand local extent if present.
<i>Macquaria australasica</i> (Macquarie Perch)	E	-	E	The Macquarie Perch is a riverine species that prefers clear water and deep, rocky holes with abundant cover such as aquatic vegetation, large boulders, debris and overhanging banks. In Victorian parts of the Murray-Darling, only small natural populations remain in the upper reaches of the Mitta Mitta, Ovens, Broken, Campaspe and Goulburn Rivers; translocated populations occur in the Yarra River and Lake Eildon. In NSW, natural inland populations are isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers. Populations of the eastern form are confined to the Hawkesbury-Nepean and Shoalhaven river systems. Translocated populations in NSW are found in the Mongarlowe River, Queanbeyan River upstream of the Googong Reservoir and in Cataract Dam. In the ACT, it is restricted to the Murrumbidgee, Paddys and Cotter Rivers.	PMST - May	Low – No suitable aquatic habitat present within the proposal area. Not mapped within the proposal area. Species would be able to recolonise / expand local extent if present.
<i>Nannoperca australis</i> (Southern Pygmy Perch)	-	-	E	Southern Pygmy Perch were formerly found in the Murray and lower Murrumbidgee River systems. There have been large-scale reductions in their range since European settlement, particularly inland. Populations of Southern Pygmy Perch have recently been discovered in tributaries of the upper Lachlan and upper Murray River catchments. They are often found in small systems with a low flow rate and quiet vegetated areas in streams, billabongs, lakes. They prefer covered habitats and are not usually found in open water.	Fisheries Spatial Data Portal	Low - This species is mapped nearby the proposal area within Toupna Creek and Aratula Creek. No suitable aquatic habitat present within the proposal area. Species would be able to recolonise / expand local extent if present.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
Migratory species						
<i>Actitis hypoleucos</i> (Common Sandpiper)	M	-	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper is wader / shorebird migrating to Australia in summer for its non-breeding period. the species breeds in a variety of habitats near water in Eurasia. When in Australia, the species is more common in the northern half of Australia, this species is widespread in small numbers and has been recorded in a variety of habitats including steep sided sewage ponds and dams, feeding in the shallow edges of inland wetlands, farm dams and lakes.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Apus pacificus</i> (Fork-tailed Swift)	M	-	-	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 metres to at least 1000 metres above ground and probably much higher, seldom recorded on the ground. The species occurs aerially over a wide range of habitats, which vary from rainforests to treeless plains.	PMST - Likely	Low – No suitable habitat present within the proposal area.
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)	M	-	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation; this includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries, or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried	PMST - May	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs.		
<i>Calidris ferruginea</i> (Curlew Sandpiper)	M, CE	E	-	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one-year old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Calidris melanotos</i> (Pectoral Sandpiper)	M	-	-	Breeds in northern North America and Siberia and migrates (from late June) to South America and to a lesser extent Australasia. In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Gallinago hardwickii</i> (Latham's Snipe)	M	-	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2,000 metres above sea-level. Non-breeding visitor to south-eastern Australia. Prefers permanent and ephemeral wetlands, usually open, freshwater wetlands with low, dense vegetation. Sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers, although usually only during migration.	PMST - Likely	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
<i>Hirundapus caudactus</i> (White- throated Needletail)	M, V	-	-	Widespread in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than one metre up to more than 1,000 metres above the ground. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.	PMST - May 1 - BioNet	Low – No suitable habitat present within the proposal area.
<i>Motacilla flava</i> (Yellow Wagtail)	M	-	-	Rare but regular visitor around Australian coast, especially in the NW coast Broome to Darwin. Found in open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground; occasionally on drier inland plains. Uncommon migratory wagtail. Nearly all Australia records are coastal, with a few widely scattered inland records. Typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Myiagra cyanoleuca</i> (Satin Flycatcher)	M	-	-	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. The species shows a north-south migration throughout its range. Breeding occurs in Australia mostly in October through January, with the species nesting preferentially in wet gullies of heavy eucalypt forest, in the south-east NSW and Victoria and Tasmania. The Satin Flycatcher spends a lot of its time aerially in the mid to upper levels of the forest feeding on flying insects from perches in the canopy around the same level.	PMST - Known	Low – No suitable habitat present within the proposal area.
<i>Numenius madagascariensis</i> (Eastern Curlew)	M, CE	-	-	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats, often with beds of seagrass.	PMST - May	Low – No suitable habitat present within the proposal area.
<i>Pandion haliaetus</i> (Osprey)	M	-	-	The Osprey has a global distribution with four subsp. previously recognised throughout its range. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Mostly occur in coastal habitats but will occasionally travel inland along major rivers. Require extensive areas of open fresh or saline water for foraging. Occasionally	PMST - Likely	Low – No suitable habitat present within the proposal area.

Scientific name (common name)	EPBC Act	BC Act	FM Act	Distribution and habitat	Records in locality	Likelihood of occurrence
				construct nests on artificial structures such as towers, but primarily near water habitats. Fish eating raptor typically feeds and nests near open water, primarily coastal.		
<i>Tringa nebularia</i> (Common Greenshank)	M	-	-	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. The Common Greenshank is a wader / shorebird, migrating to Australia in summer during its non-breeding season. This species has been recorded singly or in small to large flocks (sometimes hundreds) in Australia in a variety of coastal and inland wetlands of varying salinity. Feeding habitats include edges of wetlands, mudflats, channels, shallows and edges of mangroves or saltmarsh, coastal and inland fresh or saltwater wetlands. Roosting habitats include wetland edges, shallow pools or puddles, elevated rocks, sandbanks or muddy islets.	PMST - May	Low – No suitable habitat present within the proposal area.

Key: CE = Critically Endangered, E = Endangered, M = Migratory, PE = Presumed Extinct, V = Vulnerable

Appendix B. Assessment of significance

B.1 Biodiversity Conservation Act 2016

Woodland birds

A total of six bird species have been grouped together for this assessment based on their similar habitat requirements within the proposal area. These are referred to hereafter as 'woodland birds' and include the following species:

- Diamond Firetail (*Stagonopleura guttata*) (Vulnerable, BC Act)
- Dusky Woodswallow (*Artamus cyanopterus*) (Vulnerable, BC Act)
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*) (Vulnerable, BC Act)
- Scarlet Robin (*Petroica boodang*) (Vulnerable, BC Act)
- Superb Parrot (*Polytelis swainsonii*) (Vulnerable, BC Act)
- Varied Sittella (*Daphoenositta chrysoptera*) (Vulnerable, BC Act)

As the proposal involves replacement of an existing regulator, it would result in limited vegetation clearing and disturbance. A maximum of 0.42 hectares of low condition PCT 2 would be cleared or disturbed. All hollow bearing trees and logs will be avoided during construction. There would be some minor disturbance to Lower Toupna Creek during desilting works which will have ecological benefits.

The habitat proposed to be removed may provide potential foraging and nesting resources for threatened bird species. Indirect impacts on threatened birds such as noise disturbance during construction may also occur.

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

- a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**

These woodland bird species prefer dry sclerophyll vegetation, usually with a relatively open canopy of *Eucalyptus* spp., *Acacia* spp., *Callitris* spp., or *Casuarina* spp., and a shrubby or grassy understorey. They feed on insects present in the air, on bark, on leaves and on the ground; seed from grasses and woody fruit; nectar produced from flowers; and sugary tree sap and lerp excretions. Most species build open cups out of plant material to nest in during the breeding season but there are some species that rely on tree hollows for nesting.

The activities associated with the proposal may result in direct and indirect impacts associated with threatened woodland birds, including the Diamond Firetail, Dusky Woodswallow, Hooded Robin, Scarlet Robin, Superb Parrot and the Varied Sittella. Direct impacts may include mortality, loss of nesting, perching and sheltering habitat, loss and fragmentation of foraging habitat, , where indirect impacts could comprise of clutch failure due to noise and disturbance.

The proposal would remove medium sized and understorey riparian vegetation, resulting in 0.42 hectares of habitat. No hollow bearing trees or logs will be removed. However, these impacts are considered to be minor due to the large contiguous adjacent vegetation, providing suitable habitat for these threatened woodland birds. Furthermore, the works will be largely restricted to the existing regulator site. These species are also considered to use a range of vegetation community types within the locality of the proposal. There were no threatened woodland bird species sightings during opportunistic surveys.

The habitat to be removed is restricted to discrete areas of vegetation bordering existing disturbed regulator infrastructure. The activities are therefore not expected to create a barrier to the dispersal of these mobile avian species. It is likely that if these woodland bird species utilise the proposal area for foraging, nesting and breeding, then the local populations would be reasonably expected to use the entire patch of contiguous habitat within the Lower Toupna Creek area together with adjoining reserves and private property. Removal of vegetation is therefore not expected to adversely affect the life cycle of threatened woodland bird species such that local populations would be placed at risk of extinction. Important habitat features such as fallen timber and hollow bearing trees will be retained.

- b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:**
- i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
 - ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable to threatened species.

- c. In relation to the habitat of a threatened species or ecological community:**
- i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
 - ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**
 - iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**

With the proposed removal of a maximum of 0.42 hectares of native habitat, the activities have the potential to modify adjoining native vegetation by increasing edge effects, sedimentation and/or accidental damage caused by workers during construction. The implementation of mitigation measures (see **Chapter 0**) aim to minimise the potential indirect impacts during construction on the surrounding vegetation and habitat. Desilting works will improve existing sedimentation issues within Lower Toupnal Creek. Weed management activities will be implemented during the proposal to minimise the spread of weed species, to prevent the modification of the habitat. The threatened woodland bird habitat in the area will not be fragmented by the proposal, due to the construction area being located mostly on the existing regulator site, and any resultant disturbance will not act as a barrier for these highly mobile avian species.

The vegetation to be disturbed during the construction phase includes woodland vegetation that in the broader sense is important habitat for these species. However, the type and extent of vegetation removal/disturbance required for the regulator replacement will not jeopardise the long-term survival of these species in the locality, given the availability of similar high quality contiguous habitat immediately adjacent to the development and the local abundance of some of these threatened species. The cumulative impacts of incremental habitat loss is a key concern for woodland bird species but given the type of impact, being narrow and linear, in the context of the available surrounding suitable foraging and breeding habitat, the proposal is not likely to result in significant impacts. Habitat removal of this type and extent is therefore not likely to adversely influence the long-term survival of any threatened woodland birds.

The habitat to be removed is likely to only be used as an occasional foraging resource across a larger foraging and home range. Considering the small proportion of potential habitat to be impacted within the locality, the habitat to be removed is not considered critical to the long-term survival of these species within the locality.

The action is considered unlikely to fragment existing populations as movement corridors within the locality would remain intact. The proposed impacts are minor and within existing disturbance areas and would not be significant to the breeding, dispersal or the genetic diversity of these species. Therefore, the proposal is not expected to lead to fragmentation of habitat for this species.

- d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)**

The proposal will not impact on any declared AOBV.

- e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process**

With respect to the listed threatened woodland bird species, the proposal is consistent with two KTP's listed under the BC Act. The following KTPs are relevant to the proposal:

- Clearing of native vegetation
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

The proposal would remove up to 0.42 hectares of PCT 2, which is considered potential habitat for threatened woodland bird species. Although this would be considered a KTP, the area of vegetation to be removed is considered relatively small in size given the availability of habitat in the proposal area and locality. Therefore, the effect on this KTP in the local context is considered negligible.

The proposal may result in an initial increase in weeds such as perennial grasses and escaped garden and agricultural plants, as is often common following construction and soil disturbance. The construction area currently already contains medium densities of weeds. These weeds are mostly common agricultural weeds rather than invasive environmental weeds that pose a serious threat to the health of native plant communities. To limit the spread of these weeds and to prevent the introduction of other, potentially more invasive weed species to the site, weed management strategies would be implemented (refer to **Chapter 0**). As such, adjacent habitat for the threatened woodland bird species is unlikely to be impacted by weed invasion.

Conclusion

The proposal would have negligible impacts on the threatened woodland bird species. A maximum total of 0.42 hectares of vegetation would be removed. 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 would also disturb woodland bird species within the immediate surrounding area.

Considering the above assessment, the proposal is not likely to have a significant impact on the threatened woodland bird species assessed. Consequently, a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) is not required.

Koala (*Phascolarctos cinereus*) (Endangered, BC Act)

The proposal involves the replacement of an existing regulator, and would result in clearing or disturbance of up to a maximum of 0.42 hectares of low condition PCT 2 vegetation. PCT 2 contains suitable riverine habitat for the Koala including food tree species. Indirect impacts on the Koala such as noise disturbance during construction may also occur.

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

- a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**

Suitable habitat for the Koala exists in the study area including PCT 2 which contains *Eucalyptus camaldulensis*, which are an important food tree for the Koala. The activities proposed as a result of the proposal may result in direct and indirect impacts associated with Koalas. Direct impacts may include mortality, loss of sheltering habitat, loss and fragmentation of foraging habitat, where indirect impacts could comprise of displacement due to noise and disturbance. In order to mitigate these direct impacts, an on-site ecologist with authorisation under the BC Act would be present to assist with the relocation of Koalas if necessary.

The proposal would remove medium sized and understorey riparian vegetation, resulting in the loss or disturbance of up to 0.42 hectares of habitat. No hollow bearing trees will be removed, and as Koalas prefer mature *Eucalyptus* this indicates that the trees with highest habitat value for this species will be retained. Potential impacts of the proposal are considered to be minor due to the large contiguous adjacent vegetation, providing suitable habitat for this threatened species. Furthermore, the works will be largely restricted to the existing regulator site. The Koala uses a range of vegetation community types within the locality of the proposal. There are six BioNet records from the locality, and fresh scats were observed in areas with Eucalypt woodland during field surveys.

The habitat to be removed is restricted to discrete areas of vegetation bordering existing disturbed regulator infrastructure. Minimal to no critical habitat associated with this species will be required. Local Koala populations would be reasonably expected to use the entire patch of contiguous habitat within the Lower Toupna Creek area together with adjoining reserves and private property. Removal of vegetation is therefore not expected to adversely affect the life cycle of the Koala such that local populations would be placed at risk of extinction. Important habitat features such as large growth trees will be retained.

- b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:**
- i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
 - ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable to threatened species.

- c. In relation to the habitat of a threatened species or ecological community:**
- i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
 - ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**
 - iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**

With the proposed removal/disturbance of a total of 0.42 hectares of native habitat, the activities have the potential to modify adjoining native vegetation by increasing edge effects, sedimentation and/or accidental damage caused by workers during construction. The implementation of mitigation measures (see **Chapter 0**) aim to minimise the potential indirect impacts during construction on the surrounding vegetation and habitat. Weed management activities will be implemented during the proposal to minimise the spread of weed species, to prevent the modification of the habitat. The Koala habitat in the area will not be fragmented by the proposal, due to the construction area being located mostly on the existing regulator site, and any resultant disturbance will not act as a barrier for this mobile species.

The vegetation to be disturbed during the construction phase includes woodland vegetation that in the broader sense is important habitat for these species. However, the type and extent of vegetation removal/disturbance required for the regulator replacement will not jeopardise the long-term survival of these species in the locality, given the availability of similar high quality contiguous habitat immediately adjacent to the development and the avoidance of hollow bearing trees. The cumulative impacts of incremental habitat loss is a key concern for the Koala but given the type of impact, being narrow and linear, in the context of the available surrounding suitable foraging and breeding habitat, the proposal is not likely to result in significant impacts. Habitat removal of this type and extent is therefore not likely to adversely influence the long-term survival of the Koala.

The habitat to be removed is likely to only be used as an occasional foraging resource across a larger foraging and home range. Considering the small proportion of potential habitat to be impacted within the locality, the habitat to be removed is not considered critical to the long-term survival of these species within the locality.

The action is considered unlikely to fragment existing populations as movement corridors within the locality would remain intact. The proposed impacts are minor and within existing disturbance areas and would not be significant to the breeding, dispersal or the genetic diversity of these species. Therefore, the proposal is not expected to lead to fragmentation of habitat for this species.

- d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)**

The proposal will not impact on any declared AOBV.

- e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process**

With respect to the listed threatened woodland bird species, the proposal is consistent with two KTP's listed under the BC Act. The following KTPs are relevant to the proposal:

- Clearing of native vegetation
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

The proposal would remove or disturb up to 0.42 hectares of PCT 2, which is considered potential habitat the Koala. Although this would be considered a KTP, the area of vegetation to be removed is relatively small in size given the availability of habitat in the proposal area and locality. 0.42 hectares represents the maximum clearing required and is therefore a conservative approach has been applied. Therefore, the effect on this KTP in the local context is considered negligible.

The proposal may result in an initial increase in weeds such as perennial grasses and escaped garden and agricultural plants, as is often common following construction and soil disturbance. The construction area currently already contains medium densities of weeds. These weeds are mostly common agricultural weeds rather than invasive environmental weeds that pose a serious threat to the health of native plant communities. To limit the spread of these weeds and to prevent the introduction of other, potentially more invasive weed species to the site, weed management strategies would be implemented (refer to **Chapter 0**). As such, adjacent habitat for the Koala is unlikely to be impacted by weed invasion.

Conclusion

The proposal would have negligible impacts on the Koala. A maximum total of 0.42 hectares of vegetation would be removed or disturbed. 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 Koalas within the immediate surrounding area.

Considering the above assessment, the proposal is not likely to have a significant impact on the Koala. Consequently, a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) is not required.

Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) (Vulnerable, BC Act)

The proposal area contains potential breeding and foraging habitat for the Yellow-bellied Sheathtail-bat. As the proposal involves replacement of an existing regulator, it would result in limited vegetation clearing and disturbance. A maximum of 0.42 hectares of low condition PCT 2 would be cleared or disturbed. All hollow bearing trees and logs will be avoided during construction. There would be some minor disturbance to Lower Toupna Creek during desilting works which will have ecological benefits.

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

- a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**

The Yellow-bellied Sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings and occasionally known to occupy mammal burrows. The proposal area consists of 0.42 hectares of potential breeding and foraging habitat. However, much of the proposal area is not considered critical habitat, when compared to the available suitable habitat within the locality. Consequently, the current potential for this species to occur, based on the presence of potential foraging habitat, is unlikely to be affected by the proposal. This amount of habitat removal is not considered likely to have an adverse effect on the life cycle of this species such that a viable local population is likely to be placed at risk of extinction.

Given the presence of vast areas of habitat in the locality and the Murray Valley National Park, suitable breeding habitat is likely to be available in higher quality vegetation patches or nearby man-made structures such as abandoned structures. The loss of potential breeding habitat associated with the proposal, is not considered to significantly impact viable populations within the locality, placing this species at risk of extinction.

Furthermore, mitigation measures would be undertaken during construction to prevent impacts on this species, if present. With these measures in place, the proposal is considered unlikely to have an adverse effect on the life cycle of the Yellow-bellied Sheathtail-bat.

- b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:**

- i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable to threatened species.

- c. In relation to the habitat of a threatened species or ecological community:**
 - i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
 - ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**
 - iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**

A total of 0.42 hectares of potential foraging habitat, is proposed to be impacted as a result of the proposal. No hollow bearing trees will be removed by the proposal. However, there are considerable areas of suitable and comparable habitat for this species in the surrounding landscape, including additional roosting opportunities. Database records show multiple sightings located within the Murray Valley National Park. The high level of habitat connectivity adjacent to the proposal area and mobile nature of these species means that this activity is unlikely to significantly limit the dispersal ability of this threatened hollow dependent bat species in the locality.

The Yellow-bellied Sheathtail-bat is highly mobile and would freely fly long distances over open areas to move between habitats. Therefore, the proposal would not affect the movement of the Yellow-bellied Sheathtail-bat between habitat patches. Additionally, impacts would not be significant to the breeding, dispersal or the genetic diversity of this species due to the already existing disturbances experienced within the proposal area. Hence, the proposal is not expected to lead to fragmentation of habitat for this species.

The habitat to be removed is likely to only be used as an occasional foraging resource across a larger foraging and home range. Considering the small proportion of potential habitat to be impacted within the locality, the habitat to be removed is not considered critical to the long-term survival of this species within the locality. Additionally, the proposal is considered unlikely to fragment existing populations as movement corridors within the locality would remain intact. The proposed impacts are minor and within existing disturbed access tracks and would not be significant to the breeding, dispersal or genetic diversity of this species. Therefore, the proposal is not expected to lead to fragmentation of habitat for this species.

- d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)**

The proposal will not impact on any declared AOBV.

- e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process**

With respect to the Yellow-bellied Sheathtail-bat, the proposal is consistent with two KTP's listed under the BC Act. The following KTPs are relevant to the proposal:

- Clearing of native vegetation
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

The extent of native vegetation clearing, and habitat removal associated with the proposal area is considered unlikely to be significant for the Yellow-bellied Sheathtail-bat in terms of available habitat for this species adjacent to the construction area and within the locality. Hygiene and weed control measures would reduce or avoid the impact of most other KTPs. However, mitigation measures would be put in place for the Yellow-bellied Sheathtail-bat to minimise impacts during construction. Therefore, the effect on this KTP in the local context is considered negligible.

Conclusion

The proposal 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 Sheath-tail-bat would potentially suffer a small reduction in extent of foraging habitat from the proposal. However, the proposal is unlikely to reduce the population size or decrease the reproductive success of this species. After consideration of the factors above, an overall conclusion has been made that the proposal is unlikely to result in a significant impact to this species. Consequently, a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) is not required.

B.2 Environment Protection and Biodiversity Conservation Act 1999

NSW Central Murray Forests Ramsar site (listed as a wetland of international importance under the EPBC Act)

Central Murray Forests Ramsar site covers about 84,000 hectares and comprises three discrete but interrelated units: the Millewa Forest Group (largely comprising Murray Valley National Park and Regional Park but also including the proposal site), the Werai Forest Group, and the Koondrook-Perricoota Forest Group, which lie to the south, north-west and south-west of Deniliquin respectively (Harrington and Hale, 2011). The Ramsar site has two critical wetland vegetation categories: River Red Gum forests and Floodplain Marshes. More than 90 percent of the Ramsar site is covered in inundation dependent forest and woodland. Inundation of the Ramsar site is driven largely by flows within the Murray River. The hydrology of the site is highly regulated and seasonality of low and moderate flow is determined largely by irrigation needs. Large scale floods that inundate the forests are generally the result of rainfall events.

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

1. areas of the wetland being destroyed or substantially modified

The proposal would not result in areas of the NSW Central Murray Forests Ramsar site being destroyed or substantially modified. Construction of a new Bullatale Inlet Regulator is proposed within the footprint of the existing Bullatale Inlet Regulator, so that the area of direct impact would comprise previously disturbed areas of the Ramsar site. The proposal includes removing fill material along an about 70-metre long section of Bullatale supply channel between the inlet and outlet of the existing Bullatale Inlet Regulator. The removal of this fill material and the twin pipelines buried beneath it would enable the channel bed and banks beneath it to be shaped to tie in with the replacement inlet regulator (upstream) and the section of channel downstream of the existing inlet regulator, to give this location a more natural appearance. Stabilisation of this reinstated section of channel by planting with suitable aquatic macrophytes would increase the area of aquatic habitat with the Ramsar site.

The proposal includes desilting of Bullatale supply channel upstream of the replacement inlet regulator to the Murray River. Desilting of this about 70-metre long section of Bullatale supply channel would prevent this silt from being carried downstream and smothering aquatic vegetation and habitat when the replacement inlet regulator commences operation. The desilting work would also reinstate the historical commence to flow rate in Bullatale supply channel.

2. a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change in the volume, timing, duration and frequency of ground and surface water flows to and within the wetland

The proposal would not result in a substantial change in the hydrological regime of the NSW Central Murray Forests Ramsar site.

Bullatale supply channel would be temporarily blocked at the proposal site during the construction phase of the proposal, however the impact would be to a regulated waterway and the construction works would be carried out during a period of low flow in the Murray River and, therefore, low inflows to Bullatale supply channel, which would reduce the magnitude of any temporary reduction in downstream flow.

The proposal would reinstate the historical commence to flow rate in Bullatale supply channel, which occurs at flow rates in the Murray River above about 4,000 megalitres per day. In comparison, inflows to the existing Bullatale Inlet Regulator only occur when there are flows in the Murray River above about 5,500 megalitres per day. This change would occur due to the lower invert level of the replacement inlet regulator and the desilting of the channel between the Murray River and the replacement inlet regulator.

Bullatale Creek Water Trust would operate the replacement Bullatale Inlet Regulator in accordance with an operational management plan that would require the maximum daily volume of water allowed to pass the structure to be the same as that which passes the existing inlet regulator, and no more than the bank-full capacity of the channel of about 80 megalitres per day. This would result in no changes to flows in the supply channel downstream of the replacement inlet regulator except during the shoulder irrigation season, more commonly in the autumn months, when the reinstatement of the historical commence to flow rate in Bullatale supply channel upstream of the replacement inlet regulator would enable the trust to create downstream flows that are not possible with the existing inlet regulator. In these instances the operational extent of the proposal would extend downstream along the supply channel to Bullatale Creek, with the impact reducing downstream of

where the trust extracts water. Any flow in Bullatale supply channel and Bullatale Creek during the shoulder irrigation season is not considered an adverse impact to the waterway when compared to the existing absence of flows at these times due to the silt built-up on the supply channel upstream of the existing inlet regulator.

The increased capacity of the replacement inlet regulator and the lower flow rate in the Murray River at which there would be inflows to the replacement inlet regulator would create an opportunity to introduce environmental flows in Bullatale Creek and environmental water to Millewa Forest. Any future use of the replacement Bullatale Inlet Regulator to deliver environmental water would be at the discretion of site environmental water managers in line with established NSW government environmental watering protocols. Future environmental watering decisions would be guided by the *Barmah-Millewa Forest Environmental Water Management Plan* (Murray-Darling Basin Authority, 2012) and *Murray-Lower Darling Long Term Water Plan* (DPIE, 2020b). Successful collaboration with the Bullatale Creek Water Trust would need to be embedded into this decision process.

3. the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected

The proposal would not seriously affect the habitat or lifecycle of native species dependent upon the wetland, including invertebrate fauna and fish species.

The proposal would occupy a negligible area of habitat for native species and its direct and indirect impacts would not be significant, particularly in the context of the available habitat for native species located within the surrounding Murray Valley National Park and nearby Barmah National Park and the footprint of the proposal being previously disturbed 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.

The construction of the proposal would not impede fish passage between the Murray River and Bullatale supply channel any more than that already caused by the existing Bullatale inlet regulator.

The operation of the proposal 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.

Assessments of significance for EPBC Act listed threatened species and ecological communities with potential to occur at the proposal site do not identify the potential for the proposal to have any significant impacts to EPBC Act listed threatened species.

4. a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or

The proposal would not cause a substantial or measurable change in the water quality of the NSW Central Murray Forests Ramsar site.

The proposal includes carrying out construction works within Bullatale supply channel. The risk of causing water pollution would be minimised by undertaking the works during a period of low flow in the Murray River and, therefore, low inflows to Bullatale supply channel. Also, cofferdams would be installed upstream and downstream of the in-stream work sites to create dry work areas in which to carry out the proposed works. Elements of the existing Bullatale Inlet Regulator will be used to create the cofferdams where feasible to minimise disturbance of the supply channel.

The proposal includes desilting of the section of Bullatale supply channel upstream of the replacement inlet regulator to the Murray River. Silt would be removed down to the invert level of the replacement inlet regulator. The removal of this silt would eliminate the potential for it to be transported downstream and smother downstream habitat once the replacement inlet regulator starts operating.

Water quality monitoring would be carried out upstream and downstream of the construction work site during the construction phase of the proposal. It would include monitoring of turbidity and dissolved oxygen to ensure suitable water quality is available for aquatic species within proximity of the proposal site.

The CEMP will include mitigation measures to prevent sediment / contaminant runoff from the work site.

5. an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

The proposal is not expected to result in an invasive species becoming established or spreading within the NSW Central Murray Forests Ramsar site.

The replacement Bullatale Inlet Regulator would provide upstream and downstream fish passage that is not possible past the existing inlet regulator. The provision of fish passage past the replacement inlet regulator would enable movement of both native and pest fish species. However, the impact of pest species past the replacement inlet regulator is likely to be small given under current conditions these species have potential to move into and out of Millewa Forest when there is high flow in the Murray River and the forest is inundated.

Eleven alien fish species are now established in the Murray-Darling Basin (Murray-Darling Basin Commission, 2002), with Carp (*Cyprinus carpio*), Redfin Perch (*Perca fluviatilis*), Goldfish (*Carassius auratus*) and Eastern Gambusia (*Gambusia holbrooki*) the most widespread. Possible impacts on native aquatic species include predation, competition, habitat alteration and spread of diseases and parasites. As such, the proposal is not likely to result in the establishment of these species or increase their spread through other waterways.

The construction environmental management plan will include mitigation measures to avoid the introduction and spread of pathogens, weeds and pest species.

Conclusion

The proposal would not have a significant impact 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 in accordance with an operational management plan that would require the maximum daily volume of water allowed to pass the structure to be the same as that which passes the existing inlet regulator, and no more than the bank-full capacity of the channel of about 80 megalitres per day
- 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 proposal 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.

Superb Parrot (*Polytelis swainsonii*) (Vulnerable, EPBC Act)

The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5,000 breeding pairs left in the wild. This species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South-West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.

The proposal involves the removal of up to 0.42 hectares of PCT 2, which provides suitable foraging and breeding habitat for the Superb Parrot.

The tree hollows present within the proposal area would provide roosting opportunities for threatened fauna species, such as the Superb Parrot, which require hollows greater than five centimetres in diameter, have a DBH greater than 30 centimetres and at least four meters from the ground. The two hollow bearing trees within the proposal area will be retained, therefore the proposal will not have direct impacts to breeding habitat. Small areas of low condition PCT 2 foraging vegetation will be removed.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

1. lead to a long-term decrease in the size of an important population of a species

Under the EPBC guidelines (DoE, 2013), “an ‘important population’ is a population that is necessary for a species’ long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.”

There are numerous records of Superb Parrot in Murray Valley National Park and the species could be expected to utilise vegetation and to forage on flowering trees throughout the study area. The proposal will avoid hollow bearing trees, and therefore breeding habitat will be retained. The proposal will remove small trees, as well as understorey habitat, totalling, as a worst-case scenario, 0.42 hectares of PCT 2, which is considered foraging habitat for the Superb Parrot. However, the habitat that will be removed or modified is a negligible amount compared to the available habitat across the context of the landscape. The Murray Valley National Park contains multiple known records of the species, and maintains a linear connection of riparian vegetation to the proposal area. The levels of roosting, breeding and foraging resources available to the species across the locality will not be significantly affected. Therefore, is it unlikely that the proposal will lead to a long-term decrease in an important population.

2. reduce the area of occupancy of an important population

The proposal is unlikely to reduce the area of occupancy for this species. There is potential loss of foraging habitat with the removal of up to 0.42 hectares of PCT 2. However, this impact is minimal compared to the adjacent contiguous riparian vegetation and suitable habitat available within the locality.

3. fragment an existing important population into two or more populations

This species is highly mobile with a broad dispersal extent. The construction area is currently disturbed, containing existing regulator infrastructure, and will be constrained to narrow and linear areas. Therefore, the proposal would not fragment existing habitats or an important population of this species into two or more populations.

4. adversely affect habitat critical to the survival of a species

The small area of habitat potentially affected by the proposal is not critical to the survival of the species. All hollow bearing trees will be retained. It is unlikely that the habitat critical to the survival of the Superb Parrot would be adversely affected.

5. disrupt the breeding cycle of an important population

The proposal will avoid the hollow bearing trees which provide suitable breeding habitat for the Superb Parrot. The vegetation to be removed is minimal in relation to the context of the available surrounding suitable habitat and the connection to the Murray Valley National Parks. Therefore, it is unlikely that the proposal will significantly disrupt the breeding cycle of an important population.

6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The extent of removal and modification of habitat for the activity is negligible in the context of the habitat available to the species throughout the locality. The narrow and linear areas affected will not fragment habitats for this mobile species. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

7. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species’ habitat

The proposal is unlikely to result in the invasion of species harmful to this species becoming established in the in the construction area. The implementation of mitigation measures, provided in **Chapter 0**, will reduce the impacts associated with the proposal on this species.

8. introduce disease that may cause the species to decline, or

There is no known risk of disease introduction for Superb Parrots associated with the proposal. The proposal is unlikely to introduce disease that may cause decline to this species in the construction area. The implementation of mitigation measures provided in **Chapter 0** will reduce the impacts associated with the proposal on this species.

9. interfere substantially with the recovery of the species.

There is no adopted or made Recovery Plan for this species, however, there is a current National Recovery Plan for the Superb Parrot (Baker-Gabb, 2011). This recovery plan identifies conservation actions to minimise the probability of extinction of the Superb Parrot in the wild, and to increase the probability of important populations becoming self-sustaining in the long term. Given that habitat loss constitutes a key threat to the species, the potential removal of foraging habitat may have potential to interfere in the recovery of this species. However, the impact is considered to be minor due to the large expanse of suitable habitat within the locality.

Conclusion

The proposal has a low potential of significant impacts on the Superb Parrot as the impacts associated with the proposal are minimal in the context of the available habitat located within the Murray Valley National Park and Barmah National Park. Mitigation measures will also be implemented to reduce the risk of injury to individuals if a species is identified, weed proliferation and the introduction of disease during construction.

Koala (*Phascolarctos cinereus*) (Endangered, EPBC Act)

Koala distribution includes Queensland, NSW, the Australian Capital Territory, Victoria and South Australia. The listed population has a wide but patchy distribution that spans the coastal and inland areas of Queensland north to the Herberton area, extending westwards into hotter and drier semi-arid climates of central Queensland, NSW and the Australian Capital Territory.

In NSW koalas occupy a range of habitats, primarily in forests and woodlands on the central and north coast. The NSW western distribution of Koala extends into the South-Eastern Highlands, NSW South Western Slopes, Cobar Peneplain, Riverina, and Murray Darling Depression bioregions. West of the Great Dividing Range populations are low-density and occur in semi-arid environments, in patchy and fragmented habitats.

The proposal involves the removal of up to 0.42 hectares of PCT 2, which provides suitable foraging and breeding habitat for the Koala.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

1. lead to a long-term decrease in the size of a population

There are numerous records of Koala in Murray Valley National Park (nearest approximately 3.6 km east of the proposal) and this species could be expected to utilise vegetation and to forage on trees throughout the study area. The proposal will avoid hollow bearing trees, and therefore most breeding habitat will be retained. The proposal will remove small/medium trees, as well as understorey habitat, totalling, as a worst-case scenario, 0.42 hectares of PCT 2, which is considered foraging habitat for the Koala. However, the habitat that will be removed or modified is a negligible amount compared to the available habitat across the context of the landscape. The levels of breeding and foraging resources available to the species across the locality will not be significantly affected. Therefore, it is unlikely that the proposal will lead to a long-term decrease in any populations.

2. reduce the area of occupancy of the species

The proposal is unlikely to reduce the area of occupancy for this species. There is potential loss of foraging habitat with the removal of up to 0.42 hectares of PCT 2. However, this impact is minimal compared to the adjacent contiguous riparian vegetation and suitable habitat available within the locality. Hollow bearing trees, which are likely to have the highest habitat value for this species, will be avoided by the proposal.

3. fragment an existing population into two or more populations

The action is considered unlikely to fragment existing populations as movement corridors within the locality would remain intact. The proposed impacts are minor and within existing disturbance areas and would not be significant to the breeding, dispersal or the genetic diversity of these species. Therefore, the proposal is not expected to lead to fragmentation of habitat for this species.

4. adversely affect habitat critical to the survival of a species

The small area of habitat affected by the proposal is not critical to the survival of the species. All hollow bearing trees will be retained. It is unlikely that the habitat critical to the survival of the Koala would be adversely affected given the local vegetation context.

5. disrupt the breeding cycle of a population

The proposal will avoid the hollow bearing trees which likely provide the highest habitat value to the Koala. The vegetation to be removed is minimal in relation to the context of the available surrounding suitable habitat and the connection to the National Parks. Therefore, it is unlikely that the proposal will disrupt the breeding cycle of any Koala populations.

6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The extent of removal and modification of habitat for the activity is negligible in the context of the habitat available to the species throughout the locality. The narrow and linear areas affected will not fragment habitats for this mobile species. The proposal is therefore unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

7. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposal is unlikely to result in the invasion of species harmful to this species becoming established in the in the construction area. The implementation of mitigation measures, provided in **Chapter 0**, will reduce the impacts associated with the proposal on this species.

8. introduce disease that may cause the species to decline, or

There is no known risk of disease introduction for Koalas associated with the proposal. The proposal is unlikely to introduce disease that may cause decline to this species in the construction area. The implementation of mitigation measures provided in **Chapter 0** will reduce the impacts associated with the proposal on this species.

9. interfere substantially with the recovery of the species.

The *National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, NSW and the Australian Capital Territory)* (DAWE, 2022b) identifies research and management actions necessary to stop the decline of, and support the recovery of the Koala in order to maximise its chances of long-term survival. Given that habitat loss constitutes as the key threat to the species, the potential removal of foraging habitat may have potential to interfere in the recovery of this species. However, the impact is considered to be minor due to the large expanse of suitable habitat within the locality.

Conclusion

The proposal has a low potential of significant impacts on the Koala as the impacts associated with the proposal are minimal in the context of the available habitat located within the Murray Valley National Park and Barmah National Park. Mitigation measures will also be implemented to reduce the risk of injury to individuals if a species is identified, weed proliferation and the introduction of disease during construction.

Appendix C. EPBC Act Protected Matters Search Tool



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 26-Aug-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	37
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	4
Regional Forest Agreements:	None
Nationally Important Wetlands:	2
EPBC Act Referrals:	5
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands)		[Resource Information]
Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	400 - 500km upstream from Ramsar site	In feature area
Barmah forest	Within Ramsar site	In feature area
Gunbower forest	50 - 100km upstream from Ramsar site	In feature area
Hattah-kulkyne lakes	200 - 300km upstream from Ramsar site	In feature area
Nsw central murray state forests	Within Ramsar site	In feature area
Riverland	400 - 500km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	400 - 500km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community known to occur within area	In feature area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area	In feature area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community likely to occur within area	In feature area
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Community likely to occur within area	In buffer area only

Community Name	Threatened Category	Presence Text	Buffer Status
Weeping Myall Woodlands	Endangered	Community may occur	In feature area within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur	In feature area within area

Listed Threatened Species

[\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur	In buffer area only within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur	In feature area within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur	In feature area within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur	In feature area within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur	In feature area within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur	In feature area within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur	In feature area within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur	In feature area within area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In buffer area only
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Craterocephalus fluviatilis Murray Hardyhead [56791]	Endangered	Species or species habitat may occur within area	In feature area
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat known to occur within area	In feature area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
FROG			
Crinia sloanei Sloane's Froglet [59151]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area	In feature area
INSECT			
Synemon plana Golden Sun Moth [25234]	Vulnerable	Species or species habitat may occur within area	In feature area
MAMMAL			
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area	In feature area
Austrostipa wakoolica [66623]	Endangered	Species or species habitat likely to occur within area	In feature area
Brachyscome muelleroides Mueller Daisy [15572]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lepidium aschersonii Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area
Lepidium monoplacoides Winged Pepper-cress [9190]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Maireana cheelii Chariot Wheels [8008]	Vulnerable	Species or species habitat may occur within area	In feature area
Myriophyllum porcatum Ridged Water-milfoil [19919]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pimelea spinescens subsp. spinescens Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea [21980]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Sclerolaena napiformis Turnip Copperburr [11742]	Endangered	Species or species habitat likely to occur within area	In feature area
Senecio behrianus Stiff Groundsel, Behr's Groundsel [14030]	Endangered	Species or species habitat may occur within area	In buffer area only
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Swainsona plagiotropis Red Darling-pea, Red Swainson-pea [10804]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]	
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat likely to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Protected Area Name	Reserve Type	State	Buffer Status
Barmah	National Park	VIC	In feature area
Murray Valley	Regional Park	NSW	In buffer area only
Murray Valley	National Park	NSW	In feature area
Top End	Reference Area	VIC	In buffer area only

Nationally Important Wetlands [\[Resource Information \]](#)

Wetland Name	State	Buffer Status
Barmah-Millewa Forest	VIC	In feature area
Millewa Forest	NSW	In feature area

EPBC Act Referrals [\[Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Ecological thinning trial in NSW River Red Gum Forests	2013/6713	Controlled Action	Post-Approval	In feature area
The Modified Operation of the Goulburn Murray Irrigation District	2009/5123	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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