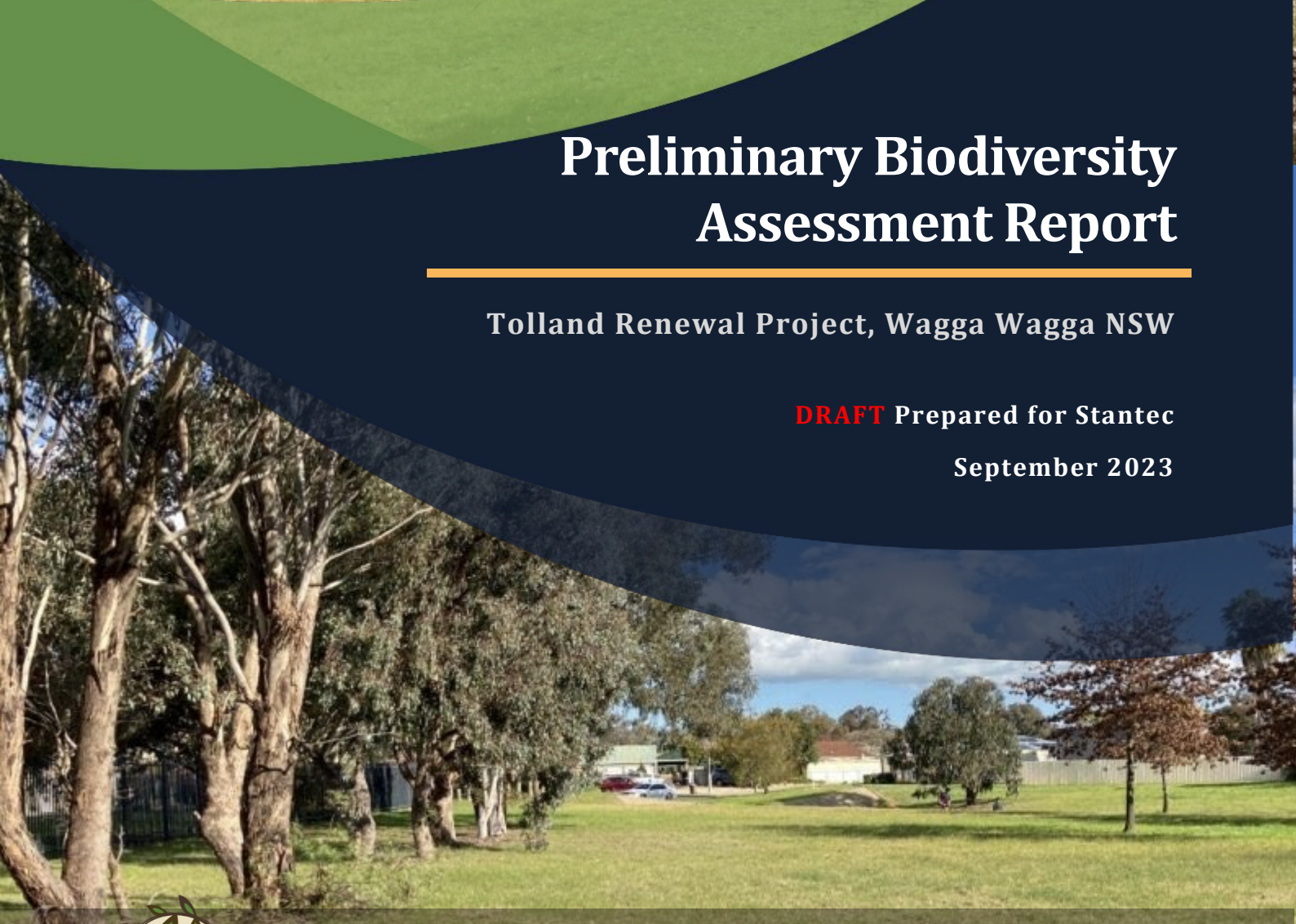
# Preliminary Biodiversity Assessment Report

Tolland Renewal Project, Wagga Wagga NSW

**DRAFT** Prepared for Stantec

September 2023



The Environmental Factor

# DRAFT REPORT Preliminary Biodiversity Assessment Report – Tolland Renewal Project, Wagga Wagga NSW

| Revision | Author/s | Internal Review | Date Submitted | Client Review and Approval | |
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This Report has been prepared by The Environmental Factor (TEF) on behalf of Stantec (The Client), to assess the ecological impacts arising from the proposed rezoning of the Tolland Renewal Project area to enable the future renewal of the Tolland Estate (the Proposal).

The purpose of this report is to document the biodiversity assets found on site, to assess those that are likely to be impacted either directly or indirectly as a result of the Proposal and determine whether the Proposal is required to participate in the Biodiversity Offset Scheme (BOS).

This document is not intended to be utilised or relied upon by any persons other than the Client and their appointed contractors nor to be used for any purpose other than that articulated above. TEF accepts no responsibility in any way whatsoever for the use of this report by any other persons or for any other purpose.

The information, statements, recommendations and commentary (together the "Information") contained in this report have been prepared by TEF on the basis of information provided by the Client and from material provided by the NSW Department of Planning and the Environment (DPE) and the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and through the survey process. This report has been developed in accordance with the NPWS Guidelines for Preparing a Review of Environmental Factors, developed by the DPE (2022). TEF has not sought any independent confirmation of the reliability, accuracy or completeness of this information. It should not be construed that TEF has carried out any form of audit of the information which has been relied upon.

Accordingly, whilst the statements made in this report are given in good faith, TEF accepts no responsibility for any errors in the information provided by the Client nor the effect of any such errors on the analysis undertaken, suggestions provided, or this report. Site conditions may change after the date of this report. TEF does not accept responsibility arising from, or in connection with, any change to the site conditions. TEF is also not responsible for updating this report if site conditions change.

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# Abbreviations

| Abbreviation | Description |
|---|---|
| **AOBV** | Areas of Outstanding Biodiversity Value |
| **BAM** | Biodiversity Assessment Methodology |
| **BC Act** | Biodiversity Conservation Act 2016 |
| **BOS** | Biodiversity Offset Scheme |
| **DCCEEW** | Department of Climate Change, Energy, the Environment and Water (formerly DAWE) |
| **DPI** | Department of Primary Industries |
| **DPE** | Department of Planning and Environment (formerly OEH) |
| **EPA** | Environmental Protection Agency |
| **EPBC Act** | Environmental Protection and Biodiversity Conservation Act 1999 |
| **FM Act** | Fisheries Management Act 1994 |
| **HTE** | High Threat Exotic |
| **LEP** | Local Environment Plan |
| **MNES** | Matters of National Environmental Significance |
| **OEH** | Office of Environment and Heritage |
| **POEO Act** | Protection of the Environment Operations Act 1997 |
| **SSC** | Singleton Shire Council |
| **TEC** | Threatened Ecological Community |
| **TEF** | The Environmental Factor |
| **WoNS** | Weeds of National Significance |

# Executive Summary

The Environmental Factor (TEF) was commissioned by Stantec (the Client) to undertake a Preliminary Biodiversity Assessment Report (PBAR) to determine the biodiversity values present on site within the Tolland Renewal Project area (53 ha), which is proposed to be rezoned to enable the development of this area. The rezoning will be undertaken to adjust the minimum lot size of reseidential zoning present, and to re-zone areas currently designated as RE1, for the purpose of providing for a new mix of modern housing in the locality of Tolland, Wagga Wagga, NSW(herein, 'the Planning Proposal').

The Subject Land occurs in the residential suburb of Tolland in Wagga Wagga NSW, located in a built-up residential area that has been historically cleared and developed. Land use of the surrounding area includes residential housing and supporting community facilities and infrastructure. Subsequently, only one (1) area of scattered remnant trees likely previously forming part of a naturally occurring woodland remains within the project area. Native vegetation is predominately comprised of planted locally and non-locally native species. In addition to native vegetation, a variety of exotic, ornamental planted tree and shrub species occurs throught the Subject Land in public recreation areas a along streets. In total, 4.65 ha of native and planted vegetation was ground-truther during the site assessment. Vegetation present within private residential areas was not ground-truthed as part of this assessment.

During field investigations, the condition and habitat values of the vegetation present was assessed in accordance with the Biodiversity Assessment Method (BAM), including habitat identification, vegetation community mapping, identification of Threatened Ecological Communities (TECs), collection of floristic data, and opportunistic threatened flora and fauna surveys.

All vegetation within the Subject Land generally contained a high level of exotic grasses and weed species within the understorey, with little native diversity present across the site.

A total of eight-four (84) species were recorded both incidentally and within the vegetation integrity plots (flora plots) undertaken across on site. Species composition consisted of forty-six (46) native species and thirty-eight (38) exotic species, including five (5) weeds classified as High-Threat Exotics (HTE) and three (3) classified as Weeds of National Significance (WoNS).

Remnant vegetation and native planted vegetation stands contained a high level of exotic species within the understorey with little native diversity present across the site.

Native vegetation on site was comprised of one (1) naturally occurring Plant Community Types (PCTs), and two (2) further PCTs assigned based on best fit with planted native vegetation present as follows:

- PCTID 266 which consisted of remnant native woodland comprised of several scattered, mature trees along Red Hill Road.
- PCTID 277 which occurred within planted native vegetation patches along Red Hill Road and Glenfield Road, and
- PCTID 346 which occurred within planted native vegetation in the public recreation area along Maher Street to the north of the Subject Land.

The remainder of native vegetation on site was comprised of planted locally and non-locally native species along road verges, in urban gardens and other public recreation areas.

Based on the field surveys and validation of vegetation condition on site, one (1) Threatened Ecological Community (TEC) was recorded in the Subject Land; remnant vegetation along Red Hill Road aligning with

PCTID 266 was consistent with the TEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* (Box-Gum Woodland), listed as critically endangered under the BC Act. In total, 0.18 ha of degraded condition TEC occurs within the Subject Land. No impacts to this community are anticipated as a result of the Planning Proposal or future development in the Tolland housing estate, as existing vegetation buffers along Red Hill Road and Glenfield Road are proposed to be maintained, however this is based on preliminary concept designs. Vegetation on site did not meet the condition benchmark for *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland* TEC, listed as critically endangered under the EPBC Act.

Based on the field surveys and validation of vegetation condition on site

In total, 0.18 ha of predominantly Box-Gum Woodland TEC in the form of eight (8) remnant canopy trees in a modified exotic ground cover along Red Hill Road occurred within the Subject Land. No impacts to this community are anticipated as a result of the Planning Proposal or future development in the Tolland housing estate, as existing vegetation buffers along Red Hill Road and Glenfield Road are proposed to be maintained. Vegetation on site did not meet the condition benchmark for *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland TEC*, listed as critically endangered under the EPBC Act (Box-Gum Woodland and DNG).

No species of threatened flora, listed under the BC Act or EPBC Act, were recorded within the Subject Land. Nine (9) threatened flora species are mapped as occurring or have been recorded within the locality, however, given the degraded condition of habitat within the Subject Land, the high levels of disturbance and lack of connected habitat, it is deemed unlikely that any naturally occurring threatened flora species are likely to persist on the site

A total of eighteen (18) fauna species were incidentally recorded during the surveys. This included fifteen (15) native bird species, two (2) exotic bird species and one (1) native amphibian species which are predominantly well adapted to utilising urban resources. The site contained a moderate diversity and abundance of native fauna with evidence of bird activity primarily within planted woodland trees within the Subject Land.

Anticipated impacts are not considered likely to occur to TECs given that recorded TECs are located in an area currently designated to be retained. The likelihood of occurrence of flora and fauna is outlined in Appendix C. In general, threatened flora and fauna are not anticipated to occur in the Subject Land given the high levels of disturbance and degraded condition of habitat within the Subject Land, the lack of habitat features to support their occurrence in the Subject Land, and lack of connected habitat. However, the Grey-headed Flying Fox are known to forage in urban gardens and have been recorded within the Assessment Area, and is likely to opportunistically utilise foraging resources within the site.

As impact areas are not finalised, and this PBAR is not an assessment for the providers of consent of the project, assessments of the likely significance of impacts of the Planning Proposal on TECs and threatened species pursuant to Section 7.3 of the BC Act (5-part test) and/or the significant impact assessment criteria for EPBC *Matters of National Environmental Significance – Significant impact guidelines 1.1* (DEWHA, 2009) **have not** been prepared to assess the potential direct impacts to these biota.

Direct and indirect impacts as a result of the Proposal would be assessed after the provision of a finalised design, however, given the low quality species habitat present in the Subject Land, the application of appropriate safeguard and management measures and the avoidance and minimisation of impacts during

detailed design, it is unlikely that a significant impact to threatened biota would occur. If required, assessments of impacts to threatened biota will be completed when final impacts are known to confirm this outcome.

based on the current preliminary design.

The Subject Land measures a total area of 53.33 ha with a total potential impacts for the future renewal project anticipated at49.35 ha. This includes:

- Potential impacts to up to2.98.4 ha of planted native shrubs and trees within the public recreation area along Maher Street, ,assigned to PCT 346 to which is proposed to be re-zoned to facilitate the construction of future dwellings for the Tolland Renewal Project
- Potential impacts to up to a further 0.18 ha of remnant native woodland conforming to PCT 266 and 2.4 ha of native planted vegetation assigned to PCT 277 located within the Subject Land, depending on the final design plans
- Potential impacts to 1.68 ha of vegetation comprised of mixed exotic and native planted trees along streets and reserves
- Potential impacts to the remaining 48.58 ha of existing residential lots, buildings, gardens, roadways, parklands and infrastructure categorised as non-native vegetation. Existing street and park trees are proposed to be retained where possible.

The minimum lot size for the Subject Land is < 1 ha; subsequently the clearing threshold for the site based on the minimum lot size, is 0.25 ha. The anticipated impacts could likely involve direct and indirect impacts, including vegetation clearing to up to 2.98 ha to facilitate the future renewal works; consequently, the BOS would apply to the approved development to be assessed under Part 4 of the EP&A Act.

No areas of High Biodiversity Value are mapped as occurring in the Subject Land or will be impacted by the Planning Proposal or the proposed future development of the Tolland Renewal Project area.

To inform the Planning Proposal, threatened species with potential to be impacted by the future proposed development which would be enabled by the rezoning have been nominated within this report (Appendix C). However, the significance of these impacts has not yet been assessed (i.e. Assessments of Significance have not been completed) for listed entities considered to have the potential to occur within the Subject Land, in accordance with Section 1.7 of the EP&A Act and the *EPBC Act Matters of National Environmental Significance – Significant Impact Criteria Guidelines* (DEWHA, 2009). Rather, this PBAR functions to inform the Planning Proposal for the re-zoning of the Subject Site, and does not provide conclusions about the impacts of the future renewal project, as the design (and assessment pathway) has not been finalised. Future environmental assessment to support the renewal would conclude whether it is likely to have a significant negative effect on the threatened biota present, and whether a Species Impact Statements and / or Referral to the Environment Minister, and participation in the BOS is required.

Recommendations to avoid and minimise impacts, including the provision of potential environmental safeguards and mitigation measures are provided in Section 7 to assist in the reduction of potential impacts to biodiversity features identified during the surveys undertaken, and to subsequently assist in the determination of the design.

# 1 Introduction

## 1.1 Overview

The Environmental Factor (TEF) was commissioned by Stantec (the Client) to undertake a Preliminary Biodiversity Assessment Report (PBAR) to determine the biodiversity values present on site within the Tolland Renewal Project area (53 ha), which is proposed to be rezoned to enable the development of this area. The rezoning will be undertaken for the purpose of enabling the future transformation of the existing Tolland housing estate in Wagga Wagga, to provide for a new mix of modern housing in the locality of Tolland, Wagga Wagga, NSW (herein, 'the Planning Proposal').

This PBAR would accompany a Planning Proposal to be submitted to the NSW Department of Planning and Environment (NSW DPE) for the proposed re-zoning of a portion of the Tolland Renewal Project area, in order to adjust the minimum Lot size. The PBAR provides an assessment of biodiversity values present on the site at a level sufficient to inform the re-zoning proposal. There's a total of 2.98 ha of native vegetation within the rezoning area; and, if native vegetation can't be avoided through the proposed development, then it may require participation in the Biodiversity Offset Scheme (BOS) and for offset credits to be calculated prior to the development proceeding.

The assessment and conclusions contained in this report are preliminary in nature, and are based on the concept designs provided in August 2023 (Stantec, 2023; Appendix A), in conjunction with information obtained through database searches and field surveys completed in August 2023. It is intended that the future Tolland Renewal Project would be assessed as a separate development that is permitted with consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), after the rezoning of the site has been completed. The concept drawings and anticipated impacts arising from this proposed future development are considered herein for context only.

This PBAR provides an assessment of potential impacts to native biota as a result of the Planning Proposal to a level sufficient to inform the rezoning determination under both the *NSW Biodiversity Conservation Act 2016* (BC Act) and the EP&A Act.

### *1.1.1 Assumptions*

The following assumptions pertain to this assessment:

- The PBAR does not constitute an impact assessment for the future Tolland Renewal Project upon the Subject Land. Details relating to the proposed impacts of the future development are preliminary, and are provided to give context for the basis of the re-zoning.
- The preparation of this PBAR is based on the impact footprints presented in this report, and are subject to change as designs are finalised.
- Assessments of significance pursuant to Section 1.7 of the EP&A Act and the EPBC Act Matters of National Environmental Significance – Significant Impact Criteria Guidelines (DEWHA, 2013) have not been prepared for the Planning Proposal. These would be required to assess the future Tolland Renewal Project and should be completed for threatened biota known or likely to occur within the development footprint of the renewal and adjacent areas, following the finalisation of the detailed design of the Tolland Renewal Project.

## 1.2 The Planning Proposal

The Planning Proposal would consist of the following key features:

- Rezoning of land within the Tolland Renewal Project Area as R1
- Provision of approximately five-hundred (500) new mixed-tenure homes within the renewed Tolland estate area including approximately one-hundred-and-eighty (180) new social housing buildings.
- Construction of approximately ten (10) new residential streets and local access roads, and three (3) new lane ways within the Tolland estate area.
- Creation of approximately four (4) new public open space parks / recreational areas.

The plans for the proposed Tolland Renewal Project are currently not finalised and are subject to concept approval; the NSW Land and Housing Corporation are currently working with Wagga Wagga City Council and other key stakeholders to finalise the plans for the proposed renewal.

The assessment captured in this report includes an investigation of the biodiversity values present in the Subject Land, to determine the maximum impact of the proposed rezoning. Site assessment was conducted to determine the condition of vegetation on site, and to allow calculations of potential impacts to native vegetation. The Subject Land is located within an area of cleared and planted vegetation in Tolland NSW within the Wagga Wagga Local Government Area (LGA) and is subject to the planning provisions of the Wagga Wagga Local Environmental Plan (LEP) 2010. To facilitate the Proposal, up to 2.98 ha of native vegetation and 46.69 ha of urban area, consisting of predominately planted exotic and mixed non-locally native planted vegetation, has the potential to be impacted.

The Subject Land is currently zoned as E1 Local Centre, R1 General Residential, R3 Medium Density Residential, RE1 Public Recreation, SP2 Infrastructure and UL Unzoned Land. The Subject Land would be rezoned to R1 as part of the Proposal.

### *1.2.1 Subject Land overview*

The Subject Land is located within a built up area of that has been historically cleared and developed for residential housing and supporting infrastructure within the major regional city of Wagga Wagga, NSW.

The Subject Land is an approximately 53.33 ha area within the Wagga Wagga suburb of Tolland. The northern extent of the project area is defined as the suburb boundary between Tolland and Mount Austin. Glenfield Road and Red Hill Road form the western and southern boundaries of the Subject Land, whilst the eastern extent is bound by Weedon Crescent, Wagga Wagga Brethren Church, Red Hill Public School and the eastern boundaries of Lot 196 DP 705940 and Lot 201 DP 705940, not inclusive of Parkhurst Street.

The Subject Land is predominantly comprised of social housing and residential dwellings within the Tolland Estate, as well as suburban streets, open public recreation areas, Chambers Park, Tolland Skatepark, Tolland Pump Track and OneSchool Global NSW – Wagga Wagga. Areas of vegetation are present within the yards and gardens of residential properties, within parks and public recreation areas, as well as along suburban streets and road reserves of Glenfield Road and Red Hill Road. Vegetation in these areas is limited to exotic species or planted native species, with only one (1) area of remnant vegetation with a modified groundcover existing along the road reserve of Red Hill Road.

One (1) stormwater drainage line was present within the Subject Land and extended from Red Hill Public School to Chambers Park, passing through the public recreation area surrounding the Wagga Wagga Brethren Church, largely following Lot 1 DP 1182775 and crossing through the road culvert beneath Bruce Street. No dams, soaks or other drainage lines occurred in the Subject Land, however, drainage also existed in the form road gutters and table drains along suburban streets, Red Hill Road and Glenfield Road.

Areas of remnant vegetation are situated in Willans Hill Nature Reserve and along the Wiradjuri Walking Trail to the east and west of the Subject Land, however, these are not connected to the site due to historic land clearing associated with agriculture and residential land use.

### *1.2.2 Aim of this report*

The purpose of this PBAR is to:

- Provide an up to date understanding of the biodiversity assets present within the Subject Land (as of August 2023), which may act as constraints to the proposed rezoning and subsequent future development, or be impacted by delivery of the Planning Proposal
- Assist the Client in planning for future site usage while retaining important ecological/biodiversity features present, thereby avoiding and minimising impacts where possible, in accordance with the principles of the BC Act
- Provide advice on the likelihood or potential for significant impacts as a result of the future renewal of the site, and
- Highlight areas of avoidance and minimisation of impacts necessary to ensure biodiversity values are retained wherever possible.

Specifically, the PBAR will:

- Describe the biodiversity values of the existing environment within the Subject Land, including vegetation types, fauna habitats and flora and fauna species known or likely to occur (as at August 2023)
- Assess the condition and conservation significance of native vegetation and habitats in the proposal site
- Compile a list of threatened biota previously recorded or predicted to occur in the locality and assess their potential to occur within the proposal site
- Assess the likely impacts on threatened biota as a result of the Planning Proposal and future proposed development
- Recommend mitigation measures to reduce impacts on biodiversity values
- Determine if the Planning Proposal will require participation the BOS, and
- Assess the potential for significant impacts arising from the proposed works on *Biodiversity Conservation Act 2016* (BC Act) listed threatened biota or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) matters of national environmental significance (MNES) and propose measures to avoid and minimise impacts.

Field data was collected by Senior Ecologist and BAM Accredited Assessor Brianna Turner (BAAS 23021) and Ecologist Tom McMahon in accordance with the Biodiversity Assessment Method (BAM). Reporting and analyses were completed by Tom McMahon and Janet Sanderson with sign-off undertaken by Brianna Turner (BAAS 23021) as an Accredited Assessor.

### 1.2.3 Terms and definitions

The following terms are used in this report:

**Table 1 Terms and definitions**

| Term | Definition |
|---|---|
| **Subject Site** | The area to be directly affected by the proposed future renewal project. Includes impacts as a result of earthworks and vegetation clearing associated with the construction of housing, road infrastructure and recreation areas (see Appendix A), measuring a combined area of 49.35 ha, of which native vegetation comprises 2.98 ha. |
| **Subject Land** | Includes the Subject Site (as described above) and any proximal areas that could be potentially directly or indirectly impacted by the Proposal. For the purposes of this report the Subject Land measures a combined total area of 53.33 ha of which native vegetation equals 4.65 ha. |
| **Assessment Area** | Includes the Subject Land plus a 1.5 km buffer surrounding the Subject Land; total area 1223.47 ha of which native vegetation comprises 52.67 ha. |
| **The Locality** | The area within 10 kilometres of the Subject Land. |


**Figure 1 Subject Land – proposed re-zoning**

# 2 Legislative Context

## 2.1 Commonwealth (Federal) Legislation

### *2.1.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides a mechanism for the assessment of environmental impacts caused by activities or developments on 'matters of national environmental significance' (MNES). Under the EPBC Act a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on MNES or the environment of Commonwealth land.

MNES include:

- World heritage properties
- National heritage places
- Wetlands of international importance (RAMSAR)
- Listed threatened species and ecological communities
- Listed migratory species
- Commonwealth marine areas
- Nuclear actions

Activities and developments likely to have a significant impact on MNES must be referred to the Commonwealth Minister for the Environment, who then determines if further assessment and approval under the EPBC Act is required.

Federally listed threatened species and ecological communities with the potential to be impacted by the Proposal have been identified in this PBAR. Conclusions on the significance of impacts on Commonwealth listed species or ecological communities has not been assessed as part of this PBAR, as this assessment is not intended to support the future Tolland Renewal Project. Impacts to Commonwealth listed biota would be assessed during the future development of the project when the design is finalised. A summary of the likelihood of occurrence and impact of Commonwealth listed biota with the potential to occur in the locality has been provided in Appendix C.

## 2.2 State (NSW) Legislation, Policies and Guidelines

### *2.2.1 Environmental Planning and Assessment Act 1979 (EP&A Act)*

The Environmental Planning and Assessment Act 1979 (EP&A Act) forms the legal and policy platform for the assessment and approval of works in NSW and aims to ensure that public authorities examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment before they undertake or approve activities that do not require development consent.

All development in NSW is assessed in accordance with the provisions of the EP&A Act and the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation).

The application for the Planning Proposal, which this PBAR supports, is being assessed in accordance with Division 3.4 of the EP&A Act.

The future Tolland Renewal Project is anticipated to require development consent under Part 4 of the EP&A Act. The determining authority for the project would be Wagga Wagga City Council.

As part of the future consideration of impacts of the Tolland Renewal Project on the environment under Division 5.1 of the EP&A Act, the significance of impacts on threatened species, populations and endangered ecological communities listed under the *Biodiversity Conservation Act 2016* (BC Act) or *Fisheries Management Act 1994* (FM Act), if applicable, must be assessed as described below. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Secretary's Environmental Assessment Requirements, or a biodiversity development assessment report (BDAR) developed in accordance with the requirement of the Biodiversity Offsets Scheme and Biodiversity Assessment Method. This would be determined by the NSW Environment Minister, if a significant impact is considered likely to occur.

### *2.2.2 Biodiversity Conservation Act 2016 (BC Act)*

Sections 7.2 and 7.8 of the Biodiversity Conservation Act 2016 (BC Act) state that the determining authority must consider the effect of an activity on:

- Areas of Outstanding Biodiversity Value (AOBV), and/or
- Species, populations or ecological communities, or their habitats and whether there is likely to be a 'significant effect' on those species, populations or ecological communities.

The BC Act provides legal status for biota of conservation significance in NSW. It provides a framework for the Biodiversity Assessment Method (BAM) and the calculation of offset requirements for projects participating in the BOS.

The BC Act aims to:

- Conserve biological diversity on a bioregional and state scale
- Lists Areas of Outstanding Biodiversity Value (AOBV)
- Assess the extinction risk of species and ecological communities
- Identify Key Threatening Processes
- Slow the rate of biodiversity loss, and
- Conserve threatened species

The 'five part test' or 'assessment of significance' is used to assist in the determination of whether a project is 'likely' to impose 'a significant effect' on threatened biota and thus whether a SIS or BDAR is required.

Impacts to NSW listed threatened species and ecological communities (threatened biota) as a result of the future Tolland Renewal Project would be assessed as part of the environmental assessment for the future development of the Subject Land.

Threatened biota considered likely to occur have been compiled and presented in Appendix C. Anticipated impact areas based on the current preliminary design have been used to discuss the likelihood of impacts to threatened species as a result of the project. As impact areas are not finalised, and this PBAR is not an assessment for the providers of consent of the project, assessments of significance pursuant to Section 7.3 of

the BC Act (5-part test) **have not** been prepared for threatened biota considered likely to occur at this stage of the assessment.

### *2.2.3 Biodiversity Conservation Regulatory Act 2017 (BC Regulatory Act)*

The Biodiversity Conservation Regulation 2017 (BCR Act) provides a number of considerations and practices to be implemented as part of the BC Act, as follows:

- Identifies clearing thresholds and the Biodiversity Values Map for the application of the Biodiversity Offsets Scheme (BOS)
- Outlines principles for Serious and Irreversible Impacts (SAII) to biodiversity
- Rules for meeting biodiversity offset obligations
- Biodiversity certification criteria

***Biodiversity Values Map***

The BOS threshold is exceeded on land subject to clearing of native vegetation or other biodiversity impacts prescribed by clause 6.1 of the Biodiversity Regulation 2017 on land identified on the Biodiversity Values Map (BVM), except where:

- the land is subject to a planning approval made up to 90 days after the land was added to the BVM; or
- If the land was already subject to planning approval when the land was added to the BVM.

The BVM shows no areas of vegetation mapped as containing High Biodiversity Values in proximity to the Subject Land.

***Area Criteria Threshold***

Native vegetation clearing thresholds as outlined in Part 7 of the Biodiversity Conservation Regulation 2017 (Table 2) indicates when a project would need to enter the BOS according to the minimum lot sizes and the corresponding native clearing thresholds.

Site assessment confirmed that the site contains native vegetation. The clearing threshold for the site, based on the minimum lot size, is >0.25 ha.

**Table 2 Area criteria - Biodiversity Offset Scheme threshold**

| Minimum lot size | Threshold for clearing (ha) to enter BOS |
|---|---|
| **<1 ha** | >0.25 |
| **1 ha < 40 ha** | >0.5 |
| **40 ha – 1000 ha** | >1 |
| **>1000 ha** | >2 |

The Subject Land within which the future Tolland Renewal Project will be completed contains 4.65 ha of native vegetation. If this area of native vegetation required removal to support the future development, based on the current plans, the clearing threshold for native vegetation would be exceeded; and, participation in the BOS would likely be required.

***Areas of Outstanding Biodiversity Value***

The Subject Land is not listed as and does not support an Area of Outstanding Biodiversity Value.

### 2.2.4 Fisheries Management Act 1994 (FM Act)

The Fisheries Management Act 1994 (FM Act) aims to conserve threatened species, populations and ecological communities of fish and marine vegetation native to NSW and to promote ecologically sustainable development, including the conservation of biological diversity. It also aims to reduce the threats faced by native fish and marine vegetation in NSW.

Section 220ZZ of the FM Act states that the determining authority must consider the effect of an activity on:

- Areas of Outstanding Biodiversity Value (AOBV) as defined by the BC Act, and
- Species, populations or ecological communities, or their habitats as listed under the FM Act, and whether there is likely to be a 'significant effect' on those species, populations or ecological communities

If a planned development or activity is likely to have an impact on an aquatic threatened species, population or ecological community this must be taken into account in the development approval process. If the impact is likely to be significant, as determined through an Assessment of Significance, participation in the BOS is required.

No mapped streams and no wetlands occur within the Subject Land. Other waterways on the site, including one (1) informal drainage line and stormwater infrastructure do occur on site and have the potential to be directly impacted.

It is unlikely that impacts to Key Fish Habitat (KFH) would occur as a result of the Proposal or future proposed works , as no KFH is mapped as occurring within the Subject Land. Subsequently, a permit under the FM Act is not required to support the Planning Proposal or any future development within the Subject Land.

### 2.2.5 Local Land Services Amendment Act 2016 (LLSA Act)

The Local Land Services Act, as amended by the Local Land Services Amendment Act 2016 (LLSA Act), provides a regulatory framework for the management of native vegetation in NSW.

The **Native Vegetation Regulatory (NVR) Map** identifies rural land that is regulated under the land management framework. Landholders are able to review the categories of vegetation as depicted on the regulatory map for their property. The new State Environmental Planning Policy (Vegetation) 2017 (Vegetation SEPP) regulates clearing of native vegetation in urban and all other land in NSW that is zoned for environmental conservation/management.

The **Land Management (Native Vegetation) Code** supports landholders to manage their land to ensure more productive farming methods and systems, while responding to environmental risks. Some clearing under the Land Management Code will require land to be set aside, which will be listed in a new public register. Clearing of some native vegetation may be carried out without approval for the purposes of allowable activities.

Higher impact clearing will require approval from a new **Native Vegetation Panel**, and landholders will be required to assess and offset the biodiversity impacts of approved clearing.

Review of the Native Vegetation Regulatory map confirmed that the Subject Land does not contain areas mapped as Category 2 – Vulnerable or Sensitive Regulated Land. Consequently, the clearing regulations under the LLSA Act do not apply.

### 2.2.6 NSW Biosecurity Act 2015 (Biosecurity Act)

The NSW Biosecurity Act 2015 (Biosecurity Act) outlines mandatory measures that persons are to take with respect to biosecurity matters including the management of weeds (Part 2, Division 8 including Weeds of National Significance (WoNS)). Under the Biosecurity Act the responsibilities for weed management by public and private landholders are consistent reflecting that weed management is a shared community responsibility. The Act introduces the legally enforceable concept of a General Biosecurity Duty (GBD). Priority weeds are listed within Regional Strategic Weed Management Plans, however the GBD is not restricted to listed weeds.

The Biosecurity Act is administered by NSW Department of Primary Industries which determines the weed species covered by regulatory tools including Prohibited Matters, Control Orders and Biosecurity Zones. Existing Local Control Authorities (Councils) continue to be responsible for enforcing weed legislation.

Weeds identified on site are discussed in Section 5.1.4.

### 2.2.7 Wagga Wagga Local Environmental Plan 2010

The Subject Land for the Proposal is located on land in the Wagga Wagga Local Government Area (LGA), and is located within the following land use zones:

- E1 Local Centre
- R1 General Residential
- R3 Medium Density Residential
- RE1 Public Recreation
- SP2 Infrastructure
- UL Unzoned Land

The objectives of zone E1 Local Centre are to:

- To provide a range of retail, business and community uses that serve the needs of people who live in, work in or visit the area.
- To encourage investment in local commercial development that generates employment opportunities and economic growth.
- To enable residential development that contributes to a vibrant and active local centre and is consistent with the Council's strategic planning for residential development in the area.
- To encourage business, retail, community and other non-residential land uses on the ground floor of buildings.

The objectives of zone R1 General Residential are to:

- To provide for the housing needs of the community.
- To provide for a variety of housing types and densities.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.
- To ensure co-ordinated and cost-effective provision of physical, social and cultural infrastructure in new residential areas.

The objectives of zone R3 Medium Density Residential are to:

- To provide for the housing needs of the community within a medium density residential environment.
- To provide a variety of housing types within a medium density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.
- To ensure that medium density residential environments are of a high visual quality in their presentation to public streets and spaces.

The objectives of zone RE1 Public Recreation are to:

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To protect and enhance the natural environment generally and to assist in ensuring that areas of high ecological, scientific, cultural or aesthetic values are maintained or improved.

The objectives of zone SP2 Infrastructure are to:

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

UL Unzoned Land:

(1) Development may be carried out on unzoned land only with development consent.

(2) In deciding whether to grant development consent, the consent authority—

(a) must consider whether the development will impact on adjoining zoned land and, if so, consider the objectives for development in the zones of the adjoining land, and

(b) must be satisfied that the development is appropriate and is compatible with permissible land uses in any such adjoining land.

The re-zoning of the Subject Land is required to allow for the future construction and development associated with the Tolland Renewal Project. The Planning Proposal would allow for the future project to be permitted with consent under the future zoning of the Subject Land.

# 3 Landscape context

The following sections describe the current landscape features and condition of the Subject Land and broader locality, as observed on site and according to available resources accessed at the time of assessment.

## 3.1 Bioregions and landscapes

The Subject Land occurs within the NSW South Western Slopes Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and contains one (1) mapped NSW Soil Landscape (previously Mitchell Soil Landscape). Details on these are provided below.

### *3.1.1 Bioregion*

A detailed description of the Subject Land IBRA sub region is provided in Table 3 below, and is based on Bioregions of New South Wales: South Western Slopes (XXX bioregion | NSW Environment and Heritage).

**Table 3 Subject Land IBRA region and subregion**

| Category | Description |
|---|---|
| **IBRA region** | NSW South Western Slopes |
| **IBRA sub region** | Inland Slopes |
| **Characteristics** | ***Geology***<br>Ordovician to Devonian folded and faulted sedimentary sequences with inter-bedded volcanic rocks and large areas of intrusive granites.<br>***Characteristic landforms***<br>Steep, hilly and undulating ranges and granite basins. Occasional basalt caps, confined river valleys with terrace remnants.<br>***Typical soils***<br>Shallow stony soils on steep slopes, texture contrast soils grading from red subsoils on upper slopes to yellow subsoils on lower slopes. Alluvial sands, loams and clays.<br>***Vegetation***<br>Open forests and woodlands. Red stringybark on upper slopes with black cypress pine, kurrajong, red ironbark, white gum, white box, yellow box and Blakely's red gum on lower slopes. Merging west to yellow box, grey box and white cypress pine. Rough-barked apple on flats with river oak on upper tributaries and river red gum on lower and larger streams. |

### *3.1.2 NSW Landscape (Mitchell Landscapes)*

The Subject Land is mapped as occurring on one (1) NSW Landscapes (Figure 2):

**Won Wonga Hills and Ranges**

Description Rolling hills, low rises and ridges on Ordovician siltstone, slate, quartzite and phyllite, general elevation 250 to 370m, local relief 50m. Stony, thin red and brown texture-contrast soils merging to yellow harsh texture-contrast soils on valley floors. High salinity in the subsoil and some brackish flows in small creeks. Woodlands of; tumbledown red gum (*Eucalyptus dealbata*), red stringybark (*Eucalyptus macrorhyncha*) and grey box (*Eucalyptus microcarpa*) on slopes, yellow box (*Eucalyptus melliodora*), white box (*Eucalyptus albens*)

and occasional Blakely's red gum (*Eucalyptus blakelyii*) on flats with kangaroo grass (*Themeda triandra*) and plains grass (*Austrostipa aristiglumis*).

## 3.2 Waterways and wetlands

The Subject Land contains no wetlands (farm dams) and no mapped waterways (Figure 3). One (1) stormwater drainage line was observed as occurring within the Subject Land, as well as stormwater infrastructure, such as table drains and road gutters, along suburban streets, Red Hill Road and Glenfield Road.

No Key Fish Habitat is mapped as occurring within the Subject Land, however does occur along Stringybark Creek, Crooked Creek, Marshalls Creek and Lake Albert to the south and west, and the Murrumbidgee River to the north of the site within the broader Assessment Area. The stormwater drainage line occurring within the Subject Land was dry at the time of survey (Plate 17), with no defined embankment or creek bed. No substantial native vegetation occurred along drainage lines and stormwater infrastructure within the Subject Land.

## 3.3 Native vegetation extent and connectivity

The extent of native vegetation predicted to occur in the Assessment Area was mapped using the State Vegetation Types for Wagga Wagga LGA (NSW LPI) v1.1 CRS - GDA94 MGA zone 55, within a 1,500 m buffer as specified under the BAM. Vegetation within the Subject Land was later verified during the site assessment.

**Table 4 Mapped native vegetation extent within the Assessment Area**

| Plant Community Type | Area (ha) |
|---|---|
| Non-native vegetation | 1170.8 |
| PCTID 266: White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion | 5.0806 |
| PCTID 277: Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | 2.1159 |
| PCTID 346: White Box - Blakely**s** Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion | 45.475 |
| **Total Mapped Vegetation within the Assessment Area (ha):** | 52.67 |


**Stantec Tolland Renewal Project - NSW (Mitchell) Landscapes within Assessment Area**

**Legend**

- Assessment Area
- Subject Land
- LGA Boundary
- Suburb Boundary
- Lot Boundary

**Waterways**

- 1st & 2nd order; unnamed waterways

**Roads**

- Arterial Road
- Local Road
- Sub Arterial Road

**NSW (Mitchell) Landscapes**

- Murrumbidgee - Tarcutta Channels and Floodplains
- Wonga Hills and Ranges

N 0 200 400 600 m

1:20,000



**Figure 2 NSW (Mitchell) Landscape Soils within the Assessment Area**

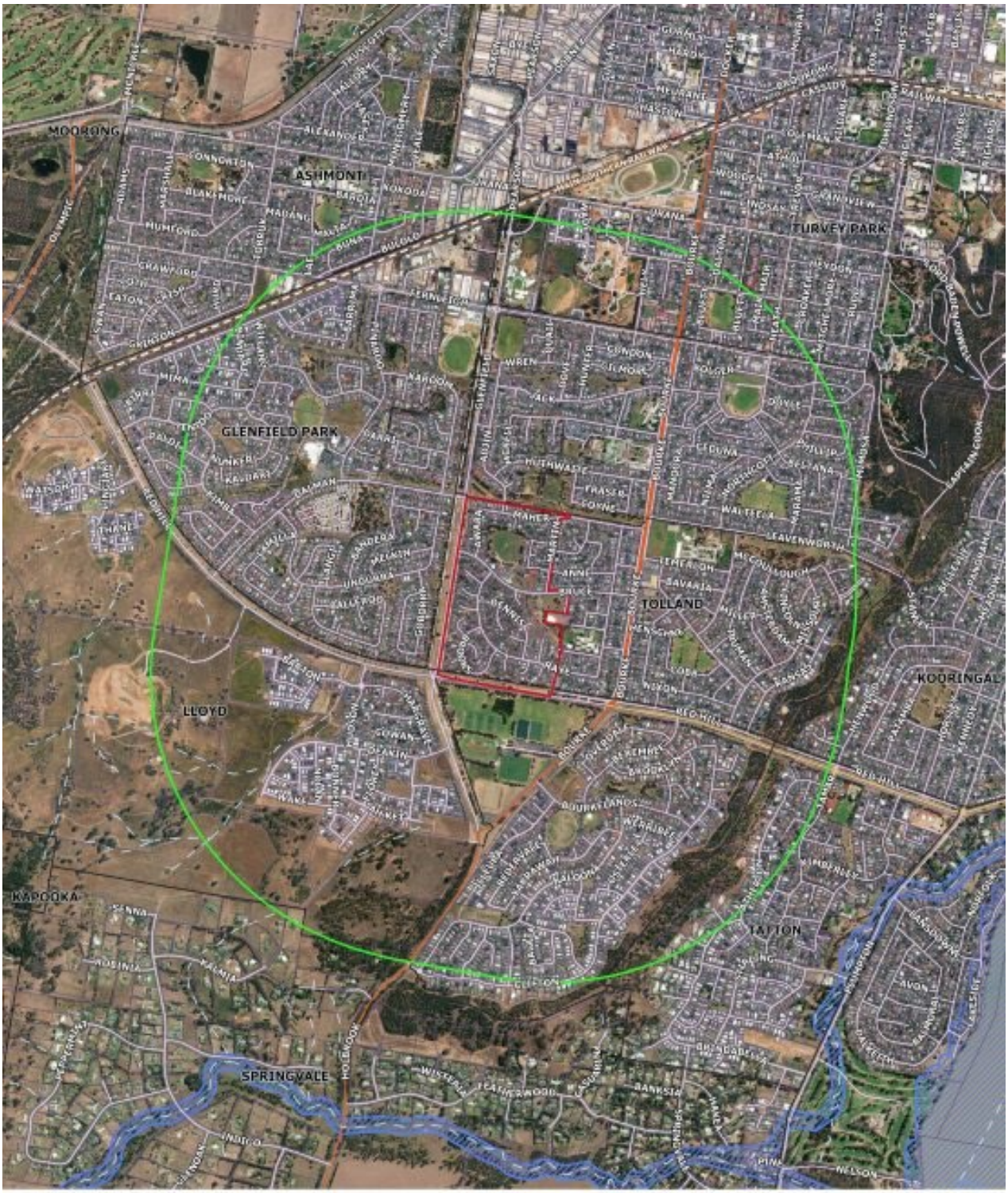




**Figure 3 Waterways, Key Fish Habitat and wetlands mapped within the Subject Land**




**Figure 4 Survey effort and verified PCTs**

# 4 Methodology

The following section outlines the methodology used to complete the desktop and site assessment that was used to inform the preparation of this PBAR.

## 4.1 Desktop assessment

A desktop review was undertaken to determine threatened flora and fauna species, populations and ecological communities (threatened biota) listed under the BC Act and FM Act, and MNES listed under the EPBC Act, that could occur in the locality based on previous records, known distribution ranges, and habitats present. Biodiversity and environmental databases, and existing literature that were reviewed included the following:

- Department of Agriculture, Water and the Environment (DECCW) EPBC Act Protected Matters Search Tool – for a 10 kilometre radius around the Subject Land
- DECCW online Species profiles and threats database (SPRAT)
- NSW Department of Planning and Environment (DPE) BioNet Atlas for records of threatened biota previously recorded in the locality (website for the Atlas of NSW Wildlife) and Threatened Biodiversity Data Collection (TBDC) profiles of threatened species listed under the BC Act
- Biodiversity Values Map and Threshold Tool, NSW Government for biodiversity values that would require further assessment under the BOS
- DPE Threatened biodiversity profile search online database for threatened ecological communities and species listed under the BC Act
- NSW BioNet Vegetation Classification to identify matching plant community types (PCTs) in the study area
- NSW Department of Primary Industries (DPI) priority weed declarations – South East region
- Threatened Species Survey and Assessment: Guidelines for developments and activities. Working Draft (DEC 2004)
- NSW Guideline to Surveying Threatened Plants and their Habitats (DPIE 2020)
- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010)
- Survey guidelines for Australia's threatened mammals. Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2011)

## 4.2 Spatial data

To inform GIS calculations and produce figures, the following spatial databases were accessed:

- NSW Base Imagery Service SIX Maps (SSSDS, 2021)
- Google Satellite Imagery
- Spot 6 & 7 Satellite Imagery (NSW SPP, 2020)
- State Vegetation Types SVMT v1.1 (DPE)
- Riparian Lands Watercourses (EPI)
- Bionet Atlas Threatened Species list (DPE, 2023)
- Mitchell Landscape Soil v3.1 (DPE)
- Wagga Wagga LGA spatial layers (roads, hydrolines, railway lines)(DFSI)

## 4.3 Site assessment

Site assessment was undertaken over one (1) day on 14 August 2023 by TEF Senior Ecologist Brianna Turner (BAAS 23021) and Ecologist Tom McMahon. During the site assessment, the following activities were undertaken:

- Identification and mapping of vegetation communities present on the Subject Land, including the identification of threatened ecological communities (TECs)
- Random meander transect surveys (Cropper, S. 1993) across the Subject Land to record incidental flora, and determine the presence of detectable threatened species and high threat exotics (WoNS and NSW Priority Weeds)
- Incidental sightings of fauna species within or adjacent to the Subject Land
- Identification of fauna habitat features (i.e. nesting, roosting or foraging microhabitats)
- Assessment of the presence and suitability of habitat of value to threatened and regionally significant fauna including, where applicable:
    - Tree hollows (habitat for threatened large forest owls, parrots, cockatoos, bats and arboreal mammals)
    - Caves and crevices (habitat for threatened reptiles, small mammals and microbats),
    - Termite mounds (habitat for threatened reptiles and the echidna)
    - Waterbodies (habitat for threatened fish, frogs and water birds)
    - Fruiting / flowering trees (food for threatened birds and mammals)
    - Rocky outcrops and overhangs (habitat for threatened microbats, herpetofauna and marsupials)
    - Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals)
    - Any other habitat features that may support fauna (particularly threatened) species
- Assessment of the connectivity and quality of the vegetation within the Subject Land and surrounding area.

### *4.3.1 Native Vegetation Assessment*

Native vegetation was assessed within the Subject Land to categorise PCTs and determine quality and extent of vegetation present, with particular emphasis on vegetation occurring within the Subject Site. A combination of vegetation integrity plots (BAM plots) and random meander surveys on foot were completed to assess vegetation composition and structure, including dominant native species and the extent of weed occupation of the site.

BAM plots and RDPs were completed in each potential condition zone present within the PCTs recorded in the Subject Land. In total, two (2) vegetation integrity plots were completed, consistent with the method outlined in Section 4.3 of the BAM 2020 (Figure 4) in order to identify the extent and type of vegetation present, assign a condition to each community present, and to assess the floristic attributes (species richness, cover and abundance) within different PCTs and condition zones present.

The identification of PCTs was conducted in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification database (OEH 2019). PCT identification was determined by identifying species dominance across stratums (canopy, shrub and groundcover), geographic distribution (based upon IBRA subregions) and vegetation and landform formation. Reference was given to previous ecological surveys

(existing data) and existing State Vegetation Type Mapping (SVTM) for the locality, to inform the selection of PCTs where applicable.

Vegetation occurring outside of the Subject Land, and subsequently outside of the areas of direct or indirect impacts, was not ground-truthed as part of the site assessment, with PCTs in these areas assigned based on available data for OEH State Vegetation Type Mapping (SVTM) (OEH 2019).

Access across the Subject Land was on-foot or within a four-wheel drive vehicle. All areas of the Subject Land to be impacted (subject site) were accessed and verified during site surveys.

**Incidental flora observations**
Incidental flora observations species during field surveys. Species observed during the site surveys (outside of the vegetation integrity plots) were recorded.

**Threatened flora surveys**
Targeted threatened flora transect surveys in the correct survey periods for individual species were not undertaken as part of this assessment. Threatened flora assessment was limited to habitat assessment of potentially suitable habitat (if any) and incidental observations only. The subject land was surveyed incidentally for detectable threatened flora species via random meander transect surveys. Habitat quality for species with potential to occur along the trail was assessed to determine the likelihood of species occurrence within the site. Locations of threatened species (if observed) were recorded using handheld GPS units (mobile phones / tablets) equipped with Avenza mapping software.

### *4.3.2 Terrestrial Fauna Assessment*

**Incidental observations**
Incidental observations of fauna species were recorded at all times during field surveys. All species observed or heard utilising the site during surveys were recorded. Any observed evidence of faunal activity (tracks, scats, feathers, pellets) were noted and specimens collected of potential threatened species (if applicable) were sent for analysis (Scats About 2020) and identification. Disturbance caused by animals including diggings and burrows were noted and any road/driveway kill was recorded.

**Habitat assessment**
In addition to incidental observations, the following general habitat features were recorded by TEF ecologists at the time of the site assessments:

- Trees with bird nests or other potential fauna roosts
- Burrows, dens and warrens, bridges, culverts and hollow-bearing trees for evidence (e.g. guano or bat droppings) of roosting microbats
- Hollow-bearing trees and logs which provide refuge, nest and den sites for a range of threatened fauna species
- Koala food trees and/or evidence of scratches or scats
- Distinctive scats or latrine sites, owl whitewash and regurgitated pellets under roost sites
- Tracks or animal remains
- Evidence of activity such as feeding scars, scratches and diggings
- Leaf litter and fallen timber were inspected for reptile habitat
- Presence of potential habitat for threatened frog species.

**Table 5 Survey methods and effort**

| Survey Method | Description | | | |
|---|---|---|---|---|
| **Survey Effort** | **Date** | **# of days** | **# of staff** | **Total hours** |
| | **14 August 2023** | 1 | 2 | 8 |
| **Vegetation identification and PCT mapping** | Vegetation identification and PCT classification were undertaken across the Subject Land | | | |
| **Flora transects** | Undertaken within areas of potential impact or suitable species habitat | | | |
| **Vegetation integrity plots (BAM plots)** | Two (2) Vegetation integrity plots (BAM plots) within different vegetation types and conditions throughout the Subject Land | | | |
| **Fauna habitat surveys** | Throughout the Subject Site and proximity within the Subject Land | | | |
| **Incidental general surveys** | Throughout the Subject Land | | | |

## 4.4 Survey conditions and limitations

Site conditions were fine and cloudy with slight wind at times. No rain fell during surveys, however rain was recorded overnight prior to the survey. The site assessment was subject to the following weather conditions preceding and at the time of surveys, as outlined in Table 6 below. Further weather conditions at the site are presented in Appendix E.

**Table 6 Weather conditions preceding and during site assessment (weather station: Wagga Wagga AMO {station 072150}, Bureau of Meteorology 2023)**

| Date | Temperature (C) | | Total Rain (mm) | Max Wind Speed 9am km/hr | Wind direction |
|---|---|---|---|---|---|
| | Minimum | Maximum | | | |
| 12/08/2023 | 2.5 | 14.5 | 0 | - | - |
| 13/08/2023 | 8.6 | 14.9 | 5.0 | - | - |
| 14/08/2023 | 8.6 | 15.9 | 2.0 | 2 | SSW |

Given the nature and timing of the surveys undertaken, it is likely that some species that occur in the Subject Land either permanently, seasonally or transiently were not detected during the survey. These species may include annual, ephemeral or cryptic flora and fauna species; nocturnal fauna; birds and frogs which call at other times of year; and mobile or transient fauna in general.

The habitat assessment conducted allows for identification of habitat resources for such species, in order to assess their likelihood of occurring within the Subject Land. As such, the survey was not designed to detect all species, rather to provide an overall assessment of the ecological values within the Proposal footprint in accordance with the BAM. This information was used to predict potential impacts of the future project on ecological values and to provide this as input to design development, so that impacts to native biota can be avoided, mitigated and / or offset through the BOS.

## 4.5 Likelihood of Occurrence of threatened biota and migratory species

Following collation of database records and review of species and community profiles, a 'likelihood of occurrence' assessment was prepared with reference to the habitats contained within the study area based on information provided in the species profiles, recovery plans, journal articles, and the field staffs' knowledge of species habitat requirements. The likelihood of occurrence assessment was refined after field surveys based on habitat features recorded within the subject land. The likelihood of threatened and migratory biota occurring in the Assessment Area was assessed based on presence of records from the locality for the last 20 years (since 2000), species distribution and habitat preferences, and the suitability of potential habitat present in the subject land. The results of this assessment are provided in Appendix C.

Anticipated impact areas based on the current preliminary design have been used to discuss the likelihood of impacts to ecological communities and threatened species as a result of the project. As impact areas are not finalised, and this PBAR is not an assessment for the providers of consent of the project, assessments of the likely significance of impacts of the Proposal on these threatened species pursuant to Section 7.3 of the BC Act (5-part test) and/or the significant impact assessment criteria for EPBC Matters of National Environmental Significance – Significant impact guidelines 1.1 (DEWHA, 2009) **have not** been prepared to assess the potential direct impacts to these species.

# 5 Results

The following chapters describe the findings of the desktop and onsite investigations completed for the Planning Proposal, within the categories of vegetation types, vegetation zones, vegetation integrity, flora and fauna species, weeds and threatened species.

## 5.1 Flora

A total of eighty-four (84) species were recorded both incidentally and within the vegetation integrity plots (flora plots) and incidentally on site. Species composition consisted of forty-six (46) native species, mostly planted, and thirty-eight (38) exotic species, including five (5) weeds classified as High-Threat Exotics (HTE) and three (3) Weeds of National Significance (WoNS). Many more species of flora are likely to occur within private gardens and yards within the Subject Land, however these were not assessed as a part of this report. The field data collected is available in Appendix B. Threatened flora results are discussed in Section 5.3.2.

### *5.1.1 Native Vegetation*

Vegetation within the Subject Land was predominantly a mixture of planted non-locally native and exotic trees planted along streets and roadways in private residential gardens and in public parks and public spaces. Some scattered larger remnant native trees were present along Redhill Road to the south of the Subject site, and some locally native planted trees occurred in some parks and road reserves. Vegetation was largely restricted to overstorey species with a predominately exotic ground layer consisting of exotic and mown grass species and some common weeds. Shrubs were occasionally planted in parks and within private gardens, however were sparse and largely absent as plantings contained a mostly open and mown understory.

Suburban streets within the site were mostly planted with non-locally native species including *Melaleuca linariifolia* (Flax-leaved Paperbark), *Melaleuca ericifolia* (Swamp Paperbark) and *Callistemon viminalis* (Weeping Bottlebrush). Other planted streets included exotic species such as *Platanus spp.* (Plane Tree), *Fraxinus angustifolia* (Desert Ash) and *Cupressus sempervirens* (Italian Cypress).

Vegetation along Red Hill Road and Glenfield Road consisted of plantings of mixed local and non-locally native species including large remnant *Eucalyptus albens* (White Box) and *E. melliodora* (Yellow Box), and planted *Eucalyptus blakelyii* (Blakely's Red Gum), Yellow Box, *E. sideroxylon* (Mugga Ironbark) and *E. leucoxylon* (Yellow Gum), as well as exotic species such as *Tamarix aphylla* (Athel Pine)(WoNS).

Vegetation within open public recreation areas in the Subject Land, including Chambers Park, Maher Street and the area surrounding the Wagga Wagga Brethren Church, was comprised of a mixture of planted exotic species and planted local and non-locally native species. These included *E. polyanthemos subsp. vestita* (Red Box), *E. melliodora, E. albens* (White Box), *E. leucoxylon, E. blakelyii, E. sideroxylon, Casuarina cunninghamiana subsp. cunninghamiana* (River Oak), *Corymbia citriodora* (Lemon-scented Gum) *Platanus spp. and Fraxinus spp.*

Groundcover within the Subject land was predominantly exotic and mostly comprised of common lawn species (*Poa annua*; Winter Grass, *Lolium perenne;* Ryegrass, *Pennisetum clandestinum;* Kikuyu Grass) and common weeds of urban areas and lawns including *Arctotheca calendula*(Capeweed), *Romulea rosea var. australis*; (Onion Grass), *Plantago lanceolata*(Lamb's Tongues), *Medicago polymorpha*(Burr Medic), *Hypochaeris radicata*(Catsear). Some native groundcover species occurred in small, localised areas within the Subject Land including in native planted areas on Maher Street, Chambers Park, Lockett Place and along Red Hill Road.

These native groundcover species occurred as minor components of the groundcover and consisted primarily of *Rytidosperma caespitosum* (Ringed Wallaby Grass), *Bothriochloa macra* (Red Grass) and *Chloris truncata* (Windmill Grass).

One (1) area of remnant vegetation occurred within the Subject Land which consisted of a total of approximately nine (9) mature *E. albens* and *E. melliodora* trees within the road reserve of Red Hill Road. The groundcover in the remnant vegetation was modified and predominantly exotic although some native species occurred in the stormwater drainage line, including *Lythrum hyssopifolia* (Hyssop Loosestrife), *Daucus glochidiatus* (Native Carrot) and *Juncus spp.*

The Assessment Area is currently mapped as supporting three (3) PCT's as outlined in Table 7.

**Table 7 Vegetation mapped within 1.5 km of the Subject Land**

| Plant Community Types | Area (ha) |
|---|---|
| Non-native vegetation | 1170.8 |
| PCTID 266: White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion | 5.1 |
| PCTID 277: Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | 2.1 |
| PCTID 346: White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes Bioregion | 45.5 |
| **Total native vegetation within 1,500 m buffer (ha)** | **52.7** |
| **Total Mapped Vegetation within 1,500 m buffer (ha):** | **1223.5** |

The site assessment confirmed the following PCT's were present within the Subject Land:

- PCTID 266: White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW Western Slopes Bioregion
- PCTID 277: Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion
- PCTID 346: White Box – Blakely's Red Gum – White Cypress Pine Shrubby Woodland on Metamorphic Hills in the Wagga Wagga – Cootamundra Region of the NSW South Western Slopes Bioregion
- Planted mixed native and non-native vegetation stands (does not conform to a PCT)
- Urban plantings and street trees – in backyards and along roadways

### *5.1.2 Nominated Plant Community Types for the Subject Land*

Based on the assessment process described in Section 4.3.1 above, the PCTs in Table 8 are nominated as the most appropriate for the species assemblages present within the Subject Land.

**Table 8 PCT Nominations for Vegetation Formations occurring within the Subject Land**

| Vegetation recorded | Potential Plant Community Types | Nominated PCT and Justification |
|---|---|---|
| Red Hill Road remnant White Box – Yellow Box woodland | Option 1: PCTID 266: White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW Western Slopes Bioregion | ***PCTID 266: White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW Western Slopes Bioregion***<br><br>This PCT is characterized by the floristic and structural vegetation attributes observed on site including remnant canopy species *Eucalyptus albens* and some occurrences of *E. melliodora* also common, with a sparse to absent mid-storey. Given the degraded nature of vegetation on the Subject Land the canopy species assemblage was used for best fit against a PCT. This PCT contained the best fit ratio and assemblage of species recorded on the site and is mapped within close proximity to the Subject Land.<br><br>PCT 276 occurs within the Wagga Wagga LGA however does not list *E. albens* as one of the potential canopy species for that PCT. PCT 268 is also suitable in terms of canopy assemblage, however, does not list *E. melliodora* as a potential canopy species.<br><br>All options are listed as occurring within the Wagga Wagga LGA and on local substrates. However, the descriptive attributes of PCT 266 best align with the conditions and species assemblage recorded within the Subject Land during surveys. |
| | Option 2: PCTID 268: White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion | |
| | Option 3: PCTID 276: Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion | |
| Red Hill Road / Glenfield Road mixed native plantings | Option 1: PCTID 277: Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion | ***PCTID 277: Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion***<br><br>This PCT is characterized by the floristic and structural vegetation attributes observed on site including remnant canopy species *Eucalyptus blakelyii* and *E. melliodora*, with a sparse to absent mid-storey. Given the vegetation within the Subject Land is planted and various combinations of native species have been planted, the canopy species assemblage was used for best fit against a PCT. This PCT contained the best fit ratio and assemblage of species recorded on the site and is mapped within close proximity to the Subject Land.<br><br>PCT 347 is mapped as occurring within the Wagga Wagga LGA however does not list *E. melliodora* as one of the potential canopy species for that PCT. PCT 3399 is also suitable in terms of canopy assemblage, however, |
| | Option 2: PCTID 347: White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion | |
| | Option 3: PCTID 3399: Southwest Hills White Box-Blakelys Red Gum Forest | |

| Vegetation recorded | Potential Plant Community Types | Nominated PCT and Justification |
|---|---|---|
| | | *E. melliodora* is noted as rarely occurring as a canopy dominant.<br><br>All options are listed as occurring within the Wagga Wagga LGA and on local substrates. However, the descriptive attributes of PCT 277 best align with the conditions and species assemblage recorded within the Subject Land during surveys. |
| Maher Road mixed native plantings | Option 1: PCTID 346: White Box – Blakely's Red Gum – White Cypress Pine Shrubby Woodland on Metamorphic Hills in the Wagga Wagga – Cootamundra Region of the NSW South Western Slopes Bioregion | ***PCTID 346: White Box – Blakely's Red Gum – White Cypress Pine Shrubby Woodland on Metamorphic Hills in the Wagga Wagga – Cootamundra Region of the NSW South Western Slopes Bioregion***<br><br>This PCT is characterized by the floristic and structural vegetation attributes observed on site including remnant canopy species *Eucalyptus blakelyii* and *E. albens*, with a sparse to mid-dense mid-storey. Given the vegetation within the Subject Land is planted and various combinations of native species have been planted, the canopy species assemblage was used for best fit against a PCT. This PCT contained the best fit ratio and assemblage of species recorded on the site and is mapped within close proximity to the Subject Land.<br><br>PCT 347 and PCT 3399 both occur within the Wagga Wagga LGA and could both align with the Maher Road mixed native plantings, however, the descriptive attributes of PCT 346 best align with the conditions and species assemblage recorded within the Subject Land during surveys. |
| | Option 2: PCTID 3399: Southwest Hills White Box-Blakelys Red Gum Forest | |
| | Option 3: PCTID 347: White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion | |

### *5.1.3 Plant Community Type descriptions*

Detailed PCT descriptions are provided below, including information on vegetation formation, class and condition. The VI scores have not been calculated. A map showing PCT distribution within the Subject Land is presented in Figure 4.

**PCTID 266: White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW Western Slopes Bioregion**

Plate 1 PCTID 266

| | |
|---|---|
| **Structure** | Grassy Woodland |
| **Landscape position** | Hill slope |
| **Overstorey** | Dominated by White Box (*Eucalyptus albens*) with occurrences of Yellow Box (*Eucalyptus melliodora*) |
| **Mid Stratum** | Absent |
| **Ground Stratum** | Modified and predominantly exotic species dominated the ground cover with a mix of pasture and lawn grasses and exotic forbs including *Avena fatua, Poa annua, Polygonum aviculare* and *Lolium perenne*. Some native species occurred in the stormwater drainage line, including *Lythrum hyssopifolia, Daucus glochidiatus* and *Juncus spp.* The road reserve is regularly maintained and mowed. |
| **Vegetation formation** | KF_CH3 Grassy Woodlands |
| **Vegetation class** | Western Slopes Grassy Woodlands |
| **PCT condition in Subject Land** | Remnant canopy species with a modified non-native understorey and high levels of weed encroachment |
| **Conservation Status** | This PCT is associated with the **NSW BC Act listed critically endangered ecological community** (CEEC) – *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and* |

| PCTID 266: White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW Western Slopes Bioregion | |
|---|---|
| | *Riverina Bioregions* (Box-Gum Woodland). In the Subject Land the community was dominated by White Box with some Yellow Box present, and was of an open grassy woodland form.<br>The patch of this community was not of sufficient size and did not contain the required native understorey diversity to conform to the EPBC Act listing requirements for CEEC *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Box-Gum Woodland & DNG). |
| **PCT estimated remaining** | 6% remaining |
| **Threatened species** | No threatened species were recorded within this PCT during surveys, however a number of threatened biota (flora and fauna) are associated with this PCT. |
| **Comments** | This PCT occurred as a total of approximately nine (9) remnant White Box and Yellow Box trees in the road reserve of Red Hill Road. The surrounding area has been completely cleared for residential land use and associated infrastructure. |
| **Justification** | Site assessment determined that the vegetation identified on site aligns with the species composition (dominance of White Box with minor occurrences of Yellow Box present). The landscape positioning (low hills and hillslopes), woodland formation (open woodland) and vegetation composition (degraded due to landuse, however containing the correct canopy species consistent with the PCT description) matches the diagnostic requirements for PCT 266. Additionally, the Subject Land occurs in the correct IBRA region and subregion for this PCT and subsequently PCT 266 is considered the best fit vegetation community for the site. |

| PCTID 277: Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion | |
|---|---|
|  Plate 2 PCTID 277 | |
| **Structure** | Grassy Woodland |
| **Landscape position** | Flat |

| PCTID 277: Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion | |
|---|---|
| **Overstorey** | Mixed Yellow Box and Blakely's Red Gum planting. Other planted canopy species of varying dominance included *Eucalyptus leucoxylon, E. sideroxylon, E. globulus, Casuarina cunninghamiana, Fraxinus angustifolia* and *Tamarix aphylla* (WoNS) |
| **Mid Stratum** | Largely absent although some small areas of planted *Acacia baileyana. Acacia spp.* and *Hakea spp*. occurred. |
| **Ground Stratum** | Predominately removed and replaced with mulch. Remaining areas of ground cover were modified and predominantly exotic species including *Avena fatua, Poa annua* and *Lolium perenne*. |
| **Vegetation formation** | KF_CH3 Grassy Woodlands |
| **Vegetation class** | Western Slopes Grassy Woodlands |
| **PCT condition in Subject Land** | Planted canopy and mid-storey species with planted exotic and non-locally native species and a removed or modified non-native understorey with high levels of weed encroachment |
| **Conservation Status** | This PCT is associated with the NSW BC Act listed critically endangered ecological community (CEEC) – *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland* ). However, in the Subject Land the community did not meet the ratio of dominance of required species for listing as Box-Gum Woodland as White Box, Yellow Box and Blakely's Red Gum did not form the most dominant component of these plantings as they were mixed and alternated canopy stratum throughout the road reserve patches.<br><br>Similarly, the community within the Subject Land did not conform to the EPBC Act listing requirements for CEEC *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Box-Gum Woodland & DNG). |
| **PCT estimated remaining** | 6% remaining |
| **Threatened species** | No threatened species were recorded within this PCT during surveys, however a number of threatened biota (flora and fauna) are associated with this PCT. |
| **Comments** | This PCT has been planted along the road reserves of Red Hill Road and Glenfield Road. The planting includes a variety of canopy and mid-storey species of varying dominance that are exotic and locally and non-locally native species. Groundcover has been removed and replaced with mulch for most of the community, with open areas dominated by common exotic lawn species and weeds of roadsides and urban areas. *Tamarix aphylla* (Athel Tree) is a WoNS and has been planted in patches throughout this community. |
| **Justification** | Site assessment determined that the vegetation identified on site somewhat aligns with the species composition (dominance of Blakely's Red Gum and Yellow Box). The landscape positioning (flat and footslopes), woodland formation (open woodland) and vegetation composition (Completely planted, however containing the correct canopy species consistent with the PCT description) matches the diagnostic requirements for PCT 277. Additionally, the Subject Land occurs in the correct IBRA region and subregion for this PCT and subsequently PCT 277 is considered the best fit vegetation community for the site. |

| PCTID 346: White Box – Blakely's Red Gum – White Cypress Pine Shrubby Woodland on Metamorphic Hills in the Wagga Wagga – Cootamundra Region of the NSW South Western Slopes Bioregion | |
|---|---|
|  <br>Plate 3 PCTID 346 (Plot 1) | |
| **Structure** | Grassy Woodland |
| **Landscape position** | Hillslope |
| **Overstorey** | Mixed White Box and Blakely's Red Gum planting. Other planted canopy species occurred as varying components of the community and included *Eucalyptus sideroxylon* (Mugga Ironbark), *Eucalyptus leucoxylon* (Yellow Gum), *Eucalyptus macrandra* (River Yate), *Casuarina cunninghamiana* (River Oak) and *Tamarix aphylla* (Athel Tree)(WoNS). One (1) juvenile *Brachychiton populneus* (Kurrajong) occurred in the ground stratum. |
| **Mid Stratum** | Largely absent although some *Acacia spp., Melaleuca linariifolia* (Flax-leaved Paperbark) and *Ligustrum lucidum* (Broad-leaved Privet) have been planted. |
| **Ground Stratum** | Modified and predominantly exotic species dominated the ground cover with a mix of pasture and lawn grasses and exotic forbs including *Poa annua, Lolium perenne, Solanum nigrum, Ehrharta erecta, Romulea rosea var. australis* and *Hypochaeris radicata*. Some native species occurred in the ground stratum, including *Rytidosperma spp., Galium gaudichaudii* and *Cotula australis.* |
| **Vegetation formation** | KF_CH3 Grassy Woodlands |
| **Vegetation class** | Western Slopes Grassy Woodlands |
| **PCT condition in Subject Land** | Planted canopy and mid-storey species with planted exotic and non-locally native species and a modified non-native understorey with high levels of weed encroachment |
| **Conservation Status** | This PCT is not associated with any threatened ecological communities. |

| PCTID 346: White Box – Blakely's Red Gum – White Cypress Pine Shrubby Woodland on Metamorphic Hills in the Wagga Wagga – Cootamundra Region of the NSW South Western Slopes Bioregion | |
|---|---|
| **PCT estimated remaining** | 40% remaining |
| **Threatened species** | No threatened species were recorded within this PCT during surveys, however a number of threatened biota (flora and fauna) are associated with this PCT. |
| **Comments** | This PCT has been planted in the public recreation area along Maher Street in the north of the Subject Land. The planting includes a variety of canopy and mid-storey species that are exotic and locally and non-locally native species. The groundcover is dominated by common exotic lawn species and weeds of roadsides and urban areas. *Tamarix aphylla* (Athel Tree) is a WoNS and has been planted in patches throughout this community. *Asparagus asparagoides* (Bridal Creeper) is a WoNS and also occurs in this community. |
| **Justification** | Site assessment determined that the vegetation identified on site aligns with the species composition (dominance of Blakely's Red Gum and White Box). The landscape positioning (hillslopes), woodland formation (open woodland) and vegetation composition (Completely planted, however containing the correct canopy species consistent with the PCT description) matches the diagnostic requirements for PCT 346. Additionally, the Subject Land occurs in the correct IBRA region and subregion for this PCT and subsequently PCT 346 is considered the best fit vegetation community for the site. |

**Table 9 Vegetation and PCT's occurring within the Subject Land**

| Plant Community Type | Subject Land (ha) |
|---|---|
| PCTID 266: White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW Western Slopes Bioregion | 0.18 |
| PCTID 277: Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion | 2.4 |
| PCTID 346: White Box – Blakely's Red Gum – White Cypress Pine Shrubby Woodland on Metamorphic Hills in the Wagga Wagga – Cootamundra Region of the NSW South Western Slopes Bioregion | 0.4 |
| PCTID 0: Planted locally and non-locally native | 1.68 |
| PCTID 0: Urban plantings and street trees/non-native | 48.58 |
| **Total Area (ha):** | **53.24** |
| **Total Native Vegetation (ha):** | **4.66** |
| **Percentage Native Vegetation** | **8.75 %** |

### *5.1.4 Exotic Vegetation*

The Subject Land and surrounding areas have experienced a high proportion of disturbance from historic land management (clearing for residential land use). This disturbance, along with the introduction of exotic lawn and garden species, has likely encouraged the proliferation of common exotic species to dominate the site including listed High Threat Exotic's (HTEs) and Weeds of National Significance (WoNs) (Table 10) throughout.

Exotic vegetation had been substantially planted within the Subject Land. Street trees along suburban streets and main roads consisted of locally and non-locally native species as well as exotic species including *Fraxinus angustifolia* (Desert Ash), *Platanus spp*. (Plane Trees), *Cupressus lusitanica* (Mexican Cypress), *Cupressus sempervirens* (Italian Cypress), *Prunus spp.* (Cherry Blossom) and Tamarix aphylla (Athel Pine)(WoNS). Within public recreation areas, *Schinus areira* (Peppercorn Tree) had also been planted.

Vegetation within private gardens and yards was not assessed as a part of this report but is likely comprised of a high proportion of exotic species.

Groundcover within open public recreation areas and roadsides in the Subject Land was largely modified and dominated by sown exotic grasses including *Poa annua* (Winter Grass), *Pennisetum clandestinum* (Kikuyu Grass) and Lolium *perenne* (Perennial Ryegrass) with scattered native species including *Rytidosperma caespitosum* (Ringed Wallaby Grass) and *Bothriochloa macra* (Red Grass) present in low densities in minor, localised areas. Weed cover and diversity was moderate to high and dominated by common weeds of urban areas and lawns (*Arctotheca calendula*; Capeweed, *Romulea rosea var. australis*; Onion Grass, *Plantago lanceolata*; Lamb's Tongues, *Medicago polymorpha*; Burr Medic, *Hypochaeris radicata*; Catsear). Three (3) WoNS and five (5) HTE species occurred in planted vegetation within the Subject Land (Plate 7). Weeds listed as HTE, WoNS, and/or Priority Weeds for the Riverina region are listed in Table 10 below.

**Table 10 High Threat Weeds recorded within the Subject Land**

| Scientific Name | Common Name | Status | Regional/National Listing |
|---|---|---|---|
| *Asparagus asparagoides* | Bridal Creeper | HTE | WoNS;<br>Priority Weed – Prohibition on certain dealings |
| *Ehrharta erecta* | Panic Veldt Grass | HTE | - |
| *Ligustrum lucidum* | Broad-leaved Privet | HTE | - |
| *Nassella neesiana* | Chilean Needle Grass | HTE | WoNS;<br>Priority Weed – Prohibition on certain dealings |
| *Tamarix aphylla* | Athel Pine | HTE | WoNS;<br>Priority Weed – Prohibition on certain dealings |

**Plate 4 PCT 346 on Maher Street**

**Plate 5 PCT 266 along Red Hill Road**

Plate 6 PCT 277 along Red Hill Road

Plate 7 Athel Pine (WoNS) along Glenfield Road

Plate 8 Native ground cover (*Juncus spp.*)

Plate 9 Exotic ground cover (*Vulpia spp., Poa annua*)

## 5.2 Fauna

A total of eighteen (18) fauna species were incidentally recorded during the surveys. This included fifteen (15) native bird species such as Red Wattlebird (*Anthochaera carunculata*) and Rainbow Lorikeet (*Trichoglossus haematodus*), two (2) introduced bird species (House Sparrow; *Passer domesticus* and Common Starling; *Sturnus vulgaris*) and one (1) native amphibian (Eastern Sign-bearing Froglet; *Crinia parasignifera*). A full list of species is provided in Table 15 (Appendix B).

The site contained a low to moderate diversity and abundance of native fauna with evidence of bird activity primarily within planted woodland trees within the Subject Land. Species recorded within the Subject Land are commonly found in urban areas and are well adapted to utilising urban resources such as planted street trees, residential gardens and domestic waste which are found within the site.

Threatened fauna results are discussed below in Section 5.3.3.

### *5.2.1 Fauna habitats*

The Subject Land contained planted native canopy species in open areas and along suburban streets, and a small, degraded stand of remnant woodland surrounded by residential dwellings and heavily-used roads. Habitat within the Subject Land was limited to foraging habitat suitable for urban area, disturbance tolerant bird species.

Native vegetation within the Subject Land consisting of plantings (Plate 4, Plate 6, Plate 10, Plate 11) and approximately nine (9) remnant canopy trees along Red Hill Road (Plate 1, Plate 5) provides suitable potential foraging resources for urban-area, disturbance tolerant fauna such as Red Wattlebirds (*Anthochaera carunculata*) and Rainbow Lorikeets (*Trichoglossus moluccanus*). No hollow-bearing trees or suitable nesting resources for hollow-dependent fauna species were recorded within the Subject Land. No nests or dens were observed within the site.

Given the lack of connectivity of less disturbed remnant patches to the Subject Land, it is considered unlikely that less mobile species, such as terrestrial fauna (eg. reptiles) would frequent the site as large areas of residential land and heavily used roads are required to be traversed between suitable woodland patches in the surrounding landscape.

No defined waterways occurred within the Subject Land, however one (1) stormwater drainage line and stormwater infrastructure such as road table drains occurred, containing limited emergent riparian vegetation (i.e sedges and rushes), with exotic grasses and weed species also present (Plate 16, Plate 17). One (1) Eastern Sign-bearing Froglet was present within the Red Hill Road table drain during surveys. These resources are likely to provide habitat for disturbance tolerant frog species and opportunistic habitat for semi-aquatic bird species within a highly modified and degraded landscape.

### *5.2.2 Habitat connectivity*

The Subject Land has minimal connectivity for fauna species due to the large tracts of residential land-use and associated infrastructure surrounding the site and is likely only utilised reliably by more mobile avian species and high disturbance tolerant terrestrial fauna able to traverse these areas. Terrestrial fauna movement is particularly restricted within and surrounding the Subject Land due to historic clearing, fencing, dwellings and roads.

Areas of remnant vegetation are situated in Willans Hill Nature Reserve and along the Wiradjuri Walking Trail to the east and west of the Subject Land in the broader Assessment Area, however, these are not connected to the site due to historic land clearing associated with agriculture and residential land use.

**Plate 10 Native planted vegetation**

**Plate 11 Native planted vegetation**

Plate 12 Remnant White Box on Red Hill Road

Plate 13 Remnant White Box trees on Red Hill Road

Plate 14 Open grassed recreation area

Plate 15 Garden and yard plants

Plate 16 Red Hill Road table drain

Plate 17 Stormwater drainage line

## 5.3 Conservation significance

The following section describes the conservation significance of vegetation communities and species likely to be present within the Subject Land.

Threatened biota and migratory species that are known or predicted to occur in the locality are presented in Appendix C.

The habitat resources present at the site (determined during the site survey) were compared with the known habitat associations/requirements of the threatened and migratory biota identified through the desktop review. This was used to determine the likelihood of each threatened ecological community, endangered population and threatened or migratory species occurring within the Subject Land. The results of this assessment are presented in Appendix C.

The threatened biota and migratory species recorded during surveys, or that are considered likely to occur and to be affected by the Proposal, are discussed below.

### 5.3.1 Threatened ecological communities

One (1) Threatened Ecological Community (TEC) was recorded as occurring within the Subject Land during surveys.

PCTID 266 was confirmed as occurring within the Subject Land as Grassy Woodland in a degraded condition. This PCT aligns with the listed Threatened Ecological Community (TEC) *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions*, listed as critically endangered under the BC Act. Vegetation within the Subject Land did not meet the condition benchmark for *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland TEC*, listed as critically endangered under the EPBC Act. No impacts to this community are anticipated as a result of the Planning Proposal or future development in the Tolland housing estate, as existing vegetation buffers along Red Hill Road and Glenfield Road are proposed to be maintained. Potential impacts of future works and the Planning Proposal to TECs are discussed in further detail in Section 6.2.1.

### 5.3.2 Threatened flora species

No species of threatened flora were recorded within the Subject Land during surveys, and no previous records for threatened flora species occur within the Subject Land. However, seasonal targeted surveys were not undertaken as part of this assessment.Nine (9) additional threatened flora species are mapped as occurring or have been recorded within the locality, including:

- *Austrostipa wakoolica* – listed as Endangered, BC & EPBC Act
- *Brachyscome muelleroides* (Claypan Daisy) – listed as Vulnerable, BC & EPBC Act
- *Caladenia arenaria* (Sand-hill Spider-orchid) – listed as Endangered, BC & EPBC Act
- *Lepidium aschersonii* (Spiny Pepper-cress) – listed as Vulnerable, BC & EPBC Act
- *Lepidium monoplocoides* (Winged Pepper-cress) – listed as Endangered, BC & EPBC Act
- *Prasophyllum petilum* (Tarengo Leek Orchid) - listed as Endangered, BC & EPBC Act
- *Senecio garlandii* (Woolly Ragwort) – listed as Vulnerable, BC Act
- *Swainsona murrayana* (Slender Darling-pea) – listed as Vulnerable, BC & EPBC Act
- *Swainsona recta* (Mountain Swainsona Pea) – listed as Endangered, BC & EPBC Act

Given the degraded condition of habitat within the Subject Land, the high levels of disturbance and lack of connected habitat, it is unlikely that any naturally occurring threatened flora species are likely to persist on the site (Appendix C).

### 5.3.3 Threatened fauna species

No threatened fauna species were identified within the Subject Land during the site assessment, and no previous records for threatened fauna species occur within the Subject Land. However, targeted surveys were not undertaken as a part of this assessment.

Forty-four (44) additional species of threatened fauna are mapped as occurring within the locality or have records within the locality (Figure 5), including one (1) 2017 record for Grey-headed Flying Fox approximately 100m to the east of the Subject Land.

Given the degraded condition of habitat across the Subject Land, the high level of disturbance and lack of connected habitat due to historic clearing and residential development, it is considered unlikely that threatened fauna species may frequent the Subject Land (Appendix C). However, Grey-headed Flying Fox are known to forage in urban gardens and have been recorded within the Assessment Area, and are likely to opportunistically utilise foraging resources within the site.

### 5.3.4 Migratory fauna

No migratory species were recorded during field surveys, and limited habitat for migratory waders or wetland birds occurs within the Subject Land, restricted to stormwater drainage lines and road table drains.

A full list of migratory fauna species recorded in the locality or predicted to occur is provided in Appendix C, together with their habitat requirements and likelihood of occurrence.

Important habitat for migratory birds is defined in the significance criteria for listed migratory species (DoE 2013) as follows:

- Habitat utilised by a migratory species occasionally or periodically within the region that supports an ecologically significant proportion of the population of the species.
- Habitat that is of critical importance to the species at particular life-cycle stages.
- Habitat utilised by a migratory species which is at the limit of the species range.
- Habitat within an area where the species is declining.

Habitat in the Proposal site is unlikely to be important for these species as defined in the significance criteria (DoE 2013) given the extensive degradation of the Subject Land, the extent of previous and ongoing disturbance, and the lack of connected habitat due to historic land modification and residential development. Habitat in the Subject Land would not support an ecologically significant proportion of the population, is not critical to the lifecycle of these species and is not at the limit of these species' range. These species are unlikely to occur and would not rely on the habitats present within the Subject Land for their persistence in the locality.

# 6 Preliminary Impact Assessment

The following chapters detail the preliminary impact assessment completed for the Planning Proposal; the below information is intended to provide a broad overview of the potential impacts associated with the future renewal works, which may arise by reason of the Planning Proposal.

Impacts assessed include anticipated direct and indirect impacts arising from the future works associated with the Tolland Renewal Project to native vegetation, threatened species, ecological communities and their habitats, and Key Threatening Processes (KTP).

It should be noted that final impacts of the Proposal are likely to change, and this assessment should be used to guide the avoidance and minimisation of potential impacts of the project.

## 6.1 Direct Impacts

The direct impacts discussed in the below chapter pertain to anticipated impacts of the future Tolland Renewal Project, and do not constitute final impact calculations.

At present, a preliminary design for the proposed renewal (Appendix A) has been used to calculate the impacts discussed below, however these are subject to change based on the final design, and adoption of mitigation measures, for the development. The below preliminary assessments are intended to provide a basis for the consideration of biodiversity on the Subject Land to demonstrate the likely impacts of the proposed future development, and subsequently, the potential impacts arising as a result of the Planning Proposal.

### *6.1.1 Loss of native vegetation*

Based on the current concept design, impacts to allow for the rezoning and future proposed construction of residential dwellings, roads and public recreation areas will result in direct impacts to up to 2.98 ha of native vegetation in the form of planted locally and non-locally native canopy species (2.98 ha), and up to 46.69 ha of urban area, consisting of non-native and non-locally native street trees and urban gardens (Figure 4), Table 11 below).

**Table 11 Preliminary impacts to vegetation as a result if the future proposed renewal**

| Plant Community Type (PCT) to be impacted | Subject Land (Indirect impacts) ha | Subject Site (Direct impacts) ha |
|---|---|---|
| PCTID 266: White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW Western Slopes Bioregion | 0.18 | 0.0 |
| PCTID 277: Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion | 2.4 | 0.0 |
| PCTID 346: White Box – Blakely's Red Gum – White Cypress Pine Shrubby Woodland on Metamorphic Hills in the Wagga Wagga – Cootamundra Region of the NSW South Western Slopes Bioregion | 0.4 | 0.4 |
| PCTID 0: Planted mixed native and non-native vegetation stands | 1.68 | 1.68 |
| PCTID 0: Urban planting and street trees | 48.58 | 48.58 |
| **Total vegetation removal (ha):** | 53.24 | 50.66 |
| **Total native vegetation removed (ha):** | | 0.04 |

Vegetation impacts will include the clearing of canopy and understorey species from within the Subject Land for the construction of dwellings and landscaping purposes as defined above.

Recommended future avoidance and mitigation measures to reduce the loss of native vegetation are presented in Section 7.

### *6.1.2 Fauna habitat loss and fragmentation*

The anticipated loss of up to 2.98 ha of planted locally and non-locally native species within the Subject Land has the potential to reduce the future availability of foraging, nesting and movement resources for fauna within the Subject Land and surrounding Assessment Area. No hollow bearing trees occur within the Subject Land, and as such, breeding and roosting habitat for hollow-dependent species within the locality will not be impacted by the proposed renewal project.

Given the nature and limited extent of possible impacts, the Planning Proposal will not result in a substantial increase in fragmentation given the nature of the Subject Land and locality, and the avoided impacts to remnant native vegetation within the Subject Site.

Safeguard and management measures to reduce the future risk of habitat loss and fragmentation are presented in Section 7.

### *6.1.3 Fauna injury and mortality*

There is the potential for fauna injury or mortality during anticipated vegetation clearing and disturbance. Less mobile fauna present such as small terrestrial fauna such as lizards and frogs are most at risk of becoming trapped, injured or killed as part of vegetation removal or earthworks. Direct injury/mortality to these species may occur and as such, safeguard and management measures to reduce the likelihood of fauna injury and mortality are presented in Section 7.

Consideration should be given to future surveys including pre-clearing surveys conducted prior to vegetation removal and construction works to determine if species are occupying vegetation to be removed. Additionally, it is recommended that if the Tolland Renewal Proposal progresses in the future, an ecologist or fauna spotter should be present both prior to, and at the time of vegetation removal to re-assess species habitation of the site and to identify species habitat at risk of impact.

## 6.2 Impacts to Threatened Biota

### *6.2.1 Impacts to Threatened Ecological Communities*

Based on preliminary designs, no areas that contain threatened ecological communities are anticipated to be impacted by the Planning Proposal or proposed future renewal works. 2.98 ha of PCTID 266 which conforms to BC listed Box-Gum Woodland occurs within an existing vegetation buffer along Red Hill Road, as designated in the current concept design as of August 2023, and is not anticipated to be directly impacted as a result of the future Tolland Renewal Project, and future design consideration should avoid mapped native vegetation (particularly TEC) wherever possible.

Any impacts to threatened ecological communities as a result of the future Tolland Renewal Project, once areas of impact are finalised, would be assessed as part of the environmental assessment for the future development of the Subject Land.

Anticipated impact areas based on the current preliminary design have been used to discuss the likelihood of impacts to threatened ecological communities as a result of the project. As impact areas are not finalised, and this PBAR is not an assessment for the providers of consent of the project, assessments of the likely significance of impacts of the Planning Proposal on this threatened ecological community pursuant to Section 7.3 of the BC Act (5-part test) and/or the significant impact assessment criteria for EPBC Matters of National Environmental Significance – Significant impact guidelines 1.1 (DEWHA, 2009) **have not** been prepared to assess the potential direct impacts to this community. Safeguards and management measures have been developed to minimise potential future impacts of the Tolland Renewal Project to threatened ecological communities within the Subject Land (Section 7).

### *6.2.2 Impacts to Threatened Species*

The following species listed under either the NSW BC Act and/or the Commonwealth EPBC Act, have the potential to be impacted by the future Tolland Renewal Project based on preliminary concept designs:

- Grey-headed Flying-fox (*Pteropus poliocephalus*), listed as Vulnerable under BC & EPBC Act

Impacts to threatened species as a result of the future Tolland Renewal Project would be assessed as part of the environmental assessment for the future development of the Subject Land.

Anticipated impact areas based on the current preliminary design have been used to discuss the likelihood of impacts to threatened species as a result of the project. As impact areas are not finalised, and this PBAR is not an assessment for the providers of consent of the project, assessments of the likely significance of impacts of the Proposal on these threatened species pursuant to Section 7.3 of the BC Act (5-part test) and/or the significant impact assessment criteria for EPBC Matters of National Environmental Significance – Significant impact guidelines 1.1 (DEWHA, 2009) **have not** been prepared to assess the potential direct impacts to these species.

Safeguards and management measures have been developed to minimise potential future impacts of the Tolland Renewal Project to threatened species and their habitats within the Subject Land (Section 7).

However, given the low quality species habitat present in the Subject Land, the application of appropriate safeguard and management measures and the avoidance and minimisation of impacts during detailed design, it is unlikely that a significant impact to threatened biota would occur. If required, assessments of impacts to threatened biota will be completed when final impacts are known to confirm this outcome.

## 6.3 Indirect Impacts

The indirect impacts discussed in the below chapters pertain to anticipated impacts arising from the future Tolland Renewal Project works, and do not constitute final impact calculations.

At present, a preliminary design for the proposed renewal has been used to calculate the impacts discussed below, however these are subject to change based on the final design for the development. The below impacts are intended to provide a basis for the biodiversity assessment to demonstrate the likely impacts of the proposed future project, and subsequently, the expected impacts as a result of the rezoning Planning Proposal.

Indirect impacts considered herein include potential impacts to up to 2.98 ha of native vegetation located in the Subject Site that will be re-zoned from RE1 Public Recreation to R1-R3 Residential, as potential future impacts that may occur as a result of the change in land use.

Further indirect impacts to the Subject Land includes impacts to an area comprising 4.65 ha of planted native vegetation which will both be re-zoned and remain as currently zoned.

These are discussed in further detail below.

### *6.3.1 Change of land-use*

The Planning Proposal will result in a change in land-use zone, and subsequently in the use and occupation of that land; including for approximately 2.98 ha of planted locally and non-locally native canopy species with a modified exotic ground cover within three separate RE1 Public Recreation areas in the Subject Land (Lot 5 DP 249806; Lot 1 & Lot 2 DP 1182775; Lot 178 DP 235331). The current preliminary design has indicated these public recreation areas will require re-zoning to allow for a maximum of 200 – 1200 $m^2$ area per dwelling. The proposed change in land-use would result in a downgrading of the protection and enhancement of the natural environment facilitated by the RE1 Public Recreation land-zone, and instead allow for a wider array of developments under the appropriate residential land-zoning. While the indirect impacts of this are difficult to quantify, biodiversity features present within the Subject Site could be lost or degraded due to the change in land-use. Given the low quality of habitat present which is largely limited to planted mixed native and non-native vegetation, it is unlikely that any substantial impacts would result in the change of land use proposed.

### *6.3.2 Invasion and spread of weeds, pests and pathogens*

The future development of the Subject Land has the potential to result in further introduction and spread of exotic plants throughout the site as a result of construction activities. The further disturbance of soil for construction creates an environment conducive to the spread of weeds. Additionally, inappropriate hygiene measures associated with imported materials and vehicle and machinery movements also increases the risk of introducing and spreading weeds.

Exotic plants already occur throughout the site, and NSW Priority Weeds and WONS were recorded within the Subject Land during the site assessment (Section 5.1.4). Given the current condition of the site, further spread of existing weed species is unlikely to have a significant impact on the existing environment. Nonetheless, safeguard and management measures (Section 7) would be implemented to limit the spread of existing weeds to the site, and to minimise the likelihood of new exotic species being introduced.

### *6.3.3 Noise and vibration disturbance*

The future development of the Subject Land would result in an increase in noise and vibration disturbance due to the use of machinery during construction. Noise and vibration levels during the construction period would result in a slight increase above existing background levels for the duration of construction, however, will generally be characteristic of existing noise and vibration disturbances in the area due to the existing residential land-use (i.e. traffic and vehicle noise).

Given the high disturbance levels that exist on the site already, and the dominance of disturbance-tolerant fauna species within the Subject Land, it is unlikely that the increase in noise and vibration during renewal works of the proposed future project would significantly disturb fauna that occur in the Subject Land.

Site specific safeguard and mitigation measures should be developed as part of the future environmental impact assessment for the Tolland Renewal Project to reduce the magnitude of impacts of noise and vibration on fauna in the environment.

## 6.4 Key Threatening Processes

A key threatening process (KTP) is defined in the BC Act as an action, activity or proposal that:

- Adversely affects two or more threatened species, populations or ecological communities
- Could cause species, populations or ecological communities that are not currently threatened to become threatened

There are currently thirty-nine (39) KTPs listed under the BC Act (DPIE 2021) eight (8) listed under the FM Act (DPI 2021) and twenty-one (21) under the EPBC Act (DCCEEW 2022). KTPs of relevance to the future development of the Tolland housing estate are outlined and discussed in Table 12.

**Table 12 Key Threatening Processes for relevance to the Proposal**

| Key Threatening Process | Status | Comment |
|---|---|---|
| **Clearing of native vegetation** | BC Act; EPBC Act | Native vegetation is made up of plant communities, comprising primarily indigenous species and includes canopy trees (where present), understorey, ground cover and below ground biomass (roots, bulbs and the seed bank). For the purposes of this determination native vegetation does not include marine vegetation within the meaning of the Fisheries Management Act 1994.<br><br>Clearing, as defined by the determination, refers to the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. |

| | | |
|---|---|---|
| | | Anticipated future construction impacts would result in the removal of native vegetation. Impacts would be further reduced via the application of measures outlined in Section 7. |
| **Infection of frogs by amphibian chytrid causing the disease chytridiomycosis** | BC Act; EPBC Act | Chytridiomycosis is potentially fatal to all native species of amphibian. As such, all frog species that are listed under the schedules of the Act may be affected by the disease. Fifty species of Australian frogs have been found infected with the chytrid fungus.<br><br>High altitude (>400m) populations are more severely affected by chytridiomycosis. Such population declines have been reported from the NSW uplands (Gillespie and Hines 1999, Hines et al. 1999). Stream-associated frog species are more likely to be infected because the pathogen is waterborne.<br><br>The future development at the Subject Land could result in a slight increase in the risk of the spread of chytrid due to improper machinery hygiene on site during construction. This would be managed via mitigation measures and safeguards outlined in Section 7. |
| **Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants** | BC Act; EPBC Act | Native woodland patches in proximity to residential areas and waste disposal sites are exposed to increased risk of weed invasion through garden escapees from the Subject Land.<br><br>The future development of the site would provide a risk of this KTP increasing within the locality. |

## 6.5 Biodiversity Offset Scheme

The Biodiversity Offset Scheme (BOS) applies to local development (assessed under Part 4 of the Environmental Planning and Assessment Act 1979) that is likely to significantly affect threatened species. Local development is likely to significantly affect threatened species and require a biodiversity development assessment report (section 7.7 of the Biodiversity Conservation Act 2016) if impacts:

- exceed the Biodiversity Offsets Scheme are clearing threshold (BC Act, section 7.4); the threshold includes clearing on land within the Biodiversity Values Map or clearing of an area that exceeds the threshold, or
- are carried out on an Area of Outstanding Biodiversity Value (AOBV), or
- are likely to significantly affect threatened species, ecological communities and their habitats according to the test in section 7.3 of the BC Act

### *6.5.1 Area Clearing Threshold*

The minimum lot size for the Subject Land is <1 ha; subsequently the clearing threshold for the site based on the minimum lot size, is 0.25 ha.

### *6.5.2 The anticipated impacts would likely involve direct and indirect impacts, including potential vegetation clearing and disturbance to up to 2.98 ha of remnant native vegetation and native vegetation reasonably assigned to a PCT occurring within the Subject Land to facilitate the future renewal works. Additionally, anticipated direct impacts (at this stage of the Proposal) are estimated to involve the removal of up to 0.04 ha of native vegetation assigned to a NSW PCT; consequently, it is likely that the BOS would apply to the approved development to be assessed under Part 4 of the EP&A Act.Biodiversity Values Mapping*

No areas of High Biodiversity Value are mapped as occurring in the Subject Land or will be impacted by the Planning Proposal or the proposed future development of the Tolland Renewal Project area.

### *6.5.3 Assessment of Significance Threshold*

To inform the Planning Proposal, threatened species with potential to be impacted by the future proposed development which would be enabled by the rezoning have been nominated within this report (Appendix C). However, the significance of these impacts has not yet been assessed (i.e. Assessments of Significance have not been completed) for listed entities considered to have the potential to occur within the Subject Land, in accordance with Section 1.7 of the EP&A Act and the *EPBC Act Matters of National Environmental Significance – Significant Impact Criteria Guidelines* (DEWHA, 2009). Rather, this PBAR functions to inform the Planning Proposal for the re-zoning of the Subject Site, and does not provide conclusions about the impacts of the future renewal project, as the design (and assessment pathway) has not been finalised. Future environmental assessment to support the renewal would conclude whether it is likely to have a significant negative effect on the threatened biota present, and whether a Species Impact Statements and / or Referral to the Environment Minister, and participation in the BOS is required.

# 7 Recommendations, Avoidance and Mitigation

This section outlines recommended efforts to avoid and minimise impacts on biodiversity values associated with the Planning Proposal, and the recommended measures to further mitigate impacts to biodiversity for the proposed future Tolland Renewal Project.

Avoidance and mitigation measures are described below.

## 7.1 Recommended measures for avoidance and minimisation of impacts

The following measures are proposed to avoid and minimise impacts to biodiversity values recorded within the Subject Land:

- The impacts of future developments on native vegetation within the Subject Site (i.e., land to be re-zoned) should be considered cumulatively.
- Assessments of significance pursuant to Section 1.7 of the EP&A Act and the EPBC Act *Matters of National Environmental Significance – Significant Impact Criteria Guidelines* (DEWHA, 2013) should be completed for threatened biota known or likely to occur within the development footprint of the housing estate, and adjacent areas following the finalisation of the detailed design of the renewal project.
- Further refinement of the design footprint during detailed design to avoid impacts to canopy vegetation, including existing street trees, should be completed.
- Further refinement of the design footprint during detailed design to maintain existing vegetation buffers along Glenfield Road and Red Hill Road to avoid impacts to remnant canopy vegetation should be completed.
- Once the final design footprint is complete, including formalisation of vegetation to be removed, a suitably qualified ecologist will be required to undertake a pre-clearing survey and supervise all clearing activities.
- Planting of locally native species within proposed public recreation areas and in proposed road verges to increase native cover and biodiversity within the Subject Site.

The following mitigation measures presented in Table 13 below provide future recommended measures to ensure that impacts to threatened species with the potential to be impacted by the proposed future Tolland Renewal Project are minimised wherever possible.

**Table 13 Proposed mitigation measures for threatened species with a moderate to high potential to be impacted by the future renewal works**

| Scientific Name | Common Name | BC Act | EPBC Act | Future recommended measures |
|---|---|---|---|---|
| **Mammals** | | | | |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | V | V | The anticipated impacts of the renewal project would result in a loss of foraging habitat which consists of the nectar and pollen of native trees, in particular Eucalypts and Melaleucas, which occur within the Subject Land along suburban streets and in urban gardens.<br><br>Detailed design to retain vegetation wherever possible. |

The following Environmental Safeguards (Table 13) are provided to further mitigate or manage impacts resulting from the proposed future Tolland Renewal Project. Environmental safeguards and mitigation measures would require reassessment and refinement upon the finalisation of the detailed design and construction methodology, and are instead provided as a general guide for the planned future construction.

**Table 13 Environmental safeguards and mitigation measures**

| Biodiversity impact | Mitigation measure | Responsibility and timing |
|---|---|---|
| **General** | Ensure all workers are provided with an environmental induction prior to the commencement of works to outline key biodiversity features of the site (i.e. Remnant trees, planted native vegetation, drainage lines), and the management measures in place to protect biodiversity during construction.<br><br>Site is to be kept tidy and free from rubbish at all times, to prevent wastes being blown into adjacent areas of native vegetation or waterways. | Project and site manager<br>Pre-construction and construction |
| **Native vegetation loss** | Clearly delineate vegetation to be removed/retained, and induct all site personnel as to the approved extent of clearing.<br><br>Vehicles and machinery to utilise existing roads, fire trails or existing cleared areas where possible, and are not to extend beyond the direct impact footprint. | Project and site manager<br>Pre-construction and construction |
| **Invasion and spread of weeds and pests** | Develop and implement an active weed and pest management plan prior to construction commencing, to reduce the risk of weed spread and safety issues arising from pest and weed presence (e.g. blackberry).<br><br>Declared weeds within the Subject Site must be managed according to requirements under the Biosecurity Act 2015. It is recommended that all Weeds of National Significance and NSW Priority Weeds should be controlled, and where possible, eradicate to reduce the risk of further spread.<br><br>The Client should implement an ongoing weed control program throughout the Subject Land to manage the spread of weeds across the site.<br><br>Strict hygiene protocols must be followed. If weeds are accidentally transported to site, or identified during construction activities, all weed material should be immediately contained and removed from site. | Project and site manager<br>Pre-construction and construction |
| **Habitat loss and fragmentation** | Prior to clearing, a preclearance survey should be undertaken including inspection for threatened species (flora and fauna), and habitat features (i.e nests or burrows) to confirm occupation by fauna. Care should be taken to identify nests and/or roosting sites. If fauna habitat is present the appointed contractor would contact the project ecologist for further advice prior to clearing. | Project and site manager<br>Pre-construction and construction |

| | | |
|---|---|---|
| **Fauna injury and mortality** | Where practicable, it is recommended that construction occurs outside of key breeding seasons (fledging of active nests/roosts) (approximately June to January) for species likely to utilise the site to avoid or minimise the chance of nest abandonment, injury or death to native fauna.<br><br>Ensure the presence of an ecologist or fauna spotter catcher at all times during pre-clearing and clearing activities to remove and relocate wildlife as necessary, and to attend to any wildlife that are injured as a result of works. | Project and site manager<br>Pre-construction and construction |
| **Impacts to waterways, chemical contamination and sedimentation** | All erosion, sedimentation and contamination control plans should be established and implemented prior to construction.<br><br>Sediment and erosion controls must be installed downslope of any disturbance areas prior to to earthworks.<br><br>Soils to be stockpiled at designated stockpile locations in a cleared area, within pre-approved zones away from waterways, drainage lines and native vegetation, and are appropriately stabilized in accordance with the 'Blue Book' (Landcom 2004).<br><br>Chemicals or pollutants on site to be stored appropriately in bunded areas to prevent pollution of soils or waters which may impact upon biodiversity.<br>Any use of herbicide is to be safe for environmentally sensitive areas and registered for use within waterways to reduce potential for impacts to aquatic fauna and amphibia.<br><br>Recently disturbed soils must be stabilised progressively and promptly after works are completed to prevent erosion and sediment migration.<br><br>Maintain Vegetation Protection Zones outside direct impact area to avoid compaction of soils. This includes no movement of excavation machinery or parking or storing equipment outside designated clearing areas or laydown areas.<br><br>Vegetation existing along gullies or eroded areas should be retained and protected where possible, to ensure future erosion potential is minimised. | Project and site manager<br>Pre-construction and construction |
| **Introduction and spread of pathogens and disease** | Development and implementation of a pathogen management procedure as part of the CEMP.<br><br>Strict hygiene protocols, as outlined in the CEMP should be implemented and followed including:<br>• All machinery entering the site must be appropriately washed down and disinfected prior to work on site to prevent the potential spread of weeds and pathogens | Project and site manager<br>Pre-construction and construction |

| | | |
|---|---|---|
| | • Protocols to prevent introduction or spread of chytrid fungus should be implemented following hygiene protocol for the control of disease in frogs (DECC 2008b). | |

# 8 Conclusion

Surveys undertaken to assess ecological attributes present within the Tolland Renewal Project area included habitat identification, confirmation of vegetation community mapping, identification of TECs, collection of BAM data, as well as incidental threatened flora and fauna observations.

The Subject Land occurs in the residential suburb of Tolland in Wagga Wagga NSW, located in a built-up residential area that has been historically cleared and developed. Land use of the surrounding area includes residential housing and supporting community facilities and infrastructure. Subsequently, only one (1) area of scattered remnant trees likely previously forming part of a naturally occurring woodland remains within the project area. Native vegetation is predominately comprised of planted locally and non-locally native species. In addition to native vegetation, a variety of exotic, ornamental planted tree and shrub species occurs throughout the Subject Land in public recreation areas along streets.

In total, 4.65 ha of native and planted vegetation was ground-truther during the site assessment. Vegetation present within private residential areas was not ground-truthed as part of this assessment.

Native vegetation on site was comprised of one (1) naturally occurring Plant Community Types (PCTs), and two (2) further PCTs assigned based on best fit with planted native vegetation present as follows:

- PCTID 266 which consisted of remnant native woodland comprised of several scattered, mature trees along Red Hill Road.
- PCTID 277 which occurred within planted native vegetation patches along Red Hill Road and Glenfield Road, and
- PCTID 346 which occurred within planted native vegetation in the public recreation area along Maher Street to the north of the Subject Land.

The remainder of native vegetation on site was comprised of planted locally and non-locally native species along road verges, in urban gardens and other public recreation areas.

Based on the field surveys and validation of vegetation condition on site, one (1) TEC (Box-Gum Woodland), listed as critically endangered under the BC Act. In total, 0.18 ha of degraded condition TEC occurs within the Subject Land. No impacts to this community are anticipated as a result of the Planning Proposal or future development in the Tolland housing estate, as existing vegetation buffers along Red Hill Road and Glenfield Road are proposed to be maintained, however this is based on preliminary concept designs. Vegetation on site did not meet the condition benchmark for *White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland* TEC, listed as critically endangered under the EPBC Act.

No species of threatened flora, listed under the BC Act or EPBC Act, were recorded within the Subject Land and it is deemed unlikely that any naturally occurring threatened flora species are likely to persist on the site. Potential impacts are not considered likely to occur to TECs given that recorded TECs are located in an area currently designated to be retained. The likelihood of occurrence of flora and fauna is outlined in Appendix C. In general, threatened flora and fauna are not anticipated to occur in the Subject Land given the high levels of disturbance and degraded condition of habitat within the Subject Land, the lack of habitat features to support their occurrence in the Subject Land, and lack of connected habitat. However, the Grey-headed Flying Fox are

known to forage in urban gardens and have been recorded within the Assessment Area and is likely to opportunistically utilise foraging resources within the site.

As impact areas are not finalised, and this PBAR is not an assessment for the providers of consent of the project, assessments of the likely significance of impacts of the Planning Proposal on TECs and threatened species pursuant to Section 7.3 of the BC Act (5-part test) and/or the significant impact assessment criteria for EPBC *Matters of National Environmental Significance – Significant impact guidelines 1.1* (DEWHA, 2009) **have not** been prepared to assess the potential direct impacts to these biota.

Direct and indirect impacts as a result of the Proposal would be assessed after the provision of a finalised design, however, given the low quality species habitat present in the Subject Land, the application of appropriate safeguard and management measures and the avoidance and minimisation of impacts during detailed design, it is unlikely that a significant impact to threatened biota would occur. If required, assessments of impacts to threatened biota will be completed when final impacts are known to confirm this outcome.

The Subject Land measures a total area of 53.33 ha with a total potential impacts for the future renewal project anticipated at 49.35. This includes:

- Potential impacts to up to2.98.4 ha of planted native shrubs and trees within the public recreation area along Maher Street, ,assigned to PCT 346 to which is proposed to be re-zoned to facilitate the construction of future dwellings for the Tolland Renewal Project
- Potential impacts to up to a further 0.18 ha of remnant native woodland conforming to PCT 266 and 2.4 ha of native planted vegetation assigned to PCT 277 located within the Subject Land, depending on the final design plans
- Potential impacts to 1.68 ha of vegetation comprised of mixed exotic and native planted trees along streets and reserves
- Potential impacts to the remaining 48.58 ha of existing residential lots, buildings, gardens, roadways, parklands and infrastructure categorised as non-native vegetation. Existing street and park trees are proposed to be retained where possible.

The minimum lot size for the Subject Land is < 1 ha; subsequently the clearing threshold for the site based on the minimum lot size, is 0.25 ha. The anticipated impacts could likely involve direct and indirect impacts, including vegetation clearing to up to 2.98 ha of native vegetation to facilitate the future renewal works; consequently, the BOS would apply to the approved development to be assessed under Part 4 of the EP&A Act.

No areas of High Biodiversity Value are mapped as occurring in the Subject Land or will be impacted by the Planning Proposal or the proposed future development of the Tolland Renewal Project area.

As discussed above, significant impacts to threatened species are not considered likely, however this assessment does not provide conclusions about the impacts of the future renewal project as the design (and final impacts) have not been finalised. Future environmental assessment to support the Proposal would conclude whether it is likely to have a significant negative effect on the threatened biota present, and whether a Species Impact Statements and / or Referral to the Environment Minister, and participation in the BOS is required.

Recommendations to avoid and minimise impacts, including the provision of potential environmental safeguards and mitigation measures are provided in Section 7 to assist in the reduction of potential impacts to biodiversity features identified during the surveys undertaken, and to subsequently assist in the determination of the design.

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# 10 Appendices

| Appendix | Item |
|---|---|
| Appendix A | Proposal Design Plans |
| Appendix B | Species Lists |
| Appendix C | Threatened Species Likelihood of Occurrence |
| Appendix D | BAM Data Sheets |
| Appendix E | Climate Data |

# Appendix A – Proposed Design Plans

# Appendix B – Species Lists

**Table 14 Flora species recorded during surveys**

| *Scientific name* | Common name | Exotic | Weed listing status |
|---|---|---|---|
| *Acacia baileyana* | Cootamundra Wattle | N | |
| *Acacia dealbata* | Silver Wattle | N | |
| *Acacia spp.* | Wattle | N | |
| *Amyema spp.* | Mistletoe | N | |
| *Angophora costata* | Sydney Red Gum | N | |
| *Angophora floribunda* | Rough-barked Apple | N | |
| *Arctotheca calendula* | Capeweed | E | |
| *Asparagus asparagoides* | Bridal Creeper | E | *WoNS;* *Priority Weed – Prohibition on certain dealings* |
| *Avena fatua* | Wild Oats | E | |
| *Bothriochloa macra* | Red Grass | N | |
| *Brachychiton populneus* | Kurrajong | N | |
| *Callistemon viminalis* | Weeping Bottlebrush | N | |
| *Callitris glaucophylla* | White Cypress Pine | N | |
| *Capsella bursa-pastoris* | Shepherd's Purse | E | |
| *Casuarina cunninghamiana subsp. cunninghamiana* | River Oak | N | |
| *Cerastium glomeratum* | Mouse-ear Chickweed | E | |
| *Chloris truncata* | Windmill Grass | N | |
| *Cirsium vulgare* | Spear Thistle | E | |
| *Conyza bonariensis* | Flaxleaf Fleabane | E | |
| *Correa reflexa* | Native Fuschia | N | |
| *Corymbia citriodora* | Lemon-scented Gum | E | |
| *Corymbia spp.* | 0 | N | |
| *Cotula australis* | Common Cotula | N | |
| *Cupressus lusitanica* | Mexican Cypress | E | |
| *Cupressus sempervirens* | Italian Cypress | E | |
| *Cynodon dactylon* | Common Couch | N | |
| *Daucus glochidiatus* | Native Carrot | N | |

| *Scientific name* | Common name | Exotic | Weed listing status |
|---|---|---|---|
| *Ehrharta erecta* | Panic Veldtgrass | E | |
| *Eleusine spp.* | 0 | E | |
| *Erodium crinitum* | Blue Crowfoot | N | |
| *Eucalyptus albens* | White Box | N | |
| *Eucalyptus blakelyi* | Blakely's Red Gum | N | |
| *Eucalyptus cinerea* | Argyle Apple | N | |
| *Eucalyptus globulus* | Tasmanian Blue Gum | N | |
| *Eucalyptus leucoxylon* | Yellow Gum | N | |
| *Eucalyptus leucoxylon subsp. megalocarpa* | Large-fruited Yellow Gum | N | |
| *Eucalyptus macrandra* | River Yate | N | |
| *Eucalyptus mannifera* | Brittle Gum | N | |
| *Eucalyptus melliodora* | Yellow Box | N | |
| *Eucalyptus polyanthemos* | Red Box | N | |
| *Eucalyptus sideroxylon* | Mugga Ironbark | N | |
| *Fraxinus angustifolia* | Ash Tree | E | |
| *Fumaria muralis subsp. muralis* | Wall Fumitory | E | |
| *Galium gaudichaudii* | Rough Bedstraw | N | |
| *Grevillea robusta* | Silky Oak | N | |
| *Hakea spp.* | 0 | N | |
| *Hardenbergia violacea* | False Sarsaparilla | N | |
| *Hypochaeris radicata* | Catsear | E | |
| *Lactuca serriola* | Prickly Lettuce | E | |
| *Ligustrum lucidum* | Large-leaved Privet | E | |
| *Lolium perenne* | Perennial Ryegrass | E | |
| *Lomandra spp.* | Mat-rush | N | |
| *Lophostemon confertus* | Brush Box | N | |
| *Lythrum hyssopifolia* | Hyssop Loosestrife | N | |
| *Malva parviflora* | Small-flowered Mallow | E | |
| *Medicago polymorpha* | Burr Medic | E | |
| *Melaleuca ericifolia* | Swamp Paperbark | N | |

| *Scientific name* | Common name | Exotic | Weed listing status |
|---|---|---|---|
| *Melaleuca linariifolia* | Flax-leaved Paperbark | N | |
| *Melaleuca quinquenervia* | Broad-leaved Paperbark | N | |
| *Nassella neesiana* | Chilean Needle Grass | E | *WoNS;*<br>*Priority Weed – Prohibition on certain dealings* |
| *Oplismenus aemulus* | 0 | N | |
| *Oxalis pes-caprae* | Soursob | E | |
| *Oxalis spp.* | 0 | N | |
| *Panicum effusum* | Hairy Panic | N | |
| *Pennisetum clandestinum* | Kikuyu Grass | E | |
| *Pinus radiata* | Radiata Pine | E | |
| *Plantago lanceolata* | Lamb's Tongues | E | |
| *Platanus spp.* | Plane Tree | E | |
| *Poa annua* | Winter Grass | E | |
| *Polygonum aviculare* | Wireweed | E | |
| *Prunus spp.* | Cherry Blossom | E | |
| *Romulea rosea var. australis* | Onion Grass | E | |
| *Rytidosperma caespitosum* | Ringed Wallaby Grass | N | |
| *Rytidosperma spp.* | 0 | N | |
| *Salvia verbenaca* | Vervain | E | |
| *Schinus areira* | Pepper Tree | E | |
| *Solanum nigrum* | Black-berry Nightshade | E | |
| *Sonchus oleraceus* | Common Sowthistle | E | |
| *Stachys arvensis* | Stagger Weed | E | |
| *Tamarix aphylla* | Athel Tree | E | *WoNS;*<br>*Priority Weed – Prohibition on certain dealings* |
| *Trifolium arvense* | Haresfoot Clover | E | |
| *Trifolium spp.* | A Clover | E | |
| *Vittadinia gracilis* | Woolly New Holland Daisy | N | |
| *Vulpia spp.* | Rat's-tail Fescue | E | |

Native (N), Exotic (E)

**Table 15 Fauna species recorded during surveys**

| Class | Common Name | *Scientific name* | Conservation Status | Observation |
|---|---|---|---|---|
| *Amphibia* | Eastern Sign-bearing Froglet | *Crinia parinsignifera* | P | W |
| *Aves* | Australian Magpie | *Cracticus tibicen* | P | OW |
| *Aves* | Australian Raven | *Corvus coronoides* | P | OW |
| *Aves* | Blue-faced Honeyeater | *Entomyzon cyanotis* | P | O |
| *Aves* | Common Starling | *Sturnus vulgaris* | | OW |
| *Aves* | Crested Pigeon | *Ocyphaps lophotes* | P | OW |
| *Aves* | Eastern Rosella | *Platycercus eximius* | P | O |
| *Aves* | Galah | *Eolophus roseicapillus* | P | OW |
| *Aves* | House Sparrow | *Passer domesticus* | | OW |
| *Aves* | Laughing Kookaburra | *Dacelo novaeguineae* | P | OW |
| *Aves* | Magpie-lark | *Grallina cyanoleuca* | P | OW |
| *Aves* | Pied Currawong | *Strepera graculina* | P | OW |
| *Aves* | Rainbow Lorikeet | *Trichoglossus haematodus* | P | OW |
| *Aves* | Red Wattlebird | *Anthochaera carunculata* | P | OW |
| *Aves* | Silvereye | *Zosterops lateralis* | P | OW |
| *Aves* | Sulphur-crested Cockatoo | *Cacatua galerita* | P | OW |
| *Aves* | Willie Wagtail | *Rhipidura leucophrys* | P | O |
| *Aves* | Yellow-rumped Thornbill | *Acanthiza chrysorrhoa* | P | OW |

Observed (O), Heard (W)

# Appendix C – Threatened Species Likelihood of Occurrence

The below map (Figure 5) and assessment includes national and state significant species from the following sources:

- BioNET Database (accessed June 2023)
- DECCW database (PMST accessed June 2023).
- Search area is 10 km radius.
- Not considered further pelagic seabirds, shorebirds, sandpipers, turtles, whales, sharks - no preferred marine or coastal habitat in Subject Land.

All habitat information is taken from NSW OEH and Commonwealth DEE Threatened Species profiles (DPIE 2020 DEE 2020) unless otherwise stated. The codes used in this table are:

- CE – Critically Endangered
- E – Endangered
- V – Vulnerable
- EP – Endangered Population
- C – CAMBA
- J – JAMBA
- R – ROKAMBA
- CEEC – Critically Endangered Ecological Community
- EEC – Endangered Ecological Community

The Likelihood of Occurrence (Table 17) below includes migratory species not captured in the BAM. It is assumed that all other threatened species with the potential to occur on the site have been captured through the BAM process.

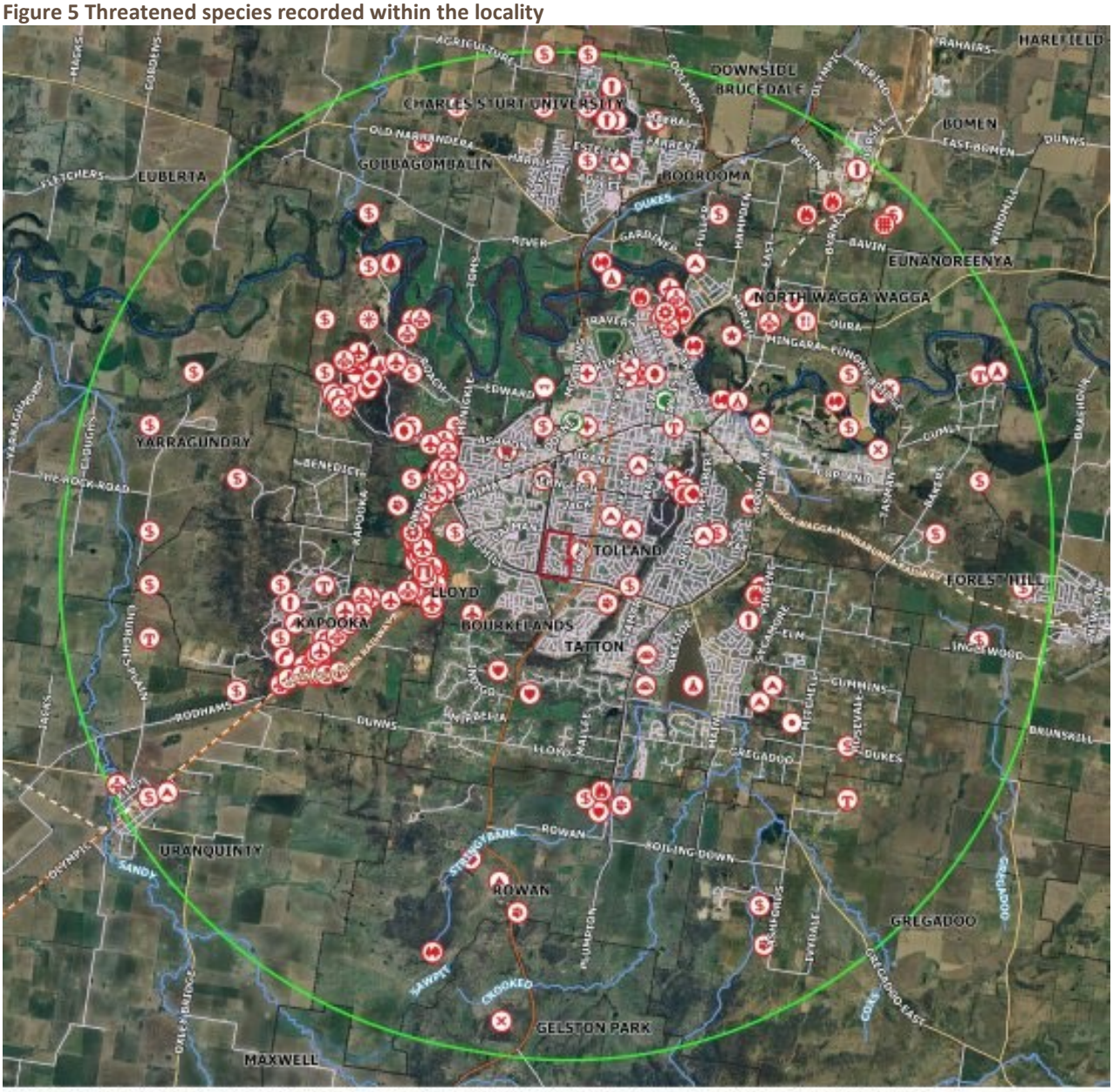
**Table 16 Likelihood of Occurrence definitions**

| Likelihood of occurrence | Definition |
|---|---|
| **Known** | Species recorded in the subject site or Subject Land |
| **Likely** | Species previously recorded within a 10-kilometre radius of the Subject Land and suitable habitat occurs within the subject site. |
| **Possible** | Species previously recorded within a 10-kilometre radius of the Subject Land but only marginal suitable habitat recorded within the subject site.<br>OR<br>Species not previously recorded within a 10-kilometre radius of the Subject Land, but the proposal footprint is within the species known distribution and suitable habitat occurs within the subject site. |
| **Unlikely** | Species previously recorded within a 10-kilometre radius of the Subject Land but no suitable habitat recorded within the subject site. |
| **Nil** | Species not previously recorded within a 10-kilometre radius of the Subject Land and no suitable habitat occurs in the area. |

**Table 17 Likelihood of impact definitions**

| Likelihood of impact | Definition |
|---|---|
| **Nil** | Species / community and its habitat will not be impacted by the proposal. |
| **Low** | Species / community has been determined as 'possible', 'likely' or 'known' to occur within the Subject Land but is unlikely to be impacted by the proposal due to avoidance of individuals and / or their broad habitats within the subject site. Impact to important habitat resources will not occur or has been avoided / reduced through the design process. |
| **Moderate** | Species / community is 'known' or 'likely' to occur within the Subject Land and the proposal will impact on an area of habitat / resources. Impact to individuals / important habitat resources is unlikely or has been avoided / reduced through the design process. |
| **High** | Species / community is known or likely to occur within the Subject Land and the proposal will impact on important habitat resources or individuals. |

**Figure 5 Threatened species recorded within the locality**




**Stantec Tolland Renewal Project - Threatened Species within a 10km radius of the Proposal location**

**Legend**

- 10km Radius
- Subject Land
- Suburb Boundary
- Railway

**Waterways**

- Creek
- Gully
- River

**Roads**

- Arterial Road
- Local Road
- Sub Arterial Road

**Threatened Species**

- Barking Owl
- Bilby
- Black Falcon
- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Bush Stone-curlew
- Claypan Daisy
- Curlew Sandpiper
- Diamond Firetail
- Dusky Woodswallow
- Flame Robin
- Freckled Duck
- Gang-gang Cockatoo
- Gilbert's Whistler
- Grey-crowned Babbler (eastern subspecies)
- Grey-headed Flying-fox
- Hooded Robin (south-eastern form)
- Inland Forest Bat
- Koala
- Large Bent-winged Bat
- Little Eagle
- Little Lorikeet
- Major Mitchell's Cockatoo
- Regent Honeyeater
- Scarlet Robin
- Small Purple-pea
- South-eastern Glossy Black-Cockatoo
- Southern Myotis
- Speckled Warbler
- Spotted Harrier
- Spotted-tailed Quoll
- Squirrel Glider
- Squirrel Glider in the Wagga Wagga LGA
- Superb Parrot
- Swift Parrot
- Turquoise Parrot
- Varied Sittella
- White-fronted Chat
- Woolly Ragwort
- Yellow-bellied Sheathtail-bat

N 0 1.5 3 4.5 km

1:110,000

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| **Amphibia** | | | | | | | |
| *Crinia sloanei* | Sloane's Froglet | V | E | 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 New South Wales. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. | PMST | Unlikely – No records for this species exist within the locality and no habitat or connected habitat occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Litoria raniformis* | Southern Bell Frog | E | V | In NSW the Southern Bell Frog was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few yet unconfirmed records have also been made in the Murray Irrigation Area in recent years. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Breeding occurs during the warmer months and is | PMST | Nil – No records for this species exist within the locality and no natural habitat occurs within the Subject Land. | Nil – The species does not occur, and no habitat will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | triggered by flooding or a significant rise in water levels. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks. (Sourced from NSW Office of Environment - Threatened species profile 2022) | | | |
| ***Aves/Birds*** | | | | | | | |
| *Botaurus poiciloptilus* | Australasian Bittern | E | E | Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g., Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate. | PMST | Nil – No records for this species exist within the locality and no suitable habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Rostratula australis* | Australian Painted Snipe | E | E | The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin. This species occupies wetland and swamp habitats, preferring the fringes of swamps | PMST | Nil – No records for this species exist within the locality and no | Nil – The species does not occur and no habitat for the species will be |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | and dams with a cover of grasses, reeds, scrub or woodland. Breeding occurs anytime during spring and summer when conditions are favorable. It nests on the ground amongst tall vegetation. | | suitable habitat occurs within the Subject Land. | impacted by the Proposal. |
| *Ninox connivens* | Barking Owl | V | - | Found throughout continental Australia except for central arid regions. The Barking Owl requires large tree hollows in order to roost and breed. It occupies open forests and woodlands including partially cleared farmland. They often roost in densely formed Acacia and Casuarina species. Known to successfully breed along timbered watercourses in heavily cleared habitats, where a higher density of prey is found around fertile riparian soils. A large portion of its diet consists of arboreal mammals but can adapt to ground dwelling species where the habitat cannot sustain preferred prey. Requires very large permanent territories in most habitats due to sparse prey densities. | Bionet (5) | Unlikely – Records for this species exist within the locality but no suitable habitat, such as tree hollows or farmland, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Falco subniger* | Black Falcon | V | - | The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Tree lined watercourses and isolated woodlands in arid and semi-arid areas are preferred nesting and roosting habitat. Large old trees are a resource that is critical for nesting and hunting. | Bionet (13) | Unlikely – Records for this species exist within the locality but no suitable habitat, such as natural | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | | | watercourses, occurs within the Subject Land. | |
| *Melithreptus gularis gularis* | Black-chinned Honeyeater | V | - | The Black-chinned Honeyeater is widespread throughout NSW, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. The Black-chinned Honeyeater occupies open woodland habitats and open forests of smooth gums, stringybarks, ironbarks and Casuarinas and Melaleucas. They require large foraging territories of woodland patches at least 5 hectares large. | Bionet (4) | Unlikely – Records for this species exist within the locality but no suitable habitat, such as suitably sized woodland patches, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Neophema chrysostoma* | Blue-winged Parrot | - | V | Blue-winged Parrots breed on mainland Australia south of the Great Dividing Range in Victoria, South Australia and Tasmania. During the non-breeding period, from autumn to early spring, birds are recorded in western New South Wales and sometimes south-eastern NSW, particularly on the southern migration. Birds inhabit a range of habitats from coastal, sub-coastal and inland areas through to semi-arid zones. They tend to favor grasslands and grassy woodlands and are often found near wetlands. Can also be found in altered | PMST | Unlikely – No records for this species exist within the locality and no habitat, such as suitable grasslands, tree hollows or wetlands, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | environments such as airfields, golf-courses and paddocks. Forage mainly near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs. Nests are made in hollows, preferably with a vertical opening, in live or dead trees or stumps, in eucalypt forests and woodlands within the breeding range. | | | |
| *Climacteris picumnus victoriae* | Brown Treecreeper (eastern sub-species) | V | - | The eastern subspecies of Brown Treecreeper lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys with its western boundary of the range running approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell. This species territory is in open woodland habitats (including Box-Gum Woodland), preferring woodlands dominated by stringybarks and rough barked eucalypts with a grassy understory. It requires tree hollows in live and dead trees or stumps for nesting. | Bionet (28), PMST | Unlikely – Records for this species exist within the locality but no suitable habitat, such as tree hollows or suitable woodland, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Burhinus grallarius* | Bush Stone-curlew | E | - | The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south- | Bionet (4) | Unlikely – Records for this species exist within the locality but no suitable | Nil – The species is unlikely to occur and no habitat for the species will be |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | east, it is either rare or extinct throughout its former range. The Bush Stone-curlew occupies open grassy woodland habitat with sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. (Sourced from NSW Office of Environment - Threatened species profile 2022) | | habitat, such as fallen timber or undisturbed woodland, occurs within the Subject Land. | impacted by the Proposal. |
| *Calidris ferruginea* | Curlew Sandpiper | E | CE - Mi, C, J,R | 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. Inland records are probably mainly of birds pausing for a few days during migration. | Bionet (3), PMST | Unlikely – Records for this species exist within the locality but no suitable habitat, such as lakes or dams, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Stagonopleura guttata* | Diamond firetail | V | - | The Diamond Firetail tends to occur in proximity to watercourses building small dome nests in shrubs and dense foliage. It is found within Box-Gum Woodlands, Snow Gum Woodlands, open forests, mallee, Natural Temperate Grassland and in secondary grasslands derived from other communities. This species forages on grasses, forbs and insects along the ground. Nests are globular structures built either in the shrubby | Bionet (7), PMST | Unlikely – Records for this species exist within the locality but no suitable habitat, such natural shrubby understory, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | understory, or higher up, especially under hawk's or raven's nests. (DPE 2022) | | | |
| *Artamus cyanopterus cyanopterus* | Dusky Woodswallow | V | V | Dry, open eucalypt forests and woodland are the preferred habitat. Mallee associations with a sparse understory of eucalypt saplings, acacias and other shrubs and ground cover of grasses or sedges and woody debris are also inhabited. Farmland, particularly forest or woodland edges are also inhabited and very occasionally, moist forest or rainforest. This species feeds on insects foraged aerially or from the ground or canopy, and also feeds on flower nectar. The nest is a loose bowl of grass, twigs and roots which is lined with finer grass and typically placed 1-10m above ground level in a tree fork, however also behind bark or in stump hollows about. The Dusky Woodswallow feeds on insects taken on the wing, as well as from foliage and on the ground. It also eats nectar from flowers. | Bionet (8) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance, location within the town of Wagga Wagga, and no connected habitat. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Numenius madagascariensis* | Eastern Curlew | - | CE - Mi, C, J,R | The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbors, lagoons and occasionally on wooden oyster leases or other similar structures. It is rarely found inland. The Eastern Curlew occurs only in our flyway, | PMST | Nil – No records for this species exist within the locality and no suitable water habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | and about 75 per cent of the world's curlews' winter in Australia. | | | |
| *Petroica phoenicea* | Flame Robin | V | - | Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understory. Occasionally occurs in temperate rainforest, and also in herb fields, heathlands, shrublands and sedgelands at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e., valleys below the ranges, and to the western slopes and plains). Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. | Bionet (13) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance, location within the town of Wagga Wagga, and no connected habitat. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Stictonetta naevosa* | Freckled Duck | V | - | Found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps and prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Nesting usually occurs between | Bionet (1) | Unlikely – A record for this species exists within the locality but no suitable water or swamp habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | October and December with nests usually located in dense vegetation at or near water level. | | | |
| *Callocephalon fimbriatum* | Gang-gang Cockatoo | V | E | This species is nomadic, spending summer in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests and winter at lower altitudes in drier more open eucalypt forest and woodlands, particularly in coastal areas. This species nests in hollow-bearing trees close to water with breeding taking place between October and January. Favours old growth forest and woodland attributes with dense understory, for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts. | Bionet (3), PMST | Unlikely – Records for this species exist within the locality but no suitable habitat, such as tree hollows or old growth patches, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Pachycephala inornata* | Gilbert's Whistler | V | - | The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, from the western slopes of NSW to the Western Australian wheatbelt. The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests, though at this stage it is only known to use this habitat along the | Bionet (5) | Unlikely – Records for this species exist within the locality but no suitable habitat, such as dense shrub understory or undisturbed vegetation, | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | Murray, Edwards and Wakool Rivers. Its food consists mainly of spiders and insects such as caterpillars, beetles and ants, and occasionally, seeds and fruits are eaten. Breeding takes place between August and November. Nests are usually built below about two and a half metres (but up to six metres) above the ground in the fork of dense foliage of plants such as wattles or cypress pines. (DPE 2022) | | occurs within the Subject Land. | |
| *Falco hypoleucos* | Grey Falcon | V | - | Restricted to shrubland, grassland and wooded watercourses and sometimes near wetlands where surface water attracts prey. Occasionally found in open woodlands near the coast. Nests are constructed in high living eucalypts near a watercourse. Likely to be extinct in areas with higher than 500mm annual rainfall. | PMST | Nil – No records for this species exist within the locality and no suitable wetland or undisturbed vegetation habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Pomatostomus temporalis temporalis* | Grey-crowned Babbler (eastern subspecies) | V | - | The Grey-crowned Babbler occupies Box-gum woodlands, Box-cypress-pine and Box Woodlands on alluvial plains. They construct several large dome stick nests within a territory and breed cooperatively during the warmer months. Birds are generally unable to cross large open areas. | Bionet (4) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | | | level of disturbance, location within the town of Wagga Wagga, and no connected habitat. | |
| *Melanodryas cucullata cucullata* | Hooded Robin (south-eastern form) | V | E | The Hooded Robin is considered a sedentary species, but local seasonal movements are possible. Prefers lightly wooded country, usually open eucalypt woodland, wattle scrub and mallee, often in or near clearings or open areas. The species requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. | Bionet (7), PMS | Unlikely – Records for this species exist within the locality but no suitable habitat, such as structurally diverse habitat or undisturbed vegetation, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Hieraaetus morphnoides* | Little Eagle | V | - | The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. | Bionet (39) | Unlikely – Records for this species exist within the locality but no suitable habitat, such as remnant patches, | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | | | occurs within the Subject Land. | |
| *Glossopsitta pusilla* | Little Lorikeet | V | - | In NSW Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. They are considered nomadic responding to food availability and highly gregarious often foraging in mixed flocks. They occur in dry, open eucalypt forests and woodlands using roadside vegetation. They rely on nectar and pollen, particularly on profusely flowering eucalypts, melaleucas and mistletoes. On the western slopes and tablelands White Box E. albens and Yellow Box E. melliodora are particularly important food sources for pollen and nectar respectively. They often return to the same nest hollow annually preferring smooth barked Eucalypts with small hollows (3 cm entrance diameter). | Bionet (4) | Unlikely – Records for this species exist within the locality but no suitable habitat, such as tree hollows, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Lophochroa leadbeateri* | Major Mitchell's Cockatoo | V | - | Inhabits treed and treeless inland areas, always within easy reach of water. Predominantly feeds on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Nesting occurs in tree hollows throughout the second half of the year with nests being | Bionet (2), PMST | Unlikely – Records for this species exist within the locality but no suitable habitat, such as tree hollows or undisturbed | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | at least 1 km apart, with no more than one pair every 30 square kilometres. | | foraging habitat, occurs within the Subject Land. | |
| *Leipoa ocellata* | Malleefowl | E | V | Historically found widely throughout Australia, Malleefowl are now mostly limited to areas of inland semi-arid scrub. It requires light sandy loam soils with a diverse shrub and understory. They prefer a dry environment with low-growing eucalypt trees and shrubs, referred to as mallee country. Feeds mostly on ants and the seeds of wattle and senna plants. | PMST | Nil – No records for this species exist within the locality and no suitable mallee habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Grantiella picta* | Painted Honeyeater | V | V | A nomadic species inhabiting Boree/ Weeping Myall (Acacia pendula), Brigalow (A. harpophylla) 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 Amyema. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches. | PMST | Nil – No records for this species exist within the locality and no suitable habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Pedionomus torquatus* | Plains Wanderer | E | CE | The vast majority (>99%) of records of Plains-wanderers in NSW over the past 30 years come from an area of the western Riverina. Even within its western Riverina stronghold, the Plains-wanderer has a very | PMST | Nil – No records for this species exist within the locality and no | Nil – The species does not occur and no habitat for the species will be |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | patchy distribution. The Plains Wanderer inhabits open native grasslands with approximately 50% bare soils. It does not occupy densely vegetated grasslands preferring habitats with short grass species ranging from 5-30cm high. | | suitable grassland habitat occurs within the Subject Land. | impacted by the Proposal. |
| *Anthochaera phrygia* | Regent Honeyeater | CE | CE | The Regent Honeyeater is a migratory woodland bird moving across the landscape in response to climatic conditions and food availability. This species prefers Box-Ironbark woodland and riparian forests particularly habitats with mature trees, high canopy cover and abundance of mistletoes. Nonbreeding flocks occasionally seen in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female. | Bionet (1), PMST | Unlikely – A record for this species exists within the locality but no suitable habitat, such as woodland with abundant mistletoes, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Petroica boodang* | Scarlet Robin | V | - | In NSW, this species occupies open forests and woodlands from the coast to the inland slopes. It breeds in drier eucalypt forests and temperate | Bionet (11) | Unlikely – Records for this species exist | Nil – The species is unlikely to occur and no habitat for |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | woodlands, often on ridges and slopes, within an open understory of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter, it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. | | within the locality but no suitable habitat, such as woodland with abundant logs and coarse woody debris, occurs within the Subject Land. | the species will be impacted by the Proposal. |
| *Calyptorhynchus lathami lathami* | South-eastern Glossy Black-Cockatoo | V | V | This species predominantly nests in eucalypts and feeds on casuarinas. It nests in both living and dead trees. Glossy Black Cockatoos prefer to live in untouched, rugged country, especially that containing Brigalow scrub or rocky hilly country. Other habitat includes where she-oaks are common, coastal woodlands and drier forest areas as well as timbered watercourses. The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. | Bionet (4), PMST | Unlikely – Records for this species exist within the locality but no suitable habitat, such as untouched, rugged country, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Aphelocephala leucopsis* | Southern Whiteface | - | V | Southern Whiteface occurs across most of mainland Australia south of the tropics. The species lives in a wide range of open woodlands and shrublands where | Bionet (5), PMST | Unlikely – Records for this species exist | Nil – The species is unlikely to occur and no suitable |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | there is an understory of grasses or shrubs, or both. These areas are usually dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. Favours relatively undisturbed habitat with low tree densities and an herbaceous understory litter cover. The species almost exclusively forages on the ground, mainly feeding on insects, spiders and seeds, largely gleaned from the bare ground or leaf litter. Birds build large bulky domed nests of grass, bark and roots, usually in a living or dead trees with hollows or crevices, although sometimes in low bushes. Breeds from July to October throughout most of the species' range. | | within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance, location within the town of Wagga Wagga, and absence of tree hollows. | habitat for the species will be impacted by the Proposal. |
| *Chthonicola sagittata* | Speckled Warbler | V | - | The Speckled Warbler occupies open Eucalypt woodlands with a grassy understory and often rocky outcrops. Relatively large undisturbed areas are required to sustain this species in an area. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understory, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding | Bionet (6) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance and location within the town of Wagga Wagga. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside. A clutch of 3-4 eggs is laid, between August and January, and both parents feed the nestlings. | | | |
| *Circus assimilis* | Spotted Harrier | V | - | Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. Found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands on terrestrial mammals (e.g., bandicoots, bettongs, and rodents), birds and reptiles. They build a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. | Bionet (3) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance and location within the town of Wagga Wagga. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Polytelis swainsonii* | Superb Parrot | V | V | Found to forage in grassy box woodland up to 10km from the nesting site. They typically nest in colonies and return to the same location over generations. | Bionet (88), PMST | Unlikely – Records for this species exist within the locality | Nil – The species is unlikely to occur and no suitable habitat for the |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | During the summer they return from wintering in northern NSW to breed, often in open box-woodland or isolated paddock trees requiring tree hollows to breed. | | but habitat within the Subject Land is unsuitable given the high level of disturbance, absence of tree hollows and location within the town of Wagga Wagga. | species will be impacted by the Proposal. |
| *Lathamus discolor* | Swift Parrot | E | CE | In NSW, the Swift Parrot mostly occurs mostly on the coast and south west slopes. It breeds in Tasmania and returns to the south-eastern mainland to forage over the cooler months (March – October). They move across the landscape to forage on lerp infestations or an abundance of eucalypt flowers. Preferred feed trees include Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon and E. albens. | Bionet (19), PMST | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance, absence of tree hollows and location within the town of Wagga Wagga. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| *Neophema pulchella* | Turquoise Parrot | V | - | Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. Nests in tree hollows, logs or posts, from August to December. | Bionet (6) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance and absence of tree hollows. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Daphoenositta chrysoptera* | Varied Sitella | V | - | The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west. It prefers open Eucalypt and Acacia woodlands with Stringybark Eucalypts from which to glean insects. They are territorial preferring to use the same tree fork to construct nests for breeding. | Bionet (3) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance and location within the town of Wagga Wagga. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| *Epthianura albifrons* | White-fronted Chat | V | - | Found across the southern half of Australia in mostly temperate to arid climates and rarely sub-tropical areas. It occupies foothills and lowlands up to 1000m above sea level, mostly in damp open habitats along the coast and near waterways. The species can be seen foraging on bare or grassy ground in wetland areas for insects. This species has been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. | Bionet (8) | Unlikely – Records for this species exist within the locality but no suitable habitat, such as damp open habitats near waterways, occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Hirundapus caudacutus* | White-throated Needletail | - | V - Mi, C,J,R | In eastern Australia, the species is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains. This species is mostly aerial. Although they occur over most types of habitat, they are recorded most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings. This species forages aerially and opportunistically in many environments. The species has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows and it has been suggested that they also sometimes roost aerially. The species breeds in Asia in | Bionet (4), PMST | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is likely to be unsuitable given the high level of disturbance and location within the town of Wagga Wagga. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | wooded lowlands and sparsely vegetated hills, as well as mountains covered with coniferous forests. White-throated Needletails take refuge in a range of shelter types during extreme conditions including the potential to roost in tree hollows. | | | |
| **Fish** | | | | | | | |
| *Galaxias rostratus* | Flathead Galaxias | CE | CE | Flathead Galaxias occur in the southern part of the Murray Darling Basin and have been recorded in the Macquarie, Lachlan, Murrumbidgee and Murray Rivers in NSW. Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals.(Sourced from NSW DPI Threatened Species Profile - 2022) | PMST | Nil – No records for this species exist within the locality and no habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Macquaria australasica* | Macquarie Perch | E | E | This species of freshwater fish inhabits river and lake habitats, especially the upper reaches of rivers and their tributaries. Spawning occurs in spring and summer in shallow upland streams or flowing sections of river systems. This species is found in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers, and in parts of the Hawkesbury and Shoalhaven catchment areas. The species requires clear water with deep, rocky holes with abundant cover (including | PMST | Nil – No records for this species exist within the locality and no habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | aquatic vegetation, woody debris, large boulders and overhanging banks (DotE 2016c; DPI 2016b). | | | |
| *Maccullochella peelii* | Murray Cod | - | V | The Murray Cod occurs throughout the Murray-Darling Basin and utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW, and slow-flowing lowland rivers. Generally, they are found in waters up to 5 m deep and in sheltered areas with cover from rocks, timber or overhanging banks. The presence of wood debris has been shown to be the primary factor determining Murray cod presence. | PMST | Nil – No records for this species exist within the locality and no habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Bidyanus bidyanus* | Silver Perch | V | CE | The Silver Perch has disappeared from most of its former range. It currently persists predominantly within a population along the central Murray River downstream of Yarrawonga weir as well as within anabranches and tributaries. They occur within lowland often turbid, slow-flowing rivers in similar habitats to the Murray Cod. | PMST | Nil – No records for this species exist within the locality and no habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Nannoperca australis* | Southern Pygmy Perch (Murray-Darling Basin Lineage) | - | V | Southern Pygmy Perch were formerly found in the Murray and lower Murrumbidgee River systems with populations recently discovered in 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 and lakes. They | PMST | Nil – No records for this species exist within the locality and no habitat occurs | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | prefer covered habitats and are usually not found in open water. | | within the Subject Land. | |
| *Maccullochella macquariensis* | Trout Cod | E | E | The Trout Cod is endemic to the Murray Darling River system. The closest record occurs from the Macquarie River dating from 2006. This species requires deep water habitat with plenty of cover and refuge including undercut banks, snags (large woody debris) and prefer waterways with relatively fast currents. They typically have small home ranges and remain in the same area. | PMST | Nil – No records for this species exist within the locality and no habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| **Flora** | | | | | | | |
| *Austrostipa wakoolica* | A Spear-grass | E | E | 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 Callitris glaucophylla, Eucalyptus microcarpa, E. populnea, Austrostipa eremophila, A. drummondii, Austrodanthonia eriantha and Einadia nutans. Flowers from October to December, mainly in response to rain. | PMST | Nil – No records for this species exist within the locality and no suitable habitat, such as undisturbed floodplains or associated species, occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| *Brachyscome muelleroides* | Claypan Daisy | V | V | The Claypan Daisy 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 Pycnosorus globosus, Agrostis avenacea and Austrodanthonia duttoniana. Also recorded from the margins of lagoons in mud or water, and in association with Calotis anthemoides. Victorian collections have generally come from open positions on the Murray River floodplain, swampy River Red Gum (Eucalyptus camaldulensis) Forest and damp depressions.(DPE 2022) | Bionet (1), PMST | Unlikely – A record for this species exists within the locality but habitat within the Subject Land is likely to be unsuitable given the high level of disturbance, lack of claypans and associated species, and location within the town of Wagga Wagga. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Caladenia arenaria* | Sand-hill Spider-orchid | E | E | Caladenia arenaria is found mostly on the south west plains and western south west slopes. The original description is of a plant from Nangus, west of Gundagai (1865) and there is a report of the species from Adelong near Tumut. Occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (Callitris glaucophylla). (Sourced from NSW Office of Environment and Heritage - Species Profile - 2022) | PMST | Nil – No records for this species exist within the locality and habitat within the Subject Land is unsuitable given the high level of disturbance, lack of associated species, and | Nil – The species does not occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | | | location within the town of Wagga Wagga. | |
| *Lepidium aschersonii* | 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 Lepidium aschersonii recorded for Australia occurs in NSW. Found on ridges of gilgai clays dominated by Brigalow (Acacia harpophylla), Belah (Casuarina cristata), Buloke (Allocasuarina luehmanii) and Grey Box (Eucalyptus microcarpa). In the south has been recorded growing in Bull Mallee (Eucalyptus behriana). Often the understorey is dominated by introduced plants. The species grows as a 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 | Nil – No records for this species exist within the locality and habitat within the Subject Land is unsuitable given the high level of disturbance, lack of ridges, gilgai clays and associated species, and location within the town of Wagga Wagga. | Nil – The species does not occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | Flowers from spring to autumn." | | | |
| *Lepidium monoplocoides* | Wingged 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 mm. Predominant vegetation is usually an open woodland dominated by Allocasuarina luehmannii (Bulloak) and/or eucalypts, particularly Eucalyptus largiflorens (Black Box) or Eucalyptus populnea (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. | PMST | Nil – No records for this species exist within the locality and habitat within the Subject Land is unsuitable given the high level of disturbance, lack of associated species, relatively high rainfall and location within the town of Wagga Wagga. | Nil – The species does not occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Prasophyllum petilum* | Tarengo Leek Orchid | E | E | Natural populations are known from a total of five sites in NSW. These are near Boorowa, Queanbeyan area, Ilford, Delegate and a newly recognised population c.10 km west of Muswellbrook. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Highly susceptible to grazing impacts. | PMST | Nil – No records for this species exist within the locality and no natural temperate grassland habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| *Senecio garlandii* | Woolly Ragwort | V | - | This daisy is found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop (and surrounds). There is a single population in Victoria at Chiltern. Woolly Ragwort occurs on sheltered slopes of rocky outcrops. Flowering occurs in spring.(DPE 2022) | Bionet (2) | Nil – Records for this species exist within the locality but no sheltered slopes or rocky outcrops occur within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Swainsona murrayana* | 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 Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated (Sourced from NSW Office of Environment and Heritage - Species Profile - 2022). | PMST | Nil – No records for this species exist within the locality and no associated communities occur within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| *Swainsona recta* | Mountain Swainsona Pea | E | E | Small Purple-pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum Eucalyptus blakelyi, Yellow Box E. melliodora, Candlebark Gum E. rubida and Long-leaf Box E. goniocalyx. Grows in association with understorey dominants that include Kangaroo Grass Themeda australis, poa tussocks Poa spp. and spear-grasses Austrostipa spp. | Bionet (2), PMST | Nil – Records for this species exist within the locality but no suitable woodlands or open-forests occur within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| **Invertebrates** | | | | | | | |
| *Keyacris scurra* | Key's Matchstick Grasshopper | E | - | This grasshopper is typically found in native grasslands and grassy woodlands but it has also been recorded in other vegetation associations usually containing a native grass understory (especially kangaroo grass Themeda triandra) and known food plants (particularly Asteraceae). More recently, however, opportunistic sightings of Key's Matchstick Grasshopper have been reported in a wide range of vegetation types in south-east NSW including wet sclerophyll forest, montane low forest, dry woodlands, heathland and montane grasslands. In some reported locations there is an | PMST | Nil – No records for this species exist within the locality but no native grasslands or suitable woodlands occur within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
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| | | | | absence of kangaroo grass and very few or no Asteraceae. Being flightless, this species does not disperse large distances (<10m) which suggests these observations are indicative of resident populations (rather than dispersing individuals). Key's Matchstick grasshopper was originally distributed from Victoria to Orange (NSW) across the wheat/sheep belt, typically recorded in native grasslands and grassy woodland. | | | |
| **Mammals** | | | | | | | |
| *Macrotis lagotis* | Bilby | Extinct | V | The Bilby is presumed to be extinct in NSW with the last confirmed sightings occurring form the early 1900s. Historically they would be found throughout a variety of vegetation communities ranging from inland to coastal regions. | Bionet (1) | Nil – A record for this species exists within the locality but habitat within the Subject Land is unsuitable given the high level of disturbance and location within the town of Wagga Wagga. | Nil – The species does not occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Nyctophilus corbeni* | Corben's Long-eared Bat, South-eastern Long-eared Bat | V | V | Distribution coincides with the Murray Darling Basin, particularly the Pilliga Scrub region. Inhabits a variety of vegetation types, including mallee, buloke (Allocasuarina leuhmannii) and box eucalypt | PMST | Nil – No records for this species exist within the locality and | Nil – The species does not occur and no suitable habitat for the species will |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | 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. Roosts in tree hollows, crevices, and under loose bark. Slow flying agile bat, utilising the understorey to hunt non-flying prey . Mating takes place in autumn with one or two young born in late spring to early summer. | | habitat within the Subject Land is unsuitable given the high level of disturbance, lack od tree hollows and location within the town of Wagga Wagga. | be impacted by the Proposal. |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | V | V | This species roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species is known to forage in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps on the nectar and pollen of native trees, in particular eucalypts, Melaleucas and Banksias. This species will also forage in urban gardens and cultivated fruit crops. Typically found on the coastal plain and eastern slopes of NSW, only making regular movements to the western slopes in northern NSW. This species has complex migratory movements across local landscapes to source food across different time of the year. The Grey-headed Flying-fox roosts in aggregations of | Bionet (41), PMST | Likely – A high number of records for this species exist within the locality, including a 2017 record approximately 100m to the west of the Subject Land in similar habitat. The species likely utilises foraging resources within the Subject Land such as urban | Moderate – Foraging resources for this species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. | | gardens and planted street trees. | |
| *Vespadelus baverstocki* | Inland Forest Bat | V | - | Roosts in tree hollows and abandoned buildings – has been observed to roost in very small hollows in small trees only a few metres high. Habitat is varied – known from a variety of woodland habitats. Cover an extensive foraging area feeding on flying insects. | Bionet (1) | Unlikely – A record for this species exists within the locality but habitat within the Subject Land is likely unsuitable given the high level of disturbance, the location and the lack of tree hollows. | Nil – The species is unlikely to occur and habitat for the species will not be impacted by the Proposal. |
| *Phascolarctos cinereus* | Koala | E | E | The Koala has a fragmented distribution throughout eastern Australia. It is limited to areas of preferred feed trees in eucalypt woodlands and forests. The size of their home range varies depending on the quality of habitat. Inhabit eucalypt woodlands and forests. The Koala feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. | Bionet (7), PMST | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is likely to be unsuitable given the high level of disturbance, | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | They spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year. | | location within the town of Wagga Wagga and associated lack of connected habitat. | |
| *Miniopterus orianae oceanensis* | Large Bent-winged Bat | V | - | Caves are the primary roosting habitat for this species, but they may also use mines, stormwater outlets or tunnels and other man-made infrastructure. Eastern Bentwing-bats occur along the east and north-west coasts of Australia, hunting in forested areas, catching moths and other flying insects above the tree tops. | Bionet (1) | Unlikely – A record for this species exists within the locality but habitat within the Subject Land is likely to be unsuitable given the high level of disturbance, location within the town of Wagga Wagga and associated lack of connected habitat. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| *Myotis macropus* | Southern Myotis | V | - | The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. The Southern Myotis roosts in tree hollows, mine shafts, storm water channels, buildings, under bridges as well as amongst dense emergent riparian vegetation. This species is strongly associated with waterways foraging for small fish and insects over streams by raking their feet across the water surface. | Bionet (2) | Unlikely – Records for this species exist within the locality but habitat within the Subject Land is likely to be unsuitable given the high level of disturbance and absence of suitable waterways. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Dasyurus maculatus* | Spotted-tailed Quoll | V | E | The Spotted Tailed Quoll inhabits a range of environments in NSW including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den subject sites are in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, which are usually traversed along densely vegetated creek lines. | Bionet (1), PMST | Unlikely – A record for this species exists within the locality but habitat within the Subject Land is likely to be unsuitable given the high level of disturbance, location within the town of Wagga Wagga and associated | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | | | lack of connected habitat. | |
| *Petaurus norfolcensis* | Squirrel Glider | V | - | This species of glider is widely though sparsely distributed throughout eastern Australia. In NSW it 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. This species prefers a diversity of food supplies including wattle, gum, eucalypt saplings, nectar, honeydew and manna, with invertebrates and pollen providing protein, and requires an abundant supply of tree-hollows for nesting and shelter. | Bionet (168) | Unlikely – Although a high number of records for this species exist within the locality no records occur in urban areas and no suitable habitat, such as old growth woodlands or hollow-bearing-trees, occurs within the Subject Land. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| *Petaurus norfolcensis* | Squirrel Glider in the Wagga Wagga LGA | E | - | Between April 1996 and October 1998, five sightings of Squirrel Gliders were made in Wiradjuri Reserve and Wilks Park, two adjacent reserves that adjoin the Murrumbidgee River in North Wagga Wagga. Within the vicinity of Wagga Wagga, potentially suitable habitat is sparse and occurs as small, scattered remnants. Based on this paucity of suitable habitat and the recorded sightings of Squirrel Glider from the area, | Bionet (168) | Unlikely – Although a high number of records for this population exist within the locality no records occur in urban areas and no suitable | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | the Squirrel Glider population in Wagga Wagga Local Government Area appears to be small and disjunct. Further, the population appears to be at the western limit of the Squirrel Glider range in NSW. Threats to the Squirrel Glider population in Wagga Wagga Local Government Area include further loss of habitat through clearing of regenerating River Red Gums, lack of regeneration of other native plants, inability to recruit individuals, vulnerability to local extinction via stochastic events and predation from red foxes and domestic or feral cats. The Scientific Committee is of the opinion that the Squirrel Glider population in the Wagga Wagga Local Government Area has been reduced to such a critical level and its habitat has been so drastically reduced that it is in immediate danger of extinction, the population is disjunct and at or near the western limit of its geographic range. This species of glider is widely though sparsely distributed throughout eastern Australia. In NSW it 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. This species prefers a diversity of food supplies including wattle, gum, eucalypt saplings, nectar, honeydew and manna, with invertebrates and | | habitat, such as old growth woodlands or hollow-bearing-trees, occurs within the Subject Land. | |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | pollen providing protein, and requires an abundant supply of tree-hollows for nesting and shelter. (DPE 2022) | | | |
| *Saccolaimus flaviventris* | Yellow-bellied Sheathtail Bat | V | - | The Yellow-bellied Sheathtail Bat is found throughout south-east Australia. It roosts in tree hollows and buildings and occasionally in mammal burrows where roost sites area scarce. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Breeding has been recorded from December to mid-March, when a single young is born. | Bionet (1) | Unlikely – A record for this species exists within the locality but habitat within the Subject Land is likely to be unsuitable given the high level of disturbance, location within the town of Wagga Wagga and associated lack of connected forest habitat. | Nil – The species is unlikely to occur and no suitable habitat for the species will be impacted by the Proposal. |
| **Reptiles** | | | | | | | |
| *Aprasia parapulchella* | Pink-tailed Worm-lizard | V | V | Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (Themeda australis). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. | PMST | Nil – No records for this species exist within the locality and no suitable habitat, including | Nil – The species does not occur and no habitat for the species will be |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. | | partially-buried rocks and native groundlayers, occurs within the Subject Land. | impacted by the Proposal. |
| **Threatened Ecological Communities** | | | | | | | |
| Grey Box (Eucalyptus microcarpa) Grassy Woodland and Derived Native Grasslands of South-eastern Australia | | E | E | Eucalyptus microcarpa (Inland Grey Box), is often found in association with E.populnea subsp. bimbil (Bimble or Poplar Box), Callitris glaucophylla (White Cypress Pine), Brachychiton populneus (Kurrajong), Allocasuarina luehmannii (Bulloak) or E. melliodora (Yellow Box), and sometimes with E. albens (White Box). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. | Bionet (K), PMST | Nil – This community does not occur within the Subject Land. | Nil – This community will not be impacted by the Proposal. |
| Weeping Myall Woodlands | | E | E | Weeping Myall Woodlands occur in a range of forms from open woodlands to woodlands*, in which weeping myall (Acacia pendula) trees are the sole or dominant overstorey species. Although weeping myall | Bionet (K), PMST | Nil – This community does not occur within the Subject Land. | Nil – This community will not be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | trees are often the only tree species in these woodlands, other trees can occur in the overstorey of the ecological community. This community typically occurs in red-brown earths and heavy textured grey and brown alluvial soils in areas receiving between 375 and 500 mm mean annual rainfall. | | | |
| White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions | | CE | - | White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland can occur as either grassland or woodland is characterised by a species diverse understory of grasses, herbs and sparse shrubs. Dominant canopy species include Eucalyptus albens, E. melliodora and E. blakelyi. This ecological community occurs in areas where rainfall is between 400 and 1200 mm per annum, on moderate to highly fertile soils at altitudes of 170 metres to 1200 metres | Bionet (K) | Known – This community was observed as occurring within a small section of the Subject Land. | Low – This community occurs in a road reserve which is not anticipated to be impacted by the Proposal. |
| White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland | | - | CE | White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland can occur as either grassland or woodland is characterised by a species diverse understory of grasses, herbs and sparse shrubs. Dominant canopy species include Eucalyptus albens, E. melliodora and E. blakelyi. This ecological community occurs in areas where rainfall is between 400 and 1200 mm per annum, on moderate to highly fertile soils at altitudes of 170 metres to 1200 metres | PMST | Nil – Vegetation communities within the Subject Land did not conform to this TEC. | Nil – This community will not be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| **Migratory Species** | | | | | | | |
| *Tringa nebularia* | Common Greenshank | - | Mi, C,J,R | Common Greenshanks are common throughout Australia in the summer, found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops. | Bionet (4) | Nil – Records for this species exist within the locality but no suitable habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Actitis hypoleucos* | Common Sandpiper | - | Mi, C,J,R | In Australia, the Common Sandpiper is found in coastal or inland wetlands, both saline or fresh. It is found mainly on muddy edges or rocky shores. When in Australia, the population is concentrated in northern and western Australia . | PMST | Nil – No records for this species exist within the locality and no suitable wetland habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Numenius madagascariensis* | Eastern Curlew | - | CE - Mi, C,J,R | The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours, lagoons and occasionally on wooden oyster leases or other similar structures. It is rarely found inland. The Eastern Curlew occurs only in our flyway, and about 75 per cent of the world's curlews winter in Australia. | PMST | Nil – No records for this species exist within the locality and no suitable habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| *Apus pacificus* | Fork-tailed Swift | - | Mi, C,J,R | In Australia, the Fork-tailed Swift mostly occurs over dry or open habitats, including inland plains, riparian woodland and tea-tree swamps, low scrub, heathland, saltmarsh and sometimes above foothills or in coastal areas spending most of their time in the air, or roosting on cliffs or walls. They also occur over settled areas, including towns, urban areas and cities. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. An aerial eater, flying anywhere from 1 m to 300 m above the ground to forage on insects including small bees, wasps, termites and moths. (DCCEEW 2022) | Bionet (5), PMST | Likely – Records for this species exist within the locality and the species may occasionally occur over the Subject Land due to the location within an urban environment. | Low – Habitat for the species is unlikely to be impacted by the Proposal. |
| *Gallinago hardwickii* | Latham's Snipe | - | Mi, J,R | Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture (DCCEEW 2022). | Bionet (17), PMST | Unlikely – Records for this species exist within the locality but no suitable wetland or creek habitat occurs within the Subject Land. | Nil – The species is unlikely to occur and no habitat for the species will be impacted by the Proposal. |
| *Tringa stagnatilis* | Marsh Sandpiper | - | Mi, C,J,R | Found around ephemeral wetlands, swamps, lagoons, saltmarshes, estuaries, floodplains and also regularly at sewage farms and saltworks. In south-east Australia | Bionet (1) | Nil – A record for this species exists within the locality | Nil – The species does not occur and no habitat for the |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | they have been found to occur around inland saline lakes and coastal saltworks. | | but no suitable wetland or lake habitat occurs within the Subject Land. | species will be impacted by the Proposal. |
| *Calidris melanotos* | Pectoral Sandpiper | - | Mi, J,R | These birds forage on grasslands and mudflats, picking up food by sight, sometimes by probing. They mainly eat arthropods and other invertebrates. Some Asian breeders winter in southern Australia and NZ. | PMST | Nil – No records for this species exist within the locality and no suitable habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Calidris ruficollis* | Red-necked Stint | - | Mi, C,J,R | Mostly found in coastal areas, including estuaries with intertidal mudflats, sheltered inlets, lagoons and on protected sandy or coralline shores. They have also been found to occur in saltworks and sewage farms. | Bionet (5) | Nil – Records for this species exist within the locality but no suitable habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Myiagra cyanoleuca* | Satin Flycatcher | - | Mi | In NSW widespread on and east of the Great Divide, sparsely scattered on the western slopes, very occasional records on the western plains. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, often near wetlands and watercourses. On migration, occur in coastal forests, | PMST | Nil – No records for this species exist within the locality and no suitable gully or forest habitat | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | woodlands, mangroves and drier woodlands and open forests. Generally, not in rainforests. | | occurs within the Subject Land. | |
| *Calidris acuminata* | Sharp-tailed Sandpiper | - | Mi, C,J,R | The Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches. Its breeding habitat in Siberia is the peat-hummock and lichen tundra of the high Arctic. | Bionet (21), PMST | Nil – Records for this species exist within the locality but no suitable wetland or water habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Hirundapus caudacutus* | White-throated Needletail | - | V - Mi, C,J,R | In eastern Australia, the species is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains. This species is mostly aerial. Although they occur over most types of habitat, they are recorded most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings. | Bionet (4), PMST | Nil – Records for this species exist within the locality but no suitable open forest or wooded habitat occurs within the Subject Land. | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |
| *Motacilla flava* | Yellow Wagtail | - | Mi, C,J,R | The Yellow Wagtail is an extremely rare visitor to Australia and may be recorded as a vagrant on occasion. It prefers a range of damp or wet habitats with low vegetation, including damp meadows, pastures near water, and can even be found occupying sewage farms and bogs. It breeds from April to August, | PMST | Nil – No records for this species exist within the locality and no suitable damp or wet habitat | Nil – The species does not occur and no habitat for the species will be impacted by the Proposal. |

| Scientific name | Common name | BC Act Listing | EPBC Act Listing | Habitat | Nature of record | Likelihood of occurrence | Likelihood of impact |
|---|---|---|---|---|---|---|---|
| | | | | although this varies with latitude. The nest is a grass cup lined with hair and placed on or close to the ground in a shallow scrape. It feeds on a wide variety of terrestrial and aquatic invertebrates as well as some plant material, particularly seeds.(Birdlife.org 2022) | | occurs within the Subject Land. | |

# Appendix D – BAM Data Sheets

# Appendix E – Climate Data

## Wagga Wagga, New South Wales
## August 2023 Daily Weather Observations

Australian Government
Bureau of Meteorology

| Date | Day | Temps | | Rain | Evap | Sun | Max wind gust | | | 9am | | | | | | 3pm | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | | | | Dirn | Spd | Time | Temp | RH | Cld | Dirn | Spd | MSLP | Temp | RH | Cld | Dirn | Spd | MSLP |
| | | °C | °C | mm | mm | hours | | km/h | local | °C | % | eighths | | km/h | hPa | °C | % | eighths | | km/h | hPa |
| 1 | Tu | 6.7 | 15.0 | 0 | | | W | 28 | 11:50 | 10.9 | 82 | 8 | WSW | 7 | 1030.7 | 13.9 | 67 | 1 | W | 17 | 1029.8 |
| 2 | We | 0.8 | 19.1 | 0 | | | E | 20 | 23:20 | 7.6 | 88 | | E | 7 | 1034.7 | 18.2 | 58 | | N | 4 | 1032.3 |
| 3 | Th | 4.4 | 20.2 | 0 | | | NNE | 24 | 11:34 | 9.7 | 81 | | E | 17 | 1034.5 | 19.9 | 58 | 4 | NNE | 15 | 1030.8 |
| 4 | Fr | 8.0 | 20.9 | 0 | | | NNW | 33 | 12:21 | 12.9 | 72 | 3 | ENE | 7 | 1032.9 | 20.5 | 47 | | N | 20 | 1027.5 |
| 5 | Sa | 10.6 | 15.4 | 5.4 | | | WSW | 26 | 13:20 | 11.4 | 96 | 8 | NNE | 4 | 1031.3 | 14.4 | 73 | 2 | W | 17 | 1030.3 |
| 6 | Su | 1.3 | 17.3 | 0 | | | ENE | 26 | 11:15 | 7.0 | 93 | | ESE | 7 | 1033.3 | 15.9 | 60 | 3 | | Calm | 1030.6 |
| 7 | Mo | 3.9 | 17.3 | 0 | | | E | 24 | 10:42 | 9.7 | 81 | | E | 13 | 1032.2 | 16.9 | 56 | | NE | 7 | 1029.5 |
| 8 | Tu | 1.6 | 17.6 | 0 | | | E | 20 | 10:28 | 8.8 | 81 | | ESE | 13 | 1032.7 | 16.9 | 50 | 7 | ESE | 4 | 1029.8 |
| 9 | We | 2.8 | 18.0 | 0 | | | N | 22 | 13:32 | 7.9 | 83 | | E | 11 | 1031.7 | 16.8 | 57 | 6 | NNE | 7 | 1026.5 |
| 10 | Th | 2.3 | 15.0 | 2.6 | | | WSW | 39 | 12:37 | 9.5 | 90 | 1 | NW | 11 | 1021.5 | 14.3 | 62 | 4 | WSW | 19 | 1020.9 |
| 11 | Fr | -0.5 | 14.6 | 0 | | | NW | 24 | 14:24 | 3.8 | 98 | 8 | | Calm | 1025.8 | 13.3 | 60 | 8 | WSW | 13 | 1022.5 |
| 12 | Sa | 2.5 | 14.5 | 0 | | | W | 28 | 13:42 | 8.9 | 83 | 5 | | Calm | 1021.6 | 13.1 | 69 | 7 | W | 17 | 1019.2 |
| 13 | Su | 8.6 | 14.9 | 5.0 | | | N | 17 | 13:42 | 10.1 | 93 | 8 | | Calm | 1020.1 | 14.5 | 68 | 8 | ENE | 7 | 1017.6 |
| 14 | Mo | 8.6 | 15.9 | 2.0 | | | SW | 30 | 16:27 | 11.2 | 92 | 8 | SSW | 2 | 1017.4 | 14.6 | 63 | 8 | SW | 9 | 1015.8 |
| 15 | Tu | -1.7 | 14.3 | 0.8 | | | NNE | 17 | 12:36 | 5.2 | 87 | | ENE | 4 | 1022.7 | 13.8 | 57 | | | Calm | 1021.0 |
| 16 | We | -1.1 | 16.1 | 0.2 | | | NNE | 22 | 12:34 | 7.9 | 82 | | E | 11 | 1023.1 | 15.4 | 51 | 7 | N | 13 | 1018.3 |
| 17 | Th | 0.5 | 15.8 | 0 | | | N | 26 | 13:09 | 6.1 | 84 | | E | 13 | 1015.7 | 14.4 | 45 | 8 | NNE | 13 | 1009.9 |
| 18 | Fr | 6.0 | 12.4 | 3.4 | | | W | 52 | 10:32 | 8.9 | 86 | 7 | W | 28 | 1006.8 | 9.7 | 81 | 7 | WSW | 30 | 1007.9 |
| 19 | Sa | 1.7 | 11.6 | 0.6 | | | W | 28 | 13:47 | 5.1 | 91 | 8 | NNW | 9 | 1021.0 | 10.1 | 94 | 8 | WSW | 11 | 1020.9 |
| 20 | Su | 5.1 | 16.9 | 1.2 | | | WSW | 26 | 14:24 | 11.5 | 93 | 8 | WSW | 13 | 1025.0 | 16.9 | 62 | 7 | SW | 15 | 1023.8 |
| 21 | Mo | 2.2 | | 0 | | | | | | 5.9 | 99 | 8 | E | 13 | 1025.1 | 16.9 | 68 | | ENE | 9 | 1021.3 |
| **Statistics for the first 21 days of August 2023** | | | | | | | | | | | | | | | | | | | | | |
| Mean | | 3.5 | 16.1 | | | | | | | 8.6 | 87 | 6 | | 9 | 1025.7 | 15.3 | 62 | 5 | | 11 | 1023.2 |
| Lowest | | -1.7 | 11.6 | | | | | | | 3.8 | 72 | 1 | | Calm | 1006.8 | 9.7 | 45 | 1 | | Calm | 1007.9 |
| Highest | | 10.6 | 20.9 | 5.4 | | | W | 52 | | 12.9 | 99 | 8 | W | 28 | 1034.7 | 20.5 | 94 | 8 | WSW | 30 | 1032.3 |
| Total | | | | 21.2 | | | | | | | | | | | | | | | | | |

Observations were drawn from Wagga Wagga AMO (station 072150)
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

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